

Solicitation Print

[Return to Solicitation](#) [Send to Printer](#)**Solicitation 6447**

Procurement Folder: **98694**
 Solicitation: **6447**
 Solicitation Type: **Invitation for Bids (IFB)**
 Short Description: **Vehicle: Transit Bus**
 Description: **Vehicle: Low Floor Transit Buses, Commuter Coach Buses, and Trolleys Heavy Duty, 12 Year (29 ft. – 60 ft. sizes)**
 External Solicitation ID:
 External Solicitation Version:
 External Solicitation Type:
 Closing Date: **10/11/2022**

Requestor Office: **E194**
 Preparer Office: **E194**
 Work Location: **Virginia - Statewide**
 Created By: **pcopelan5**
 Created On: **9/27/2022**

High-Risk: **Yes**
 Amendment: **2**
 Status: **Open**
 Issued Date: **9/27/2022**

Closing Time: **1:00 PM**
 Phone: **(804) 786-4068**
 Phone: **(804) 786-4068**

Modified By: **pcopelan5**
 Modified On: **9/27/2022**

Attachments

Attachment Name: **IFB 6447 adv r.pdf** Description: **IFB 6447**
 Attachment Name: **Attachment H, Pricing Schedule 12-Year Transit - Commuter Coach DRAFT1.xlsx** Description: **Attachment H Pricing Schedule IFB 6447**
 Attachment Name: **Addendum (1).pdf** Description: **IFB 6447 Addendum 1**
 Attachment Name: **Addendum 2.pdf** Description: **Addendum 2 IFB 6447**
 Attachment Name: **IFB 6447 Attachment D Small Business Subcontracting Plan Addendum 2.pdf** Description: **Attachment D IFB 6447 Addendum 2**
 Attachment Name: **Attachment G APTA-BTS-BPG-GL-001-13_R2_1 IFB 6447.pdf** Description: **Attachment G IFB 6447 Addendum 2**
 Attachment Name: **Attachment H, Pricing Schedule 12-Year Transit - Addendum 2.xlsx** Description: **Attachment H IFB 6447 Addendum 2**

Contact Information

Pamela Copeland
 Email: pamela.copeland@dgs.virginia.gov
 Phone: **(804) 786-4068**
 Fax:

Other Events

Information not provided

Commodity Information**Lot 1: Lot 1**

Lot 1, Line 1
 Commodity: **55610 Coach, Transit (Articulated)**
 Specifications:
 Description: **Vehicle: Transit Bus Low Floor HD 12 yr. Diesel, CNG, Hybrid, Battery Electric**
 Manufacturer:
 Part Number:
 Product/Category:
 Serial Number:
 Specification:

Line Type: Good
 Quantity: **1**
 Unit: **each**
 Requested Delivery Date:

Drawing:
 Piece:
 Color:
 Size:
 Model:
 Detailed Instructions:

Warranty:

Ship To

eVA-Shipping Exception
SEE COMMENTS
 eVA,VA 99999-9999
 US
 Shipping Method:
 MSDS Required?: **No**
 Hazardous Materials:
 Handling Instructions:
 Packing Instructions:
 Additional Instructions:
 Shipping Instructions:

Bill To

eVA-Billing Exception
 Same as Ship To Address
 eVA,VA 99999-9999
 US
 Billing Instructions:

External Lot Number:

External Line Number:

Lot 1, Line 2

Commodity: **55620 Coach, Transit (Electric)**
 Specifications:
 Description: **Vehicle: Transit Bus Low Floor HD 12 yr. Diesel, CNG Hybrid, Battery Electric**

Line Type: Good
 Quantity: **1**
 Unit: **each**
 Requested Delivery Date:

Manufacturer:
 Part Number:
 Product/Category:
 Serial Number:
 Specification:

Drawing:
 Piece:
 Color:
 Size:
 Model:
 Detailed Instructions:

Warranty:

Ship To

eVA-Shipping Exception
 SEE COMMENTS
 eVA,VA 99999-9999
 US
 Shipping Method:
 MSDS Required?: No
 Hazardous Materials:
 Handling Instructions:
 Packing Instructions:
 Additional Instructions:
 Shipping Instructions:

Bill To

eVA-Billing Exception
 Same as Ship To Address
 eVA,VA 99999-9999
 US
 Billing Instructions:

External Lot Number:

External Line Number:

Build Commodity List

| Line | Commodity | Description |
|------|-----------|------------------------------|
| 2 | 55610 | Coach, Transit (Articulated) |
| 3 | 55620 | Coach, Transit (Electric) |

Terms And Conditions

**Section GEN
 NOTE**

This public body does not discriminate against faith-based organizations in accordance with the Code of Virginia, § 2.2-4343.1 or against a bidder because of race, religion, color, sex, national origin, age, disability, sexual orientation, gender identity, political affiliation, or veteran status or any other basis prohibited by state law relating to discrimination in employment. Faith-based organizations may request that the issuing agency not include subparagraph 1.f in General Terms and Condition C. Such a request shall be in writing and explain why an exception should be made in that invitation for bid.

VENDORS MANUAL

This solicitation is subject to the provisions of the Commonwealth of Virginia Vendors Manual and any changes or revisions thereto, which are hereby incorporated into this contract in their entirety. The process for filing a complaint about this solicitation is in section 7.13 of the Vendors Manual. (Note section 7.13 does not apply to protests of awards or formal contractual claims.) The procedure for filing contractual claims is in section 7.19 of the Vendors Manual. A copy of the manual is normally available for review at the purchasing office and is accessible on the Internet at www.eva.virginia.gov under "I Sell To Virginia".

APPLICABLE LAWS AND COURTS

This solicitation and any resulting contract shall be governed in all respects by the laws of the Commonwealth of Virginia, without regard to its choice of law provisions, and any litigation with respect thereto shall be brought in the circuit courts of the Commonwealth. The agency and the contractor are encouraged to resolve any issues in controversy arising from the award of the contract or any contractual dispute using Alternative Dispute Resolution (ADR) procedures (Code of Virginia, § 2.2-4366). ADR procedures are described in Chapter 9 of the Vendors Manual. The contractor shall comply with all applicable federal, state and local laws, rules and regulations.

ANTI-DISCRIMINATION

By submitting their bids, bidders certify to the Commonwealth that they will conform to the provisions of the Federal Civil Rights Act of 1964, as amended, as well as the Virginia Fair Employment Contracting Act of 1975, as amended, where applicable, the Virginians With Disabilities Act, the Americans With Disabilities Act and § 2.2-4311 of the Virginia Public Procurement Act (VPPA). If the award is made to a faith-based organization, the organization shall not discriminate against any recipient of goods, services, or disbursements made pursuant to the contract on the basis of the recipient's religion, religious belief, refusal to participate in a religious practice, or on the basis of race, age, color, gender sexual orientation, gender identity, or national origin and shall be subject to the same rules as other organizations that contract with public bodies to account for the use of the funds provided; however, if the faith-based organization segregates public funds into separate accounts, only the accounts and programs funded with public funds shall be subject to audit by the public body. (Code of Virginia, § 2.2-4343.1E). In every contract over \$10,000 the provisions in 1. and 2. below apply: 1. During the performance of this contract, the contractor agrees as follows: a. The contractor will not discriminate against any employee or applicant for employment because of race, religion, color, sex, sexual orientation, gender identity, national origin, age, disability, or any other basis prohibited by state law relating to discrimination in employment, except where there is a bona fide occupational qualification reasonably necessary to the normal operation of the contractor. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause. b. The contractor, in all solicitations or advertisements for employees placed by or on behalf of the contractor, will state that such contractor is an equal opportunity employer. c. Notices, advertisements and solicitations placed in accordance with federal law, rule or regulation shall be deemed sufficient for the purpose of meeting the requirements of this section. d. If the contractor employs more than five employees, the contractor shall (i) provide annual training on the contractor's sexual harassment policy to all supervisors and employees providing services in the Commonwealth, except such supervisors or employees that are required to complete sexual harassment training provided by the Department of Human Resource Management, and (ii) post the contractor's sexual harassment policy in (a) a conspicuous public place in each building located in the Commonwealth that the contractor owns or leases for business purposes and (b) the contractor's employee handbook. e. The requirements of these provisions 1. and 2. are a material part of the contract. If the Contractor violates one of these provisions, the Commonwealth may terminate the affected part of this contract for breach, or at its option, the whole contract. Violation of one of these provisions may also result in debarment from State contracting regardless of whether the specific contract is terminated. f. In accordance with Executive Order 61 (2017), a prohibition on discrimination by the contractor, in its employment practices, subcontracting practices, and delivery of goods or services, on the basis of race, sex, color, national origin, religion, sexual orientation, gender identity, age, political affiliation, disability, or veteran status, is hereby incorporated in this contract. 2. The contractor will include the provisions of 1. above in every subcontract or purchase order over \$10,000, so that the provisions will be binding upon each subcontractor or vendor.

ETHICS IN PUBLIC CONTRACTING

By submitting their bids, bidders certify that their bids are made without collusion or fraud and that they have not offered or received any kickbacks or inducements from any other bidder, supplier, manufacturer or subcontractor in connection with their bid, and that they have not conferred on any public employee having official responsibility for this procurement transaction any payment, loan, subscription, advance, deposit of money, services or anything of more than nominal value, present or promised, unless consideration of substantially equal or greater value was exchanged.

IMMIGRATION REFORM

Applicable for all contracts over \$10,000: By entering into a written contract with the Commonwealth of Virginia, the Contractor certifies that the Contractor does not, and shall not during the performance of the contract for goods and services in the Commonwealth, knowingly employ an unauthorized alien as defined in the federal Immigration Reform and Control Act of 1986.

DEBARMENT STATUS

By participating in this procurement, the vendor certifies that they are not currently debarred by the Commonwealth of Virginia from submitting a response for the type of goods and/or services covered by this solicitation. Vendor further certifies that they are not debarred from filling any order or accepting any resulting order, or that they are an agent of any person or entity that is currently debarred by the Commonwealth of Virginia. If a vendor is created or used for the purpose of circumventing a debarment decision against another vendor, the non-debarred vendor will be debarred for the same time period as the debarred vendor.

ANTITRUST

By entering into a contract, the contractor conveys, sells, assigns, and transfers to the Commonwealth of Virginia all rights, title and interest in and to all causes of action it may now have or hereafter acquire under the antitrust laws of the United States and the Commonwealth of Virginia, relating to the particular goods or services purchased or acquired by the Commonwealth of Virginia under said contract.

MANDATORY USE OF STATE FORM

Failure to submit a bid on the official state form provided for that purpose shall be a cause for rejection of the bid. Modification of or additions to any portion of the Invitation for Bids may be cause for rejection of the bid; however, the Commonwealth reserves the right to decide, on a case by case basis, in its sole discretion, whether to reject such a bid as nonresponsive. As a precondition to its acceptance, the Commonwealth may, in its sole discretion, request that the bidder withdraw or modify nonresponsive portions of a bid which do not affect quality, quantity, price, or delivery. No modification of or addition to the provisions of the contract shall be effective unless reduced to writing and signed by the parties.

CLARIFICATION OF TERMS

If any prospective bidder has questions about the specifications or other solicitation documents, the prospective bidder should contact the buyer whose name appears on the face of the solicitation no later than five working days before the due date. Any revisions to the solicitation will be made only by addendum issued by the buyer.

PAYMENT

1. To Prime Contractor: a. Invoices for items ordered, delivered and accepted shall be submitted by the contractor directly to the payment address shown on the purchase order/contract. All invoices shall show the state contract number and/or purchase order number; social security number (for individual contractors) or the federal employer identification number (for proprietorships, partnerships, and corporations). b. Any payment terms requiring payment in less than 30 days will be regarded as requiring payment 30 days after invoice or delivery, whichever occurs last. This shall not affect offers of discounts for payment in less than 30 days, however. c. All goods or services provided under this contract or purchase order, that are to be paid for with public funds, shall be billed by the contractor at the contract price, regardless of which public agency is being billed. d. The following shall be deemed to be the date of payment: the date of postmark in all cases where payment is made by mail, or when offset proceedings have been instituted as authorized under the Virginia Debt Collection Act. e. Unreasonable Charges. Under certain emergency procurements and for most time and material purchases, final job costs cannot be accurately determined at the time orders are placed. In such cases, contractors should be put on notice that final payment in full is contingent on a determination of reasonableness with respect to all invoiced charges. Charges which appear to be unreasonable will be resolved in accordance with Code of Virginia, § 2.2-4363 and -4364. Upon determining that invoiced charges are not reasonable, the Commonwealth shall notify the contractor of defects or improprieties in invoices within fifteen (15) days as required in Code of Virginia, § 2.2-4351. The provisions of this section do not relieve an agency of its prompt payment obligations with respect to those charges which are not in dispute (Code of Virginia, § 2.2-4363). 2. To Subcontractors: a. Within seven (7) days of the contractor's receipt of payment from the Commonwealth, a contractor awarded a contract under this solicitation is hereby obligated: (1) To pay the subcontractor(s) for the proportionate share of the payment received for work performed by the subcontractor(s) under the contract; or (2) To notify the agency and the subcontractor(s), in writing, of the contractor's intention to withhold payment and the reason. b. The contractor is obligated to pay the subcontractor(s) interest at the rate of one percent per month (unless otherwise provided under the terms of the contract) on all amounts owed by the contractor that remain unpaid seven (7) days following receipt of payment from the Commonwealth, except for amounts withheld as stated in (2) above. The date of mailing of any payment by U. S. Mail is deemed to be payment to the addressee. These provisions apply to each sub-tier contractor performing under the primary contract. A contractor's obligation to pay an interest charge to a subcontractor may not be construed to be an obligation of the Commonwealth. 3. Each prime contractor who wins an award in which provision of a SWaM procurement plan is a condition to the award, shall deliver to the contracting agency or institution, on or before request for final payment, evidence and certification of compliance (subject only to insubstantial shortfalls and to shortfalls arising from subcontractor default) with the SWaM procurement plan. Final payment under the contract in question may be withheld until such certification is delivered and, if necessary, confirmed by the agency or institution, or other appropriate penalties may be assessed in lieu of withholding such payment. 4. The Commonwealth of Virginia encourages contractors and subcontractors to accept electronic and credit card payments.

PRECEDENCE OF TERMS

The following General Terms and Conditions VENDORS MANUAL, APPLICABLE LAWS AND COURTS, ANTI-DISCRIMINATION, ETHICS IN PUBLIC CONTRACTING, IMMIGRATION REFORM AND CONTROL ACT OF 1986, DEBARMENT STATUS, ANTITRUST, MANDATORY USE OF STATE FORM AND TERMS AND CONDITIONS, CLARIFICATION OF TERMS, PAYMENT shall apply in all instances. In the event there is a conflict between any of the other General Terms and Conditions and any Special Terms and Conditions in this solicitation, the Special Terms and Conditions shall apply.

QUALIFICATIONS OF BIDDERS

The Commonwealth may make such reasonable investigations as deemed proper and necessary to determine the ability of the bidder to perform the services/furnish the goods and the bidder shall furnish to the Commonwealth all such information and data for this purpose as may be requested. The Commonwealth reserves the right to inspect bidder's physical facilities prior to award to satisfy questions regarding the bidder's capabilities. The Commonwealth further reserves the right to reject any bid if the evidence submitted by, or investigations of, such bidder fails to satisfy the Commonwealth that such bidder is properly qualified to carry out the obligations of the contract and to provide the services and/or furnish the goods contemplated therein.

TESTING AND INSPECTION

The Commonwealth reserves the right to conduct any test/inspection it may deem advisable to assure goods and services conform to the specifications.

ASSIGNMENT OF CONTRACT

A contract shall not be assignable by the contractor in whole or in part without the written consent of the Commonwealth.

CHANGES TO THE CONTRACT

Changes can be made to the contract in any of the following ways: 1. The parties may agree in writing to modify the terms, conditions, or scope of the contract. Any additional goods or services to be provided shall be of a sort that is ancillary to the contract goods or services, or within the same broad product or service categories as were included in the contract award. Any increase or decrease in the price of the contract resulting from such modification shall be agreed to by the parties as a part of their written agreement to modify the scope of the contract. 2. The Purchasing Agency may order changes within the general scope of the contract at any time by written notice to the contractor. Changes within the scope of the contract include, but are not limited to, things such as services to be performed, the method of packing or shipment, and the place of delivery or installation. The contractor shall comply with the notice upon receipt, unless the contractor intends to claim an adjustment to compensation, schedule, or other contractual impact that would be caused by complying with such notice, in which case the contractor shall, in writing, promptly notify the Purchasing Agency of the adjustment to be sought, and before proceeding to comply with the notice, shall await the Purchasing Agency's written decision.

affirming, modifying, or revoking the prior written notice. If the Purchasing Agency decides to issue a notice that requires an adjustment to compensation, the contractor shall be compensated for any additional costs incurred as the result of such order and shall give the Purchasing Agency a credit for any savings. Said compensation shall be determined by one of the following methods: a. By mutual agreement between the parties in writing; or b. By agreeing upon a unit price or using a unit price set forth in the contract, if the work to be done can be expressed in units, and the contractor accounts for the number of units of work performed, subject to the Purchasing Agency's right to audit the contractor's records and/or to determine the correct number of units independently; or c. By ordering the contractor to proceed with the work and keep a record of all costs incurred and savings realized. A markup for overhead and profit may be allowed if provided by the contract. The same markup shall be used for determining a decrease in price as the result of savings realized. The contractor shall present the Purchasing Agency with all vouchers and records of expenses incurred and savings realized. The Purchasing Agency shall have the right to audit the records of the contractor as it deems necessary to determine costs or savings. Any claim for an adjustment in price under this provision must be asserted by written notice to the Purchasing Agency within thirty (30) days from the date of receipt of the written order from the Purchasing Agency. If the parties fail to agree on an amount of adjustment, the question of an increase or decrease in the contract price or time for performance shall be resolved in accordance with the procedures for resolving disputes provided by the Disputes Clause of this contract or, if there is none, in accordance with the disputes provisions of the Commonwealth of Virginia Vendors Manual. Neither the existence of a claim nor a dispute resolution process, litigation or any other provision of this contract shall excuse the contractor from promptly complying with the changes ordered by the Purchasing Agency or with the performance of the contract generally.

DEFAULT

In case of failure to deliver goods or services in accordance with the contract terms and conditions, the Commonwealth, after due oral or written notice, may procure them from other sources and hold the contractor responsible for any resulting additional purchase and administrative costs. This remedy shall be in addition to any other remedies which the Commonwealth may have.

TAXES

Sales to the Commonwealth of Virginia are normally exempt from State sales tax. State sales and use tax certificates of exemption, Form ST-12, will be issued upon request. Deliveries against this contract shall usually be free of Federal excise and transportation taxes. The Commonwealth's excise tax exemption registration number is 54-73-0076K. If sales or deliveries against the contract are not exempt, the contractor shall be responsible for the payment of such taxes unless the tax law specifically imposes the tax upon the buying entity and prohibits the contractor from offering a tax-included price.

USE OF BRAND NAMES

Unless otherwise provided in this solicitation, the name of a certain brand, make or manufacturer does not restrict bidders to the specific brand, make or manufacturer named, but conveys the general style, type, character, and quality of the article desired. Any article which the public body, in its sole discretion, determines to be the equivalent of that specified, considering quality, workmanship, economy of operation, and suitability for the purpose intended, shall be accepted. The bidder is responsible to clearly and specifically identify the product being offered and to provide sufficient descriptive literature, catalog cuts and technical detail to enable the Commonwealth to determine if the product offered meets the requirements of the solicitation. This is required even if offering the exact brand, make or manufacturer specified. Normally in competitive sealed bidding only the information furnished with the bid will be considered in the evaluation. Failure to furnish adequate data for evaluation purposes may result in declaring a bid nonresponsive. Unless the bidder clearly indicates in its bid that the product offered is an equivalent product, such bid will be considered to offer the brand name product referenced in the solicitation.

TRANSPORTATION AND PACKAGING

By submitting their bids, all bidders certify and warrant that the price offered for FOB destination includes only the actual freight rate costs at the lowest and best rate and is based upon the actual weight of the goods to be shipped. Except as otherwise specified herein, standard commercial packaging, packing and shipping containers shall be used. All shipping containers shall be legibly marked or labeled on the outside with purchase order number, commodity description, and quantity.

INSURANCE

By signing and submitting a bid under this solicitation, the bidder certifies that if awarded the contract, it will have the following insurance coverage at the time the contract is awarded. For construction contracts, if any subcontractors are involved, the subcontractor will have workers' compensation insurance in accordance with §§ 2.2-4332 and 65.2-800 et seq. of the Code of Virginia. The bidder further certifies that the contractor and any subcontractors will maintain these insurance coverages during the entire term of the contract and that all coverage will be provided by companies authorized to sell insurance in Virginia by the Virginia State Corporation Commission. **MINIMUM INSURANCE COVERAGES AND LIMITS:** 1. Workers' Compensation - Statutory requirements and benefits. Coverage is compulsory for employers of three or more employees, to include the employer. Contractors who fail to notify the Commonwealth of increases in the number of employees that change their workers' compensation requirements under the Code of Virginia during the course of the contract shall be in noncompliance with the contract. 2. Employer's Liability - \$100,000. 3. Commercial General Liability - \$1,000,000 per occurrence and \$2,000,000 in the aggregate. Commercial General Liability is to include bodily injury and property damage, personal injury and advertising injury, products and completed operations coverage. The Commonwealth of Virginia shall be added as an additional insured to the policy by an endorsement. 4. Automobile Liability - \$1,000,000 combined single limit. (Required only if a motor vehicle not owned by the Commonwealth is to be used in the contract. Contractor must assure that the required coverage is maintained by the Contractor (or third party owner of such motor vehicle.) Profession/Service Limits Accounting \$1,000,000 per occurrence, \$3,000,000 aggregate Architecture \$2,000,000 per occurrence, \$6,000,000 aggregate Asbestos Design, Inspection or Abatement Contractors \$1,000,000 per occurrence, \$3,000,000 aggregate Health Care Practitioner (to include Dentists, Licensed Dental Hygienists, Optometrists, Registered or Licensed Practical Nurses, Pharmacists, Physicians, Podiatrists, Chiropractors, Physical Therapists, Physical Therapist Assistants, Clinical Psychologists, Clinical Social Workers, Professional Counselors, Hospitals, or Health Maintenance Organizations.) Code of Virginia § 8.01-581.15 <https://law.lis.virginia.gov/vacode/title8.01/chapter21.1/section8.01-581.15/> Insurance/Risk Management \$1,000,000 per occurrence, \$3,000,000 aggregate Landscape/Architecture \$1,000,000 per occurrence, \$1,000,000 aggregate Legal \$1,000,000 per occurrence, \$5,000,000 aggregate Professional Engineer \$2,000,000 per occurrence, \$6,000,000 aggregate Surveying \$1,000,000 per occurrence, \$1,000,000 aggregate

ANNOUNCEMENT OF AWARD

Upon the award or the announcement of the decision to award a contract as a result of this solicitation, the purchasing agency will publicly post such notice in eVA (www.eva.virginia.gov) for a minimum of 10 days.

DRUG-FREE WORKPLACE

Applicable for all contracts over \$10,000: During the performance of this contract, the contractor agrees to (i) provide a drug-free workplace for the contractor's employees; (ii) post in conspicuous places, available to employees and applicants for employment, a statement notifying employees that the unlawful manufacture, sale, distribution, dispensation, possession, or use of a controlled substance or marijuana is prohibited in the contractor's workplace and specifying the actions that will be taken against employees for violations of such prohibition; (iii) state in all solicitations or advertisements for employees placed by or on behalf of the contractor that the contractor maintains a drug-free workplace; and (iv) include the provisions of the foregoing clauses in every subcontract or purchase order of over \$10,000, so that the provisions will be binding upon each subcontractor or vendor. For the purposes of this section, "drug-free workplace" means a site for the performance of work done in connection with a specific contract awarded to a contractor, the employees of whom are prohibited from engaging in the unlawful manufacture, sale, distribution, dispensation, possession or use of any controlled substance or marijuana during the performance of the contract.

NONDISCRIMINATION

A bidder or contractor shall not be discriminated against in the solicitation or award of this contract because of race, religion, color, sex, sexual orientation, gender identity, national origin, age, disability, faith-based organizational status, any other basis prohibited by state law relating to discrimination in employment or because the bidder employs ex-offenders unless the state agency, department or institution has made a written determination that employing ex-offenders on the specific contract is not in its best interest. If the award of this contract is made to a faith-based organization and an individual, who applies for or receives goods, services, or disbursements provided pursuant to this contract objects to the religious

character of the faith-based organization from which the individual receives or would receive the goods, services, or disbursements, the public body shall offer the individual, within a reasonable period of time after the date of his objection, access to equivalent goods, services, or disbursements from an alternative provider.

eVA VENDOR REGISTRATION

The eVA Internet electronic procurement solution, web site portal www.eVA.virginia.gov, streamlines and automates government purchasing activities in the Commonwealth. The eVA portal is the gateway for vendors to conduct business with state agencies and public bodies. All vendors desiring to provide goods and/or services to the Commonwealth shall participate in the eVA Internet e-procurement solution by completing the free eVA Vendor Registration. All bidders must register in eVA and pay the Vendor Transaction Fees specified below; failure to register will result in the bid being rejected. Vendor transaction fees are determined by the date the original purchase order is issued and the current fees are as follows: a. For orders issued July 1, 2014, and after, the Vendor Transaction Fee is: (i) DSBSD-certified Small Businesses: 1%, capped at \$500 per order. (ii) Businesses that are not DSBSD-certified Small Businesses: 1%, capped at \$1,500 per order. b. Refer to Special Term and Condition "eVA Orders and Contracts" to identify the number of purchase orders that will be issued as a result of this solicitation with the eVA transaction fee specified above assessed for each order. For orders issued prior to July 1, 2014, the vendor transaction fees can be found at www.eVA.virginia.gov. The specified vendor transaction fee will be invoiced, by the Commonwealth of Virginia Department of General Services, typically within 60 days of the order issue date. Any adjustments (increases/decreases) will be handled through purchase order changes.

AVAILABILITY OF FUNDS

It is understood and agreed between the parties herein that the agency shall be bound hereunder only to the extent that the legislature has appropriated funds that are legally available or may hereafter become legally available for the purpose of this agreement.

SET-ASIDES AWARD PRIORITY

This solicitation is set-aside for award priority to DSBSD-certified micro businesses or small businesses when designated as "Micro Business Set-Aside Award Priority" or "Small Business Set-Aside Award Priority" accordingly in the solicitation. DSBSD-certified micro businesses or small businesses also includes DSBSD-certified women-owned and minority-owned businesses when they have received the DSBSD small business certification. For purposes of award, bidders shall be deemed micro businesses or small businesses if and only if they are certified as such by DSBSD on the due date for receipt of bids.

BID PRICE CURRENCY

Unless stated otherwise in the solicitation, bidders shall state bid prices in US dollars.

AUTHORIZATION TO CONDUCT BUS.

A contractor organized as a stock or nonstock corporation, limited liability company, business trust, or limited partnership or registered as a registered limited liability partnership shall be authorized to transact business in the Commonwealth as a domestic or foreign business entity if so required by Title 13.1 or Title 50 of the Code of Virginia or as otherwise required by law. Any business entity described above that enters into a contract with a public body pursuant to the Virginia Public Procurement Act shall not allow its existence to lapse or its certificate of authority or registration to transact business in the Commonwealth, if so required under Title 13.1 or Title 50, to be revoked or cancelled at any time during the term of the contract. A public body may void any contract with a business entity if the business entity fails to remain in compliance with the provisions of this section.

CIVILITY IN STATE WORKPLACES

The contractor shall take all reasonable steps to ensure that no individual, while performing work on behalf of the contractor or any subcontractor in connection with this agreement (each, a "Contract Worker"), shall engage in 1) harassment (including sexual harassment), bullying, cyber-bullying, or threatening or violent conduct, or 2) discriminatory behavior on the basis of race, sex, color, national origin, religious belief, sexual orientation, gender identity or expression, age, political affiliation, veteran status, or disability. The contractor shall provide each Contract Worker with a copy of this Section and will require Contract Workers to participate in agency training on civility in the State workplace if contractor's (and any subcontractor's) regular mandatory training programs do not already encompass equivalent or greater expectations. Upon request, the contractor shall provide documentation that each Contract Worker has received such training. For purposes of this Section, "State workplace" includes any location, permanent or temporary, where a Commonwealth employee performs any work-related duty or is representing his or her agency, as well as surrounding perimeters, parking lots, outside meeting locations, and means of travel to and from these locations. Communications are deemed to occur in a State workplace if the Contract Worker reasonably should know that the phone number, email, or other method of communication is associated with a State workplace or is associated with a person who is a State employee. The Commonwealth of Virginia may require, at its sole discretion, the removal and replacement of any Contract Worker who the Commonwealth reasonably believes to have violated this Section. This Section creates obligations solely on the part of the contractor. Employees or other third parties may benefit incidentally from this Section and from training materials or other communications distributed on this topic, but the Parties to this agreement intend this Section to be enforceable solely by the Commonwealth and not by employees or other third parties.

Reminders

Information not provided

Vendor List

Information not provided

Free Form Vendor

Information not provided

Publishing Options

Pre-Bid Conference Type: **Pre-Bid Conference**

Category: **Equipment - Non-Technology**

Pre-Bid Conference Date: **8/15/2022**

Publish Date: **9/27/2022**

Close Date: **10/11/2022**

Open Responses Date: **10/12/2022**

Pre-Bid Conference Time: **10:00 AM**

Publish Time: **10:45 AM**

Close Time: **1:00 PM**

Open Responses Time: **10:00 AM**



COMMONWEALTH of VIRGINIA

Department of General Services Division of Purchases and Supply

J. Peter Stamps, CPPO, VCM, VCO
Director

Kelly J. Langley, CPPO, CPPB, VCM, VCO
Deputy Director

P. O. Box 1199
Richmond, VA 23218-1199
Voice: (804) 786-3842

September 27, 2022

ADDENDUM NO. 2 TO ALL BIDDERS:

Reference – Invitation for Bids: IFB 6447
Commodity: 55610 & 55620
Dated: September 2, 2022
For Delivery To: Department of General Services, Division of Purchases and Supply, on behalf of the Virginia Department of Rail and Public Transportation (DRPT)
Bid Due: September 29, 2022
Public Bid Opening: September 30, 2022

The above is hereby changed to read:

1. Reference Closing Date and Time: The bid due date is hereby changed to October 11, 2022 at 1:00 p.m. (ET).
2. Reference Public Opening Date and Time: Bid Opening date is hereby changed to October 12, 2022 at 10:00 a.m. (ET).
3. Reference, Page 1, Attachment A, Section I. PURPOSE: add the following paragraph:

For the purpose of this solicitation any language on Attachment G stating “shall” are replaced with “should” and any language referencing “Requests for Proposals” or “Proposals” shall be replaced with “Invitation for Bids or Bids”.
4. Reference Page 14, Attachment A, Section IX. SPECIAL TERMS AND CONDITIONS, paragraph #14., ADDITIONAL USERS, add the following paragraph:

Authorized Users outside of the Commonwealth should inform the Contractor if their entity requires the Contractor to purchase/pay income taxes, tariffs, fees or business licenses, prior to the Contractor doing business with them.
5. Reference, Page 25, Attachment D, SMALL BUSINESS SUBCONTRACTING PLAN; replaced with:

Attachment D, SMALL BUSINESS SUBCONTRACT PLAN (Addendum #2)
6. Reference, Page 28 - 359, Attachment G, Standard Bus Procurement Guidelines; replaced with:

Attachment G: Standard Bus Procurement Guidelines (Addendum #2)

7. Reference Page 20, Section IX. SPECIAL TERMS AND CONDITIONS: #29 NEW VEHICLE PREPARATION, paragraph (f): change to read as follow:

In addition to all other remedies available to the Commonwealth, should the Contractor fail to meet any requirement set forth in this Section 29 with respect to any delivered vehicle, one (1) percent of that vehicle’s cost, not to exceed \$2,000, will be deducted from the applicable invoice in order to compensate the Commonwealth for the resulting inconvenience and business interruption.

8. Reference Page 11, Section VIII. INVOICES AND PAYMENT: B. PAYMENT: change to read as follows:

B. PAYMENT:

Payment will be made in accordance with the Virginia Prompt Payment Act. State Agencies will pay per §2.2-4350 of the Virginia Prompt Payment Act. Localities will pay per §2.2-4352 of the Virginia Prompt Payment Act. Payments will only be remitted after the receipt of valid invoice and verification of satisfactory goods received and/or completion of work. Payment is anticipated to be made by check or EDI depending on how the Contractor is registered with the Department of Accounts.

9. Reference Page 5, Section IX. C. Requirements #8 WARRANTY/MAINTENANCE (Buses): change to read as follows:
WARRANTY/MAINTENANCE (Buses)

Upon Acceptance of Buses by and Authorized User, and to ensure the maximum safety, protection and satisfaction to any Authorized User, and to their passengers, Contractor agrees that any new Bus shall be provided with a minimum twelve (12) month/50,000-mile (whichever comes first) bumper-to-bumper new vehicle warranty (“Warranty”), as follows:

Warranty is to include all Buses and integral and peripheral components, materials, parts, assemblies and subassemblies e.g., body, chassis, engine, transmission, cooling, drive train, suspension, electrical and manual controls, steering, starter and alternator, safety equipment, heater and air conditioning, electric vehicle battery, etc. necessary to keep Bus in good operating condition and preserve its operating efficiency in accordance with all OEM technical specifications and operating standards. The rights and remedies provided herein are in addition to and do not limit those available to any Authorized User by and other Contractual provision, or as provided in law.

Warranty/Maintenance repairs may be made onsite at the Authorized User’s location. Normal warranty work (other than that work required to be performed by the sub-suppliers) may be performed by the Authorized User’s maintenance department and shall be reimbursed by the manufacturer at an agreed upon warranty labor rate by both parties.

Warranty/Maintenance excludes the following normal wear items: tires. Filter, and wiper blades, light bulbs (including headlamp assemblies), seals and gaskets, oil filters, air filters, fuel filters, bushings, belts, brake linings, and brake drums. Selected optional component equipment e.g., cameras, radios, GPS, etc., may be provided with a separate Warranty/maintenance provision, but such Warranty/maintenance shall be provided solely in accordance with the pricing schedule, attached hereto.

Warranty/Maintenance of Buses shall not include any work that is external to the Bus, the furnishing of supplies, or adding or removing accessories, attachments, or other equipment that is not provided under the Contract. Maintenance of Bus also shall not include repair of damage that is the direct result from the operational use by the Authorized User or from accident, unless the accident is caused by negligent or intentional acts or omissions of Contractor or its agents.

Contractor shall not be responsible for the cost of any Warranty/Maintenance repair due to the direct result of an Authorized User’s intentional failure to properly use, maintain, and care for the Products as outlines in the documentation of manuals provided by the Contractor. Authorized Users are advised to maintain copies of all maintenance records and receipts for review by the Contractor.

All Warranty/Maintenance services to be performed on Buses shall be performed by qualified OEM-certified technicians to perform such services. Normal warranty work (other than that work required to be performed by sub-suppliers) may be performed by the Authorized User’s maintenance department and reimbursed by the Manufacturer at an agreed upon warranty labor rate by both parties. The Commonwealth or any Authorized User reserves the right to require proof of certification prior to placing an order or performance of services and at any time during the term of the Warranty/Maintenance period, and any subsequent renewal period thereafter.

During the Bus pre-production meeting, the Contractor shall offer Authorized User the option to purchase additional warranties, in accordance with all contractual provisions herein, and in accordance with pricing as delineated herein, on **Attachment H, “Pricing Schedule.” Additional warranty can only be purchased at the pre-production meeting.**

In those instances where it is necessary for the Contractor to return a Bus for depot maintenance repair and support, the Contractor shall be responsible for towing costs. Only new standard part or parts equal in performance to new parts and certified as OEM-acceptable replacement parts shall be used in effecting repairs. Parts which have been replaced shall become the property of the Contractor. Replacement parts installed shall become the property of the Authorized User. If the Equipment is out of service for more than seven (7) consecutive calendar days. Contractor would then assist the Authorized User by specifically calling the vendors directly to get them better focused on resolving the Authorized User’s issues to ensure the Bus is repaired and returned in good working order as soon as possible.

Nothing herein shall be construed to waive or limit any rights or remedies otherwise available to the Commonwealth of Virginia or Authorized User under any other provisions herein, or in Code.

All Warranty/Maintenance services to be performed on Equipment shall be performed by qualified OEM-certified technicians to perform such services. The Commonwealth or any Authorized User reserves the right to require proof of certification prior to placing an order or performance of Services and at any time during the term of the Warranty/Maintenance period, and any subsequent renewal period thereafter.

10. Reference Page 6, Section IX. C. Requirements, #9 Maintenance Support: change to read as follows:

Maintenance Support: Bidder shall include provisions with pricing (hourly labor rate and parts discount on **Attachment H (Pricing Schedule)** for post-warranty repair/maintenance support, to include, but not limited to; all labor, equipment, materials, supplies, travel time, and any other operating costs necessary to furnish and deliver OEM parts and accessories ordered to repair, service, and provide maintenance and options with appropriate service levels to 12-Year Transit Buses that any “Authorized User” may deem best to meet their specific mission requirements and service expectations e.g.:

- a. Contractor’s Services shall minimally include, but not be limited to, the following flexible maintenance support categorization options, as deemed appropriate by “Authorized Users”, and in cooperation with the Contractor:
- b. The vendor shall have personnel available to answer warranty, parts, and service inquiries Monday Through Friday, 8 A.M. to 5 P.M., except during holidays recognized by the Commonwealth of Virginia. The vendor shall respond to warranty, parts, and service inquiries and offer a reasonable initial plan to address such inquiries within 24 hours of call receipt or the next business day, whichever is later, via phone or email.
- c. Service Types: onsite, offsite, telephonic, remote, User’s maintenance department or return to depot, and In such event that Contractor’s products must be returned to depot, manufacturer, licensed facility or User’s maintenance department authorized to perform maintenance services, then Contractor should communicate estimated bus “downtime” to the Authorized User.
- d. Contractor shall include a document identifying the cost of all parts on any order, e.g., parts order only and service/maintenance and repair orders. Bidder shall provide discount percentage off the list price for parts. The parts percentage discount shall remain firm over the life of the contract.
- e. Contractor shall hold hourly labor rate pricing firm for a period of one year from the start of the contract. After the first year, labor rates may be adjusted according to the Price Escalation/De-Escalation paragraph in **Section IX., paragraph 18.**

11. Reference Page 16, Section IX. SPECIAL TERMS AND CONDITIONS, paragraph #18, PRICE ESCALATION/DE-ESCALATION; change to read as follows:

PRICE ESCALATION/DE-ESCALATION: Price adjustments may be permitted for changes in the Contractor’s cost of providing goods and services. The PRODUCER PRICE INDEX/INDICES: 1413-02, Truck and Bus Bodes, Complete vehicles on purchased chassis and other relevant market conditions as determined appropriate and approved by DPS, will be used as guides to evaluate requested price changes. Price adjustments may be allowed at the introduction of new model year, if changes in manufacturer’s price is passed down to the Contractor, or under exigent circumstances outside of the Contractor’s control.

No more than two (2) escalated price adjustments per Model Year, however DPS may use its discretion if more adjustments are needed. However, “across the board” price decreases are subject to implementation at any time and shall be immediately conveyed to the Commonwealth.

Contractor shall request approval in advance for any price increase by notifying the purchasing office. Any approved price changes shall be effective on the agreed upon effective date of the pricing change. In order to receive approval, the Contractor shall document the amount and proposed effective date of any general change in the price of materials. Documentation shall be supplied with the Contractor’s request for increase which will: (1) verify that the requested price increase is general in scope and not applicable just to the Commonwealth of Virginia; and (2) verify the amount or percentage of increase which is being passed on to the Contractor by the Contractor’s suppliers.

DPS will update the publicly posted contract and eVA catalog with the new pricing on the effective date. However, the Contractor shall fill all purchase orders received prior to the effective date of the price adjustment at the old contract prices. The Contractor is further advised that decreases which affect the cost of materials are required to be communicated immediately to the purchasing office.

12. Reference Page 20, Section IX. SPECIAL TERMS AND CONDITIONS, paragraph #29, NEW VEHICLE PREPARATION, a. Temporary License and c. State Inspection Stickers and Decals; change to read as:

- a. **Temporary License:** It is the responsibility of the purchasing entity, upon receipt/delivery, to obtain title and tags from VA DMV. The Vendor is expected to provide a 30-day tag or trip permit when delivering the vehicle to the purchasing agency.

In the event that the vehicle(s) are acquired from a Virginia manufacturer and/or authorized dealer; a paper 30 Day license tag, unless a different format (e.g., electronic) is requested in writing by the “authorized user”, shall be furnished with each vehicle; unless Authorized Users waive, in writing, the 30-Day tag.

- c. **State Inspection Stickers and Decals:** If the state (outside the Commonwealth of Virginia) where the bus is currently owned/resides does not require a state inspection, then it will be the responsibility of the purchasing entity to obtain a state inspection within 30 days of receipt/delivery.

In the event that the vehicle(s) are acquired from a Virginia manufacturer and/or authorized dealer then the vehicle(s) furnished shall conform to all applicable Federal and Motor Vehicle Safety Standards and all equipment shall conform to Title 46.2, Chapter 10, of the Code of Virginia. Vehicle(s) shall include a valid Virginia State Inspection Sticker.

- No dealer identifications such as sticker, decal, metal emblem and so forth will be accepted on vehicle(s) furnished under this contract

13. Reference Attachment H. Pricing Schedule, Maintenance Provisions, new attachment H (addendum 2), changed to read as follows:

Maintenance Provisions: A description of how and by whom warranty service can be provided is to be included with bid. Failure on the part of the Bidder to provide all requested documentation may be cause to deem the bid non-responsive. The vendor shall act as the first source for performing warranty work. This must cover both mechanical and body work. The manufacturer's warranty covering parts, materials and workmanship shall apply for a minimum period of twelve (12) months or 50,000 miles, whichever occurs first, and this warranty shall include repair and replacement of defective parts and labor. The structural body warranty to be a minimum of three (3) years or 150,000 miles, whichever occurs first. The successful vendor shall be required to offer a toll-free number to all recipients for warranty inquiries, parts orders and service-related questions. The vendor shall have personnel available to answer warranty, parts, and service inquiries Monday Through Friday, 8 A.M. to 5 P.M., except during holidays recognized by the Commonwealth of Virginia. The vendor shall respond to warranty, parts, and service inquiries and offer a reasonable initial plan to address such inquiries within 24 hours of call receipt or the next business day, whichever is later, via phone or email.

All bidders must offer proof of both chassis and body warranty (including bus body, air conditioning and wheelchair ramp) service points within the Commonwealth of Virginia. All bidders shall be required to submit documentation providing the names of the vendors.

The vehicle to be furnished shall conform to all applicable Federal and Motor Vehicle Safety Standards and all equipment shall conform to Title 46.1, Chapter 4, and Article 9 of the Code of Virginia. Chassis to be a standard proven model of manufacturer's latest current production and include all standard equipment as advertised with additional optional equipment as outlined above. All components, unless otherwise required by these specifications, shall be the standard or optional equipment specifically advertised and installed by the manufacturer including any additional warranties.

Prior to delivery the vendor must perform new vehicle service preparation. The vehicle shall be in acceptable condition upon delivery and will be accepted only by an authorized person designated by the agency. Delivery shall be during normal business hours, i.e. 8 AM – 5 PM, Monday through Friday. Payment will not be initiated until the agency is assured that the vehicle has been delivered in an acceptable condition and everything is working properly.

14. Reference Attachment B, IFB SUBMISSION INSTRUCTIONS, Bid Opening paragraph, changed to read as follows:

Bid Opening:

A public bid opening will be held at **10:00 a.m. (EST) on October 12, 2022** via Microsoft Team Meeting:

Join on your computer, mobile app or room device

[Click here to join the meeting](#)

Meeting ID: 251 132 532 366

Passcode: qTus5D

Or call in (audio only)+1 434-230-0065,,907903075# United States, Lynchburg

Phone Conference ID: 907 903 075#

15. Reference Page 9, Attachment A Section VI. Solicitation Clarifications – Inquiries for Information:

The following are the official answers corresponding with the posting of Addendum 2. Answers previously provided may not match exactly. Answers posted in Addendum 2 shall be considered the official answer of the Commonwealth.

- b. Multiple questions regarding Terms and Conditions

Terms and Conditions are non-negotiable

- c. Multiple questions regarding specifications/requirements on Attachment G. Sections 6 and 7 (APTA) Standard Bus Procurement Guidelines.

For the purpose of this solicitation any language on Attachment G stating “shall” are replaced with “should” and any language referencing “Requests for Proposals” or “Proposals” shall be replaced with “Invitation for Bids or Bids”. Please reference Page 1, Attachment A, Section I. Purpose, addendum 2 (forementioned) and attachment G, addendum 2. Bidder shall note on attachment G any discrepancies by selecting appropriate response and including comments.

- d. Several questions with regards to price escalation after award of contract and for a current model year were presented.

Reference Page 16, Section IX. SPECIAL TERMS AND CONDITIONS, paragraph #18, PRICE ESCALATION/DE-ESCALATION; (forementioned) addendum 2

- e. Product Additions - In the event the Contractor adds a new transit bus product line that represents product(s) that are consistent with the scope, type, and class of transit buses covered under the contract, then the Commonwealth and the Contractor may agree to add to contract as considered with respect to contract discount structure, net price or grand total of product(s). Would Commonwealth allow the addition of a new bus platform that is of a length not

currently listed in the RFP after award. This new product length may be added to our portfolio during the term of this contract.

Reference on page 4., Section IV., C., paragraph #7 - Product Additions –

- f. In those instances where it is necessary for the Contractor to return a Bus for depot maintenance repair and support, the Contractor shall be responsible for towing costs, can this be removed?

No, this is a requirement of the solicitation, please Reference on page 5., Section IV., paragraph #8 – towing under the required twelve (12) month/50,000-mile (whichever comes first) bumper-to-bumper new vehicle warranty (“Warranty”) – contractor shall be responsible for the towing cost.

- g. What is the applicable transaction fee (eVA) accessed to each order? Additionally, please advise if bidders are to accrue for this in their bid proposal?

Reference General Terms and Conditions; “eVA Vendor Registration”

- h. May the final Altoona test report be provided prior to final acceptance of the first vehicle per APTA Standard Bus Procurement Guidelines as specified in section TS 21. Altoona Testing "If available, the Altoona Test Report shall be provided to the Agency with the bid submittal. If not available, then the report shall be provided prior to first acceptance of bus."

Reference, Attachment H. Pricing Schedule, Bus Testing is the Commonwealths requirement, which has precedence over section TS 21 of the APTA document (Attachment G). The certification shall be required with the bid response for each vehicle bid. The Commonwealth will not accept the Altoona Testing prior to acceptance of bus.

- i. Delegation of warranty claims responsibility for the following component suppliers needs to be passed through:

1. Cummins Engine
2. Allison Transmission
3. BAE Propulsion System
4. Plug Power Fuel Cell
5. Thermo King HVAC
6. Meritor Axles

Reference attachment A. Section IV. Specifications, C. #8 and attachment H, addendum 2 (forementioned) for language regarding warranty.

- j. Warranty listed in section 7 of attachment G and warranty requirements listed on attachment H, which is required?

The warranty requirement on attachment H, addendum 2 (forementioned), is the minimum requirement for this solicitation.

- k. A state or local Small or Minority and Women-owned Business Enterprise programs must yield to the requirements of the federal DBE program.

Bidder must meet Virginia standards in addition to FTA’s, please reference Attachment A, Section IX. Special Terms and Conditions, #17 SUBMISSION OF SMALL BUSINESS SUBCONTRACTING PLAN, EVIDENCE OF COMPLIANCE WITH SMALL BUSINESS SUBCONTRACTING PLAN AND SUBCONTRACTOR REPORTING and Attachment D., Small Business Subcontracting Plan (addendum #2).

- l. Questions concerning inspection sticker/decal and temporary license.

Please reference Attachment A., Section IX. Special Terms and Conditions, paragraph #29 a and c (addendum 2) (forementioned above)

- m. Reference General Term and Condition, “Assignment of Contract”

Terms and conditions are non-negotiable. It is not applicable for internal business purposes, however, shall be applied during business actions, to include but not limited to, such as mergers and sales of companies.

- n. When offering more than one bus type/length for this contract, should a new tab be added for each bus type/length to the Attachment H Excel file or should each bus type/length be submitted on a separate Attachment H Excel file?

The bidder may provide separate tabs on attachment H, as necessary, for the different make/models of offered vehicles, including the battery electric tab.

- o. Is use of a Commissioner of Oaths, which has the legal power to administer signatures for Notaried documents acceptable?

Yes

- p. Clarification regarding term and condition ASSIGNMENT OF CONTRACT: A contract shall not be assignable by the contractor in whole or in part without the written consent of the Commonwealth.

Terms and conditions are non-negotiable. It is not applicable for internal business purposes, however, shall be applied during business actions, to include but not limited to, such as mergers and sales of companies.

- q. Request not to complete the hourly labor rate and parts discount requirement on Attachment H.

This pricing provision are required, or the bid may be considered as non-responsive.

- r. Will a regional product support manager be acceptable with regards to sales representative? (Ref. Attachment A, Section IV. C. #10)

Yes

- s. May all post-warranty repairs/maintenance services (other than that work required to be performed by sub-suppliers) be performed by the Authorized User's maintenance department and reimbursed by the Manufacturer at an agreed upon warranty labor rate by both parties?

Please reference Attachment A, Section IV. C. #9. c. Maintenance Support (forementioned), addendum #2 – This section is for post warranty maintenance and support. Yes, may be performed by Authorized user's maintenance department, please reference (forementioned).

Labor rate for post warranty maintenance/repairs, reference Attachment A, Section IX. C. 9 and Attachment H (forementioned) addendum 2 - No changes to the language.

- t. Is it acceptable that all warranty repairs (other than that work required to be performed by sub-suppliers) and maintenance services be performed by the Authorized User's maintenance department and reimbursed by the Manufacturer at an agreed upon warranty labor rate by both parties?

Reference Attachment A., Section IV. C #8. Warranty/Maintenance (Buses), second paragraph (forementioned) addendum 2

- u. Request clarification with regards to the “Additional Users” (outside the Commonwealth) Procuring Agency advise of any Local, City, County, State, Franchise or Income taxes, tariffs, fees, business licenses or licenses that will need to be paid and/or purchased by the Contractor as part of the performance of this contract or option of this contract.

Reference Page 14, Attachment A, Section IX. SPECIAL TERMS AND CONDITIONS, paragraph #14., ADDITIONAL USERS, (forementioned) Addendum 2

- v. Concurrence that the services listed in General Terms and Conditions, titled “Insurance”, section “Professionals Service Limits” are not applicable to the purchase of buses therefore are not applicable to any resulting contract?

Consolidated Laboratory • Engineering & Buildings • Fleet • Graphics • Mail • Purchases & Supply • Real Estate • Surplus

Correct, only the applicable insurance requirements apply.

- w. Contractor maintains and pays the premiums for insurance of the types and limits it deems sufficient for its protection through the manufacturing process, and through delivery and acceptance at the Agency property.

General Terms and Conditions, titled “Insurance” sets the minimum requirements by the Commonwealth. Profession/Service Limits may not be applicable to this solicitation/contract.

- x. May the contractor accept orders (PO’s, Notice to Proceed & Contracts) that have not been placed through the Commonwealth’s eVA system?

Reference Attachment A., Section IV. Specifications, C. #15., “Ordering” applies to all purchases made by authorized users in the Commonwealth. This requirement would not apply to Authorized users outside the Commonwealth.

- y. Question with regards to reporting requirement of all invoices issued within the reporting period to include invoices being paid.

Attachment A, Section VII. Reporting Requirements, A. CONTRACTOR’S QUARTERLY REPORT OF SALES: No Change

- z. Does the Commonwealth require acceptance Small Purchase Charge Card (SPCC)?

No, not for this resulting contract of buses. Please reference (forementioned) Page 11, Section VIII. INVOICES AND PAYMENT: B. PAYMENT, addendum 2.

- aa. Is it acceptable that an In-Service Date (ISD) of each bus delivered within 60 days after bus acceptance?

Yes, this is acceptable.

- bb. Are we allowed to enter into additional terms and conditions with the Authorized User? May both parties mutually agree to enter additional terms after the order is placed?

Authorized Users can add T&Cs needed for a specific project/SOW but cannot add T&Cs to the DGS/DPS contract. The additional T&Cs do not take precedence over the DGS/DPS contract T&Cs and only pertain to that specific project/SOW for the locality/authorized user.

- cc. Are we allowed to modify the general terms and conditions, and the special provisions in the IFB?

No

- dd. Is the OEM allowed to suggest modifications as well?

This question was related to Attachment G. APTA “Special Provisions”, please note that sections 6 and 7 only apply to this invitation for bid (IFB). Reference Attachment G: Standard Bus Procurement Guidelines (Addendum #2)

- ee. Will the invoice be paid in full once the bus has been inspected and accepted within 15 days of delivery?

Reference General Term and Condition: PAYMENT and the Prompt Pay Act Code of Virginia, §§ 2.2-4347 through 2.2-4354 –Section 8.6 [Vendors Manual](https://dgs.virginia.gov/globalassets/business-units/dps/documents/vendorsmanual/vendorsmanual_2022_final.pdf)
https://dgs.virginia.gov/globalassets/business-units/dps/documents/vendorsmanual/vendorsmanual_2022_final.pdf

- ff. Will we be eligible to request a price escalation adjustment based on the applicable WPU1413 Price Producer Index on the anniversary of the award date?

Reference Attachment A, Section IX. Special Term and Conditions, paragraph #18, PRICE ESCALATION/DE-ESCALATION (forementioned) Addendum 2

- gg. Will State Inspection be the responsibility of the Authorized User?

Reference Section IX. SPECIAL TERMS AND CONDITIONS, paragraph #29, NEW VEHICLE PREPARATION, c. State Inspection Stickers and Decals (forementioned) Addendum 2

hh. Will the temporary license be the responsibility of the transit agency?

Reference Section IX. SPECIAL TERMS AND CONDITIONS, paragraph #29, NEW VEHICLE PREPARATION, a. Temporary License (forementioned) Addendum 2

ii. Will electronic manuals be accepted in lieu of paper copies?

Reference Section IX. Special Terms and Conditions, Item #29 (e)

ii. Should the requirement references Attachment A, Section IX., Special Terms and Conditions, #29 New Vehicle Preparation, f, with a reference to #30 be reference to #29?

Yes, Reference Page 20, Section IX. SPECIAL TERMS AND CONDITIONS: #29 NEW VEHICLE PREPARATION, paragraph (f) (forementioned) Addendum 2 provides correction.

jj. Will you reduce the handling costs to five percent (5%) instead of fifteen percent (15%)?

Special Provisions 1.1.2. #5 is not applicable to this solicitation, only section 6 and 7 of attachment G apply (forementioned) Addendum 2 provides clarification/correction

kk. Will parts credit be accepted in lieu of reimbursements?

No (Reference Attachment G. Section WR 2.8 Reimbursements)

ll. Can we submit our FTA letter confirming our DBE goals instead of a Subcontracting Plan?

Bidder must meet Virginia standards in addition to FTA's, please reference Attachment A, Section IX. Special Terms and Conditions, #17 SUBMISSION OF SMALL BUSINESS SUBCONTRACTING PLAN, EVIDENCE OF COMPLIANCE WITH SMALL BUSINESS SUBCONTRACTING PLAN AND SUBCONTRACTOR REPORTING and Attachment D., Small Business Subcontracting Plan (addendum #2).

mm. Will we still need to issue monthly reports?

As applicable and in accordance with provided response to Attachment A, Section IX. Special Terms and Conditions, #17 SUBMISSION OF SMALL BUSINESS SUBCONTRACTING PLAN, EVIDENCE OF COMPLIANCE WITH SMALL BUSINESS SUBCONTRACTING PLAN AND SUBCONTRACTOR REPORTING and Attachment D., Small Business Subcontracting Plan (addendum #2).

(SIGNATURE PAGE TO FOLLOW)

Note: A signed acknowledgment of this addendum must be received at the location indicated on the IFB either prior to the bid due date and hour or attached to your bid.

Very truly yours,

Pamela Copeland
Pamela Copeland, VCO
Statewide Sourcing & Contracting Officer

Name of Firm

Signature/Title

Date

SECTION 6: TECHNICAL SPECIFICATIONS

GENERAL

TS 1. Scope

Technical specifications define requirements for heavy-duty transit buses and commuter coaches, which, by the selection of specifically identified alternative configurations, may be used for both suburban express service and general service on urban arterial streets. Buses shall have a minimum expected life of twelve (12) years or 500,000 miles, whichever comes first, and are intended for the widest possible spectrum of passengers, including children, adults, the elderly and people with disabilities.

TS 2. Definitions

Agency Operating Profile: The operational requirements under Agency-specific operating conditions that the bus must be able to achieve.

Alternative: An alternative specification condition to the default bus configuration. The Agency may define alternatives to the default configuration to satisfy local operating requirements. Alternatives for the default configuration will be clearly identified.

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).

Analog Signals: A continuously variable signal that is solely dependent upon magnitude to express information content.

NOTE: Analog signals are used to represent the state of variable devices such as rheostats, potentiometers, temperature probes, etc.

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.

Battery Compartment: Low-voltage energy storage, i.e. 12/24 VDC batteries.

Battery Management System (BMS): Monitors energy, as well as temperature, cell or module voltages, and total pack voltage. The BMS adjusts the control strategy algorithms to maintain the batteries at uniform state of charge and optimal temperatures.

Battery Pack: An electrical equivalent of a collection of cells or modules or physical sub-packs forming the highest-level energy storage system. Often multiple physical sub-packs are connected in series, and these may also be connected in parallel.

Braking Resistor: Device that converts electrical energy into heat, typically used as a retarder to supplement or replace the regenerative braking.

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).

Cell: Simplest discrete component of the battery storage system, such as a battery or a capacitor.

Charging Equipment: The equipment that encompasses all the components needed to convert, control and transfer electricity from the grid to the vehicle for the purpose of charging batteries. May include chargers, controllers, couplers, transformers, ventilation, etc. See *Electric Vehicle Supply Equipment (EVSE)*.

Charging Interface: The equipment and/or coupler used to create a connection between the charging equipment and the vehicle for the purpose of recharging a vehicle's batteries.

Charging Station: The location that houses the charging equipment connected to a utility's electric service to provide electricity to a vehicle's battery system through a charging interface.

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.

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.

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.

dBA: Decibels with reference to 0.0002 microbar as measured on the "A" scale.

DC to DC Converter: A module that converts a source of direct current from one voltage level to another.

Default Configuration Bus: The bus described if no alternatives are selected. Signing, colors, the destination sign reading list and other information must be provided by the Agency.

Defueling: The process of removing fuel from a tank.

Defueling Port: Device that allows for vehicle defueling, or the point at which this occurs.

Design Operating Profile: The operational requirements under standard operating conditions that the bus must be able to achieve.

Destroyed: Physically made permanently unusable.

Discrete Signal: A signal that can take only pre-defined values, usually of a binary 0 or 1 nature, where 0 is battery ground potential and 1 is a defined battery positive potential.

DPF: Diesel particulate filter.

Driver's Eye Range: The 95th-percentile ellipse defined in SAE J941, except that the height of the ellipse shall be determined from the seat at its reference height.

Electrical Pack: See "Battery Pack"

Electric Vehicle Supply Equipment (EVSE): The conductors, including the ungrounded, grounded and equipment grounding conductors, the electric vehicle connectors, the attachment plugs, and all other fittings, devices, power outlets or apparatuses installed specifically for the purpose of delivering energy from the premise's wiring to the electric vehicle.

End of Life: A condition reached when an energy storage system fails to meet specified capacity, power or function in specified use conditions.

Energy Density: The relationship between the weight of an energy storage device and its power output in units of watt-hours per kilogram (Wh/kg).

Energy Storage System (ESS): A component or system of components that stores energy and for which its supply of energy is rechargeable by the on-vehicle system(engine/regenerative braking/ generator)or an off-vehicle energy source.

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 shall not exceed 125 percent of service pressure.

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.

Fireproof: Materials that will not burn or melt at temperatures less than 2000 °F.

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.

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 sq. ft. shall be allocated for the feet of each seated passenger protruding into the standee area.

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.

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., main throttle, waste gate).

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.

Generator (Electric): A device that converts mechanical energy into electrical energy.

Gross Load: 150 lb for every designed passenger seating position, for the driver, and for each 1.5 sq. ft. of free floor space.

GVW (Gross Vehicle Weight): Curb weight plus gross load.

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.

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

High Voltage (HV): Greater than 50 V(AC and DC).

Hose: Flexible line.

Hybrid: A vehicle that uses two or more distinct power sources to propel the vehicle.

Hybrid System Controller (HSC): Regulates energy flow throughout hybrid system components in order to provide motive performance and accessory loads, as applicable, while maintaining critical system parameters (voltages, currents, temperatures, etc.) within specified operating ranges.

Hybrid Drive System (HDS): The mechanical and/or electromechanical components, including the engine, traction motors and energy storage system, which comprise the traction drive portion of the hybrid propulsion system.

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 to 70 psi).

Inverter: A module that converts DC to and from AC.

Labeled: Equipment or materials to which has been attached a label, symbol or other identifying mark of an organization, which is acceptable to the authority having jurisdiction and concerned with product evaluation, which 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 a crack. See *Rupture*.

Line: All tubes, flexible and hard, that carry fluids.

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

Local Regulations: Regulations below the state level.

Low-Floor Bus: A bus that, 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.

Low Voltage (LV): 50 V or less (AC and DC).

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.

Module: A collection of cells forming a physical and electrical subassembly contained within an enclosure.

Motor (Electric): A device that converts electrical energy into mechanical energy.

Motor (Traction): An electric motor used to power the driving wheels of the bus.

Nameplate Capacity (or Nominal Capacity): The total amount of energy available between 0% State of Charge (SoC) and 100% SoC.

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

Pack: A collection of cells or modules described on the basis of electrical or physical attributes, to include Battery *Pack* and *Physical Pack*.

Physical Layer: The first layer of the seven-layer International Standards Organization (ISO) Open Systems Interconnect (OSI) reference model. This provides the mechanical, electrical, functional and procedural characteristics required to gain access to the transmission medium (e.g., cable) and is responsible for transporting binary information between computerized systems.

Physical Pack: An enclosure consisting of a collection of cells or modules at a location or multiple locations. Physical packs differ from battery packs, as they are defined by layout rather than electrical equivalent.

Pipe: Nonflexible line.

Pressure Relief Device (PRD): A pressure and/or temperature activated device used to vent the container/cylinder contents and thereby prevent rupture of an 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.

Power: Work or energy divided by time

Power Density: Power divided by mass, volume or area.

Propulsion System: System that provides propulsion for the vehicle proportional to operator commands. Includes, as applicable, engine, transmission, traction motors, the hybrid drive system,(HDS), energy storage system (ESS), and system controllers including all wiring and converter/inverter.

Real-Time Clock (RTC): Computer clock that keeps track of the current time.

Regenerative Braking: Deceleration of the bus by switching motors to act as generators, which return vehicle kinetic energy to the energy storage system.

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.

Retarder: Device used to augment or replace some of the functions of primary friction based braking systems of the bus.

Rupture: Sudden and unstable damage propagation in the structural components of the container resulting in a loss of contents. See *Leakage*.

Seated Load: 150 lb for every designed passenger seating position and for the driver.

Seated Load Weight (SLW): Curb weight plus seated load.

Serial Data Signals: A current loop based representation of ASCII or alphanumeric data used for transferring information between devices by transmitting a sequence of individual bits in a prearranged order of significance.

NOTE: An example is the communication that takes place between two or more electronic components with the ability to process and store information.

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.

Solid State Alternator: A module that converts high-voltage DC to low-voltage DC (typically 12/24 V systems).

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.

Special Tools: Tools not normally stocked by the Agency.

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.

Standard: A firm guideline from a consensus group. Standards referenced in “Section 6: Technical Specifications” are the latest revisions unless otherwise stated.

Standee Line: A line marked across the bus aisle to designate the forward area that passengers may not occupy when the bus is moving.

State of Charge (SoC): Quantity of electric energy remaining in the battery relative to the maximum rated amp-hour (Ah) capacity of the battery expressed in a percentage. This is a dynamic measurement used for the energy storage system. A full SoC indicates that the energy storage system cannot accept further charging from the engine-driven generator or the regenerative braking system.

Stress Loops: The “pigtailed” commonly used to absorb flexing in piping.

Structure: The basic body, including floor deck material and installation, load-bearing external panels, structural components, axle mounting provisions and suspension beams and attachment points.

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 over-pressure from improper charging practices.

Useable Capacity: Nameplate Capacity x Allowable Depth of Discharge (for example, 95%)

Warrantable End of Life (WEOL): A measure of battery degradation determined as the point at which the batteries can no longer provide the energy or power required to meet the design operating profile. It is expressed as a percentage of remaining battery capacity as compared with gross capacity at the beginning of useful life. For purposes of this specification, WEOL shall be a measure of the useful and intended life of the energy storage device.

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 in. in width and 48 in. in length measured 2 in. above the ground, and does not weigh more than 600 lb when occupied.

Zero-Emission Vehicle (ZEV): A vehicle that emits no tailpipe emissions from the onboard source of power.

TS 3. Referenced Publications

The documents or portions thereof referenced within this specification shall be considered part of the requirements of the specification. The edition indicated for each referenced document is the current edition, as of the date of the issuance of this specification. The Contractor is responsible for complying with current referenced documents.

Any inconsistency in compliance with this Technical Specification and its referenced documents shall be resolved by giving precedence in the following order:

1. Federal requirements (Title 49, FMVSS, etc.)
2. State requirements (in California, for example, it would be Title 13 Vehicle Code)
3. Local requirements
4. Referenced standards, practices and codes (SAE, ASTM, UL, ISO, etc.)
5. Technical content of this Technical Specification section

As an attachment to this RFP, CER 9.3 identifies the specifications, standards, regulations and references used within the RFP. The form must be returned with a proposal and requires an indication of the state of compliance and an opportunity for listing other pertinent references. Please indicate “compliance” as full, partial or N/A (not applicable). If “partial” or “N/A,” please describe.

TS 4. Legal Requirements

The Contractor shall comply with all applicable federal, state and local regulations. These shall include but not be limited to the Americans with Disabilities Act (ADA), as well as state and local accessibility, safety and security requirements. Local regulations are defined as those below the state level.

Buses shall meet all applicable Federal Motor Vehicle Safety Standards (FMVSS) regulations and shall accommodate all applicable Federal Motor Carrier Safety Administration (FMCSA) regulations in effect at the location of the Agency and the date of manufacture.

NOTE: In the event of any conflict between the requirements of these specifications and any applicable legal requirement, the legal requirement shall prevail. Technical requirements that exceed the legal requirements are not considered to conflict.

TS 5. Overall Requirements

The Contractor shall ensure that the application and installation of major bus subcomponents and systems are compliant with all such subcomponent vendors’ requirements and recommendations. Contractor and Agency shall identify subcomponent vendors that shall submit installation/application approval documents with the completion of a pilot or lead bus. Components used in the vehicle shall be of heavy-duty design and proven in transit service.

TS 5.1 Weight

It shall be a design goal to construct each bus as light in weight as possible without degradation of safety, appearance, comfort, traction, longevity or performance.

Buses at gross vehicle weight (GVW) shall not exceed the tire factor limits, brake test criteria, structural design criteria or the gross vehicle weight rating (GVWR).

TS 5.2 Capacity

The vehicle shall be designed to carry the gross vehicle weight, which shall not exceed the bus GVWR and shall not exceed the GAWR.

TS 5.3 Service Life

The minimum useful design life of the bus in transit service shall be at least 12 years or 500,000 miles. It shall be capable of operating at least 40,000 miles per year, including the 12th year.

TS 5.4 Maintenance and Inspection

Scheduled maintenance tasks for buses shall be related and shall be in accordance with the manufacturer's recommended preventive maintenance schedule (along with routine daily service performed during the servicing). The overall PM schedule for buses shall be based upon a minimum of a 6000 mi interval and/or multiples of same.

The manufacturer is responsible for providing a written comprehensive 52-week and long-term rehab/replacement maintenance plan encompassing buses for their entire useful life. The plan should include times (in hours) to complete the jobs.

Test ports or connectors, as required, shall be provided for commonly checked functions on the bus, such as hydraulic, pneumatic, cooling, temperature, voltage, current and state of charge (SoC).

The Offeror shall give prime consideration to the routine problems of maintaining the vehicle. All vehicle components and systems, both mechanical and electrical, that will require periodic physical work or inspection processes, shall be installed so that a minimum of time is consumed in gaining access to the critical repair areas. It shall not be necessary to disassemble portions of the bus structure and/or equipment, such as seats and flooring under seats, in order to gain access to these areas. Each bus shall be designed to facilitate disassembly, reassembly, servicing or maintenance, using tools and equipment normally available as standard commercial items.

Requirements for the use of unique or specialized tools shall be minimized. The body and structure of the bus shall be designed for ease of maintenance and repair. Individual panels or other equipment that may be damaged in normal service shall be repairable or replaceable. Ease of repair shall be related to the vulnerability of the item to damage in service.

The Contractor shall provide a list of all special tools and pricing for maintaining this equipment as a supplement to the Pricing Schedule.

NOTE: Tools such as compartment door keys, bellows gauges and other tools required for daily maintenance and inspection shall not be included in the special tools list and shall be furnished for each bus.

TS 5.5 Interchangeability

Unless otherwise agreed, all units and components procured under this Contract, whether provided by Suppliers or manufactured by the Contractor, shall be duplicates in design, manufacture and installation to ensure interchangeability among buses in each order group in this procurement. This interchangeability shall extend to the individual components, as well as to their locations in the buses. These components shall

include, but are not limited to, passenger window hardware, interior trim, lamps, lamp lenses and seat assemblies. Components with non-identical functions shall not be, or appear to be, interchangeable.

Any one component or unit used in the construction of these buses shall be an exact duplicate in design, manufacture and assembly for each bus in each order group in this Contract. Contractor shall identify and secure approval for any changes in components or unit construction provided within a Contract.

In the event that the Contractor is unable to comply with the interchangeability requirement, the Contractor must notify the Agency and obtain the Agency's prior written approval, including any changes in pricing.

Agency shall review proposed product changes on a case-by-case basis and shall have the right to require extended warranties to ensure that product changes perform at least as well as the originally supplied products.

TS 5.6 Training

NOTE: The following is illustrative; the Agency should carefully specify its training requirements.

The Contractor shall have at least one qualified instructor who shall be available at the Agency's property for [insert number] calendar days between the hours of [insert starting time] and [insert closing time] per month for [insert number] months prior to, and [insert number] months after, acceptance of the first bus. Instructor(s) shall conduct schools and advise the personnel of the Agency on the proper operation and maintenance of the equipment. The Contractor also shall provide visual and other teaching aids (such as manuals, slide presentations and literature) for use by the Agency's own training staff, which become the property of the Agency.

NOTE: The Agency should insert language that specifies the hours when it wants the training to occur, the total number of hours of instruction it wants provided, what items it expects the curriculum to cover and the format in which it expects the training and teaching aids to be provided (print, DVD, etc.).

TS 5.6.1 Technical/Service Representatives

NOTE: The following examples are illustrative; the Agency should carefully specify its support requirements.

[example] The Contractor shall, at its own expense, have one or more competent technical service representatives available on request to assist the Agency in the solution of engineering or design problems within the scope of the specifications that may arise during the warranty period. This does not relieve the Contractor of responsibilities under the provisions of "Section 7: Warranty Requirements."

[example] The Contractor shall provide full-time, on-site technical support representative for the buses and charging equipment for the first two years after bus delivery, with annual renewal options for 10 more years.

TS 5.7 Operating Environment

DEFAULT

The bus shall be capable of satisfying the requirements of this specification while operating in ambient temperature ranges of 10 °F to 115 °F, at relative humidity between 5 and 100 percent, and at altitudes up to 3000 ft above sea level. Degradation of performance due to atmospheric conditions shall be minimized at temperatures below 10 °F, above 115 °F or at altitudes above 3000 ft. Altitude requirements above 3000 ft. will need separate discussions with propulsion/drive system manufacturer to ensure that performance requirements are not compromised. Speed, gradeability and acceleration performance requirements shall be met at, or corrected to, 77 °F, 29.31 inHg, dry air per SAE J1995.

ALTERNATIVE

Agency will define operating environment.

TS 5.8 Noise

The Contractor is expected to meet interior and exterior noise requirements specified in Section 5.8.1 and Section 5.8.2. Furthermore, it shall be a design goal to minimize noise. Component layout and packaging, material selection, and build quality shall reflect that goal.

TS 5.8.1 Interior Noise

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 bus shall have a sound level of 65 dBA or lower at any point inside the bus. These conditions shall prevail with all openings, including doors and windows, closed and with the propulsion/drive system and accessories switched off.

Maximum internal noise level shall not exceed 75 dBA in the operator's area near normal operator ear level and 80 dBA in all other areas in the interior of the vehicles under all normal operating conditions at locations inside the bus in adherence with the standards of ISO 5128.

TS 5.8.2 Exterior Noise

Airborne noise generated by the bus and measured from either side shall not exceed 80 dBA under full-power acceleration when operated at 0 to 35 mph at curb weight. The Contractor shall comply with the exterior noise requirements defined in local laws and ordinances identified by the Agency and SAE J366.

DEFAULT

Noise level should be as stated.

ALTERNATIVE

Agency to state what noise level should be required.

TS 5.9 Fire Safety

The bus shall be designed and manufactured in accordance with all applicable fire safety and smoke emission regulations.

TS 5.9.1 Materials

DEFAULT

All materials used in the construction of the passenger compartment of the bus shall be in accordance with the Recommended Fire Safety Practices defined in FMVSS 302.

ALTERNATIVE

All materials used in the construction of the passenger compartment of the bus shall be in accordance with the Recommended Fire Safety Practices defined in FTA Docket 90-A, dated Oct. 20, 1993. Materials entirely enclosed from the passenger compartment, such as insulation within the sidewalls and sub-floor, need not comply. In addition, smaller components and items, such as seat grab rails, switch knobs, small light lenses, door seals, window seals, steering wheel, steering column and escape hatches shall be exempt from this requirement.

TS 5.10 Fire Suppression

DEFAULT (DIESEL, CNG, HYBRID)

The bus shall have a fire suppression system in areas requested by the Agency and installed per manufacturer's recommendations.

DEFAULT (BATTERY ELECTRIC)

No fire suppression system needed

ALTERNATIVE

Fire Suppression/Gas Detection

The bus shall be equipped with a suitable means of automatically detecting and extinguishing fires and/or overtemperature situations that may cause unreliable or unsafe operation. If the energy storage device is capable of releasing combustible gas, then this same system shall incorporate an integrated gas detection and alarm feature. This system shall employ intrinsically safe detectors capable of reliable operation, alert and shutdown to ensure safe operation. Alert shall occur at approximately 25 percent lower flammability limit (LFL), and shutdown shall occur at approximately 50 percent LFL. This system shall include an uninterruptible power supply (UPS) capable of sustaining operation for a period of at least 72 h regardless of the primary energy source SoC and remain uninterrupted regardless of “run”/“ign” position. The quantity, location and technology for sensors, suppression, agents, etc. shall be best practice for the intended application and environment. Sensors shall be of the linear type, capable of measuring temperature and programmable at the controller. Fire suppression piping located in the immediate area(s) being protected shall be fireproof and capable of surviving gross thermal events. The subject piping shall include the flow path between the fire suppression bottle and nozzles, with metalized rigid/flexible stainless steel preferred. The system shall include a means to automatically monitor fire suppression storage container pressure and to provide low-pressure alerts to the integrated system controller/display.

TS 5.11 Respect for the Environment

In the design and manufacture of the bus, the Contractor shall make every effort to reduce the amount of potentially hazardous waste. In accordance with Section 6002 of the Resource Conservation and Recovery Act, the Contractor shall use, whenever possible and allowed by the specifications, recycled materials in the manufacture of the bus.

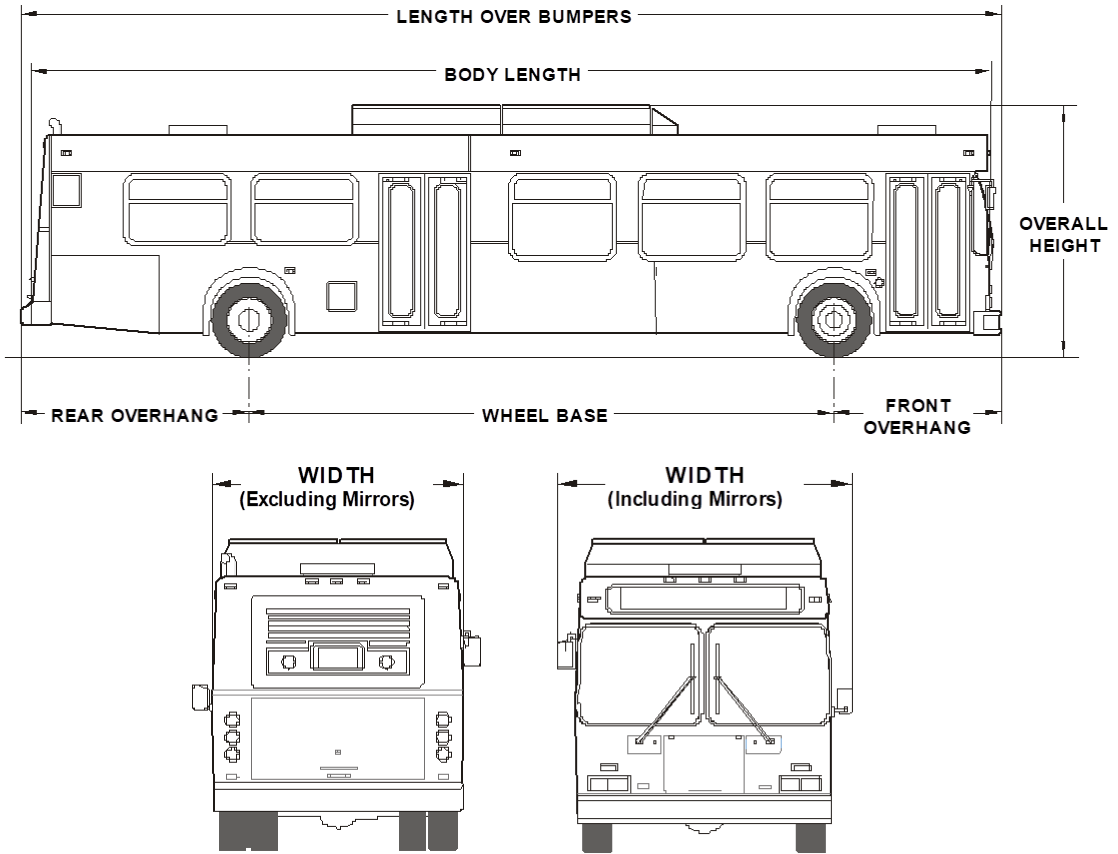
The Contractor shall provide a plan for reuse or recycling of replaced battery cells, modules and/or physical packs.

DIMENSIONS

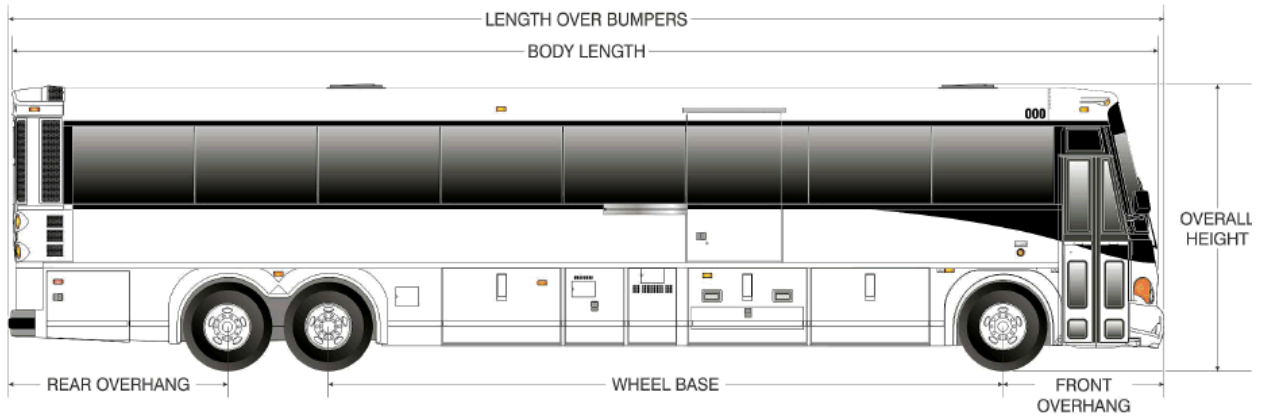
TS 6. Physical Size

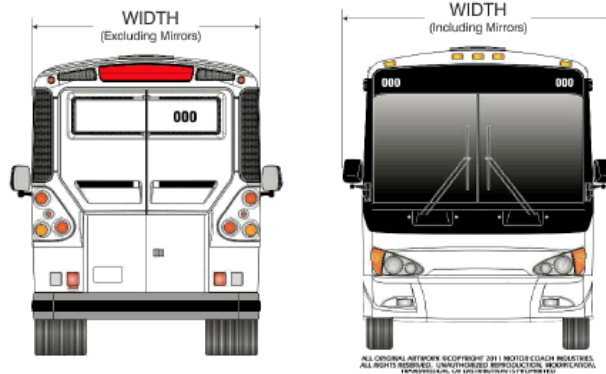
With exceptions such as exterior mirrors, marker and signal lights, bumpers, fender skirts, washers, wipers, ad frames, cameras, object detection systems, bicycle racks, feelers and rubrails, the bus shall have the following overall dimensions as shown in **Figure 1** at static conditions and design height.

FIGURE 1
Transit Bus Exterior Dimensions



Commuter Coach Exterior Dimensions





TS 6.1 Bus Length

For ease of use, the following tolerances will be allowable for each given bus length. Bus length is determined as the measurement from bumper to bumper.

- **30 ft bus:** 29 ft, 11 in. to 34 ft, 11 in.
- **35 ft bus:** 35 ft to 39 ft, 11 in.
- **40 ft bus:** 40 ft to 44 ft, 11 in.
- **45 ft bus:** 45 to 47 ft
- **60 ft (articulated) bus:** 59 to 65 ft

TS 6.2 Bus Width

TS 6.2.1 Transit Coach

DEFAULT

102 in. Width Bus

Body width shall be 102 in. (+0, -1 in.).

ALTERNATIVE

96 in. Width Bus

Body width shall be 96 in. (+0, -1 in.).

TS 6.2.2 Commuter Coach

DEFAULT

102 in. Width Bus

Body width shall be 102 in. (+0, -1 in.).

ALTERNATIVE

96 in. Width Bus

Body width shall be 96 in. (+0, -1 in.).

TS 6.3 Bus Height

DEFAULT

Maximum Overall Height

Maximum overall height shall be 140 in., including all rigid, roof-mounted items such as A/C, exhaust, fuel system and cover, etc.

ALTERNATIVE

Maximum Height

Maximum height shall be specified by Agency.

TS 6.4 Step Height

TS 6.4.1 Transit Coach

The step height shall not exceed 16.5 in. at either doorway without kneeling and shall not exceed 15.5 in. at the step. A maximum of two steps are allowed to accommodate a raised aisle floor in the rear of the bus.

TS 6.4.2 Commuter Coach

The step height shall not exceed 16.5 in. at doorway without kneeling and shall not exceed 15.5 in. at the step.

TS 6.4.3 Articulated Coach

The step height shall not exceed 16.5 in. at either doorway without kneeling and shall not exceed 15.5 in. at the step.

TS 6.5 Underbody Clearance

The bus shall maintain the minimum clearance dimensions as defined and shown in Figure 2 of SAE J689, regardless of load up to the gross vehicle weight rating.

TS 6.6 Ramp Clearances

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.

DEFAULT

Refer to [Table 2a](#).

Table 2a
Default Breakover Angle

| Angle | 30 to 45 ft Bus | 60 ft Bus |
|-----------------------------------|------------------------|------------------|
| Approach | 8.6 deg (min.) | 8.6 deg (min.) |
| Front breakover | 8 deg (min.) | 10.2 deg (min.) |
| Rear breakover (articulated only) | N/A | 8.7 deg (min.) |
| Departure | 8.6 deg (min.) | 8.6 deg (min.) |

ALTERNATIVE

Refer to **Table 2b**.

TABLE 2b
Alternative Breakover Angle

| Angle | 30 to 45 ft Bus | 60 ft Bus |
|-----------------------------------|------------------------|------------------|
| Approach | 8.6 deg (min.) | 8.6 deg (min.) |
| Front breakover | 7.5 deg (min.) | 10.2 deg (min.) |
| Rear breakover (articulated only) | n/a | 8.7 deg (min.) |
| Departure | 7.5 deg (min.) | 8.6 deg (min.) |

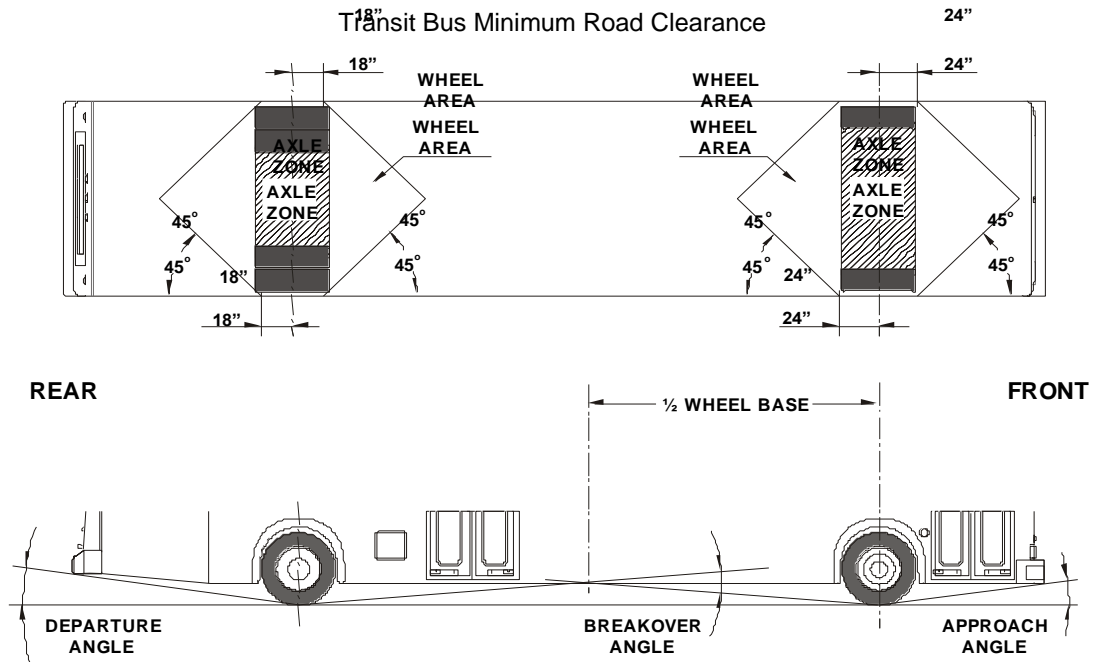
TS 6.7 Ground Clearance

Ground clearance shall be no less than 9 in., (8 in. at jacking pad) except within the axle zone and wheel area.

Axle zone clearance, which is the projected area between tires and wheels on the same axial centerline, shall be no less than 5.4 in.

Wheel area clearance shall be no less than 8 in. for parts fixed to the bus body and 6 in. for parts that move vertically with the axles.

– FIGURE 2



TRANSIT BUS MINIMUM ROAD CLEARANCE

TS 6.8 Floor Height

TS 6.8.1 Transit Coach

Height of the step above the street shall be no more than 16 in. measured at the centerline of the front and rear doorway. All floor measurements shall be with the bus at the design running height and on a level surface and with the standard installed tires. A maximum of two steps are allowed to accommodate a raised aisle floor in the rear of the bus.

TS 6.8.2 Commuter Coach

Height of the step above the street shall be no more than 16 in. measured at the centerline of the doorway. All floor measurements shall be with the bus at the design running height and on a level surface and with the standard installed tires.

TS 6.9 Interior Headroom

Headroom above the aisle and at the centerline of the aisle seats shall be no less than 76.75 in. in the forward half of the bus, tapering to no less than 74 in. forward of the rear settee. At the centerline of the window seats, headroom shall be no lower than 65 in., except for parcel racks and reading lights, if specified. Headroom at the back of the rear bench seat may be reduced to a minimum of 56 in., but it shall 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 or her head, padding shall be provided on the overhead paneling.

VEHICLE PERFORMANCE

TS 7. Power Requirements

The system shall be sized to provide sufficient power to enable the bus to meet the defined acceleration, top speed, route, mileage, GVWR and gradeability requirements, while operating all accessories. This shall be verified using actual road test results and/or simulated vehicle performance data.

A loss of power to the bus shall not cause the driver to lose control of the bus or to lose steering or braking. The bus shall be able to be safely brought to a controlled stop.

TS 7.1 Top Speed

DEFAULT

The bus shall be capable of achieving a top speed of 65 mph on a straight, level road at GVWR with all accessories operating. The bus shall be capable of safely maintaining the vehicle speed according to the recommendations by the tire manufacturer. The top speed and speedometer revolution should meet SAE J678. Manufacturer shall supply Agency with data if there is a variance between peak performance and sustained vehicle performance.

ALTERNATIVE

Agency to specify top speed limit. The bus shall be capable of safely maintaining the vehicle speed according to the recommendations by the tire manufacturer. Values are assumed to be sustained. Manufacturer shall supply Agency with data if there is a variance between peak performance and sustained vehicle performance.

NOTE: Increasing top speed in combination with more aggressive gradeability requirements may lead to higher design and operating costs and possibly have adverse effects on performance.

TS 7.2 Startability and Gradeability

Startability and gradeability requirements shall be met on grades with a dry commercial asphalt or concrete pavement at GVWR with all accessories operating.

DEFAULT

The propulsion system shall enable the bus to start from a full stop and achieve and maintain a speed of 40 mph on a 2.5 percent ascending grade continuous and 10 mph on a 10 percent ascending grade continuous.

ALTERNATIVE

The propulsion system shall enable the bus to start from a full stop and achieve and maintain a speed of 40 mph on a 2.5 percent ascending grade continuous, 10 mph on a 10 percent ascending grade continuous, and 7 mph on a 16 percent ascending grade for a minimum of 60 seconds.

ALTERNATIVE

Agency will provide startability and gradeability requirements to the Contractor.

NOTE: Increasing gradeability requirements in combination with higher top speed requirements may lead to higher design and operating costs and possibly have adverse effects on other performance characteristics.

NOTE: Unless otherwise noted, values are assumed to be sustained. Manufacturer shall supply Agency with data if there is a variance between peak performance and sustained vehicle performance.

TS 7.3 Acceleration

The acceleration shall meet the requirements in **Table 3** and shall be sufficiently gradual and smooth to prevent throwing standing passengers off-balance. Acceleration measurement shall commence when the accelerator is depressed.

TABLE 3

Maximum Start Acceleration Times on a Level Surface¹

| Speed (mph) | Maximum time (seconds) |
|-------------|------------------------|
| 10 | 5 |
| 20 | 10 |
| 30 | 18 |
| 40 | 30 |
| 50 | 60 |
| Top speed | |

1. Vehicle weight = GVWR

NOTE: The system shall be programmable to allow optimization of acceleration. Performance may be affected when reprogramming. The manufacturer shall supply the new performance data.

TS 7.3.1 Acceleration (Hybrid or Battery Electric Coach)

The propulsion and braking systems shall meet the performance requirements of the duty cycle.

Braking application and performance shall remain consistent across the highest possible range of battery system state of charge (SoC) or other variances related to regenerative braking. At very high or very low SoC, or at other conditions such as very cold or very hot battery temperatures, the application and performance of regenerative braking can be reduced but this must be done in a smooth and predictable manner. At no time should the application and performance of the mechanical friction brakes be affected by these conditions.

The system shall be programmable to allow optimization of acceleration and deceleration rate. Performance may be affected when reprogramming. The manufacturer shall supply the new performance data.

TS 7.3.2 Acceleration (Commuter Coach)

The Contractor shall provide performance scans to the Agency based on the Agency’s specific drivetrain configuration.

TS 7.4 Operating Range

The operating range of the coach shall be designed to meet the operating profile as stated in the “Design Operating Profile” section.

TS 7.4.1 Diesel (Transit Coach)

DEFAULT

The operating range of the coach when run on the FTA ABD cycle shall be at least 350 miles (560 km) or 20 hours with full fuel capacity.

ALTERNATIVE

Agency to designate operating range.

TS 7.4.2 Diesel (Commuter Coach)

DEFAULT

A fuel tank with a minimum capacity 165 gallons shall be installed.

ALTERNATIVE

Agency to designate operating range.

TS 7.4.3 CNG

DEFAULT

The operating range of the coach when run on the FTA ABD cycle shall be at least 350 miles or 20 hours with an initial gas-settled pressure of 3600 psi at 70 °F.

ALTERNATIVE

Agency to designate operating range.

TS 7.4.4 Hybrid

DEFAULT

The operating range of the coach when run on the design operating profile “Design Operating Profile” shall be at least 350 miles on a full tank of fuel.

ALTERNATIVE

Agency to designate operating range.

TS 8. Fuel Economy/Range (Design Operating Profile)

The bus must be able to achieve operational requirements under standard operating conditions and in Agency-specific conditions. These conditions make up the design operating profile. The standard operating conditions are defined by the Bus Research Testing Center at Altoona, Pennsylvania (“Altoona”), and are used as a

benchmark and as a means to compare the performance of various buses across a set standard. The Agency-specific conditions are established to ensure that the bus will be able to meet the unique operational requirements of the Agency.

TS 8.1 Altoona Fuel Economy Tests

The Altoona Energy Economy and Range Test for buses is an energy consumption and range test for battery electric buses under Altoona’s pass/fail procedures. Buses are tested using the Manhattan cycle (a low average speed, highly transient urban cycle), the Orange County cycle (consists of urban and highway driving segments), and the EPA HD-UDDS cycle test results from the Energy Economy and Range Test or other applicable test procedures. Results shall include vehicle configuration and test environment information. Energy economy data shall be provided for each duty cycle.

TS 8.1.1 Diesel (Transit Coach)

DEFAULT

The operating range of the coach when run on the combined cycle shall be at least 350 miles or 20 hours with full fuel capacity.

ALTERNATIVE

Agency to designate operating range.

TS 8.1.2 Diesel (Commuter Coach)

DEFAULT

A fuel tank with a minimum capacity of 165 gallons shall be installed.

ALTERNATIVE

Agency to designate operating range.

TS 8.1.3 CNG

DEFAULT

The operating range of the coach when run on the combined cycle shall be at least 350 miles or 20 hours with an initial gas-settled pressure of 3600 psi at 70 °F.

ALTERNATIVE

Agency to designate operating range.

TS 8.1.4 Hybrid

DEFAULT

The operating range of the coach when run on the design operating profile shall be at least 350 miles on a full tank of fuel.

ALTERNATIVE

Agency to designate operating range.

TS 8.1.5 Battery Electric

DEFAULT

Agency shall define minimum operating range and time between charges.

ALTERNATIVE

OEM-provided solution to Agency to respect Agency operation profile (range and time between charges).

NOTE: Charging can be on-route or depot.

TS 8.2 Agency Operating Profile (Battery Electric Bus)

In addition to the Altoona-defined profile, the bus must also be able to meet the Agency operating profile addressing the needs presented below. The Proposer must validate that the proposed bus will meet the Agency operating profile using sound mathematical modeling and simulation or empirical methods. Proposers must demonstrate the agreement of their mathematical models and methods against Altoona results using the Manhattan cycle, the Orange County cycle and the EPA HD-UDDS cycle test results from the Energy Economy and Range Test.

The Agency operating profile must be met under maximum auxiliary loads and at GVWR. It is assumed that buses will start daily duty cycle at maximum standard operating SoC. Batteries shall not be depleted below minimum standard operating SoC during operations. Minimum standard operating SoC shall allow for reserve battery capacity that the bus can draw upon to return to the closest charging point in degraded mode. Charging of the batteries during normal operations shall not exceed maximum standard operating SoC at any time during charging.

Nominal conditions

- **Ambient temperature:** 68 °F
- **Bus weight:** SLW

Worst-case conditions

- **Ambient temperature:** [Agency to define worst-case heating and cooling loads when operating in local Agency environmental conditions (summer or winter depending on location) as defined by NOAA.com, weather.gov, or other website as specified by the Agency.]
- **Bus weight:** GVWR

DEFAULT

Agency block information and route number(s) or name(s) are to be used as representatives of the Agency’s operating profile.

The following are general operating profile data: [insert desired Agency profile]

| | | |
|--|-------|---------|
| Average route speed (nominal) | _____ | mph |
| Average route speed (worst case) | _____ | mph |
| Average distance between stops | _____ | miles |
| Maximum required trip duration | _____ | minutes |
| Average required trip duration | _____ | minutes |
| Distance from depot to start of route | _____ | miles |
| Longest distance from depot | _____ | miles |
| Average miles per bus per day | _____ | miles |
| Longest miles per day for a bus | _____ | miles |
| Minimum layover time for charging during day | _____ | minutes |
| Average layover time for charging during day | _____ | minutes |
| Available depot charge time | _____ | hours |
| Minimum depot charge time required for full charge | _____ | hours |
| Maximum number of buses required to operate daily | _____ | buses |

ALTERNATIVE

The Agency will supply [alternatively, “Proposers shall collect”] second-by-second route and duty cycle data for a bus on the actual route(s) for modeling purposes only. The data should include time (seconds), speed (mph), and grade (%) or elevation (ft) and may be collected with a GPS data logger and noise filtered. The GPS data may use or be augmented with elevation data from the U.S. Geological Survey and NASA to determine grades. [Insert desired Agency profile.]

| | | |
|---|-------|---------|
| Maximum required trip duration | _____ | minutes |
| Average required trip duration | _____ | minutes |
| Distance from depot to start of route | _____ | miles |
| Furthest distance from depot | _____ | miles |
| Average miles per bus per day (local) | _____ | miles |
| Longest miles per day per bus | _____ | miles |
| Minimum layover time for charging during day | _____ | minutes |
| Average layover time for charging during day | _____ | minutes |
| Maximum number of buses required to operate daily | _____ | buses |

ALTERNATIVE

The Agency will provide a percentage of each standard duty cycle (Manhattan cycle, Orange County cycle, and EPA HD-UDDS) that is representative of its service.

The Contractor shall provide the following narratives with its Technical Proposal:

- Narrative description of the methods used to validate that the proposed system will meet the Agency operating profile under nominal and worst-case conditions. Detailed results should include, at a minimum, the following for both nominal and worst-case conditions:

- expected bus range (miles)
- fuel economy (kWh/mile)
- auxiliary loads (kW)
- Projected performance on the Agency operating profile when the battery reaches end-of-life (EOL) state. The Proposer will provide specific details on EOL criteria. Detailed results should include, at a minimum, the following:
 - expected battery life from factory delivery under normal operating conditions (months)
 - EOL battery capacity (kWh)
 - EOL bus range (miles)
- Description of any required or recommended charge strategies or other bus operation strategies that are necessary to meet the Agency operating profile. Note that the Agency requires that operational impacts be minimized.
- Description of the flexibility and considerations necessary to place the proposed bus and its charging solution on any Agency route at the Agency's discretion.
- Description of any required charge strategies, on-route charge requirements, bus blocking requirements or other bus operational requirements necessary to meet the Agency operating profile. Note that the Agency requires that operational impacts be minimized.
- Description of the flexibility and considerations necessary to place the proposed bus and its charging solution on any Agency route at the Agency's discretion.

POWERPLANT

TS 9. Engine

TS 9.1 Engine (Diesel and CNG)

The engine shall comply with applicable local, state and/or federal emissions and useful life requirements. The engine shall have a design life of not less than 300,000 miles without replacement or major service. The lifetime estimate is based on the design operating profile.

NOTE: For commuter coaches, minimum rating horsepower of 400 and minimum torque rating of 1400 ft-lb shall be installed.

The engine shall be equipped with an electronically controlled management system, compatible with either 12 or 24 V power distribution. The engine control system shall be capable of transmitting and receiving electronic inputs and data from other drivetrain components and broadcasting that data to other vehicle systems. Communication between electronic drivetrain components and other vehicle systems shall be made using the communications networks. The engine's electronic management system shall monitor operating conditions and provide instantaneous adjustments to optimize both engine and bus performance. The system shall be programmable to allow optimization of programmable features.

The engine starting system shall be protected by an interlock that prevents its engagement when the engine is running. Special equipment or procedures may be employed to start the bus when exposed to temperatures lower than 30 °F (-1 °C) for a minimum of 4 hours without the engine in operation. All cold-weather starting aids, engine heating devices and procedures shall be of the type recommended by the engine manufacturer and approved by the Agency. The integration of all systems on the vehicle relative to engine idle speed shall be the responsibility of the vehicle manufacturer to meet the requirements of the transit property.

The engine control system shall protect the engine against progressive damage. The system shall monitor conditions critical for safe operation and automatically derate power and/or speed and initiate engine shutdown as needed.

DEFAULT

Automatic Engine Protection/Shutdown Override Feature

A control shall be available to the operator/driver that when constantly depressed and released will delay the engine shutdown or allow the bus to be moved. Override action shall be recorded. This data shall be retrievable by the Agency.

ALTERNATIVE

No requirement for an automatic engine protection/shutdown override feature.

TS 9.2 Engine (CNG)

The engine shall meet all regulatory requirements 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.

TS 9.3 Propulsion System (Hybrid or All Electric)

TS 9.3.1 Propulsion System Description (Hybrid)

The bus shall be powered by a hybrid propulsion system. The OEM shall ensure that the bus structure can successfully accept the installation of the propulsion system and be operated on the stated duty cycle for a period of 12 years without a structural failure. At a minimum, the propulsion system shall comply with applicable local, state and/or federal emissions and useful life requirements. The propulsion system shall comply with local, state and federal (maintenance) and other applicable sections.

The hybrid drive system shall be rated for the GVWR or greater of the bus.

Labels should be posted on high-voltage devices to identify them as components containing high voltage potential. These labels shall be applied in such a way that they can be seen when access doors are opened or closed, so as to protect both emergency and maintenance personnel.

A detailed description of the propulsion system shall be provided with the proposal. The description shall include a written narrative, a block diagram showing major propulsion system components, an illustration showing the physical layout of propulsion components and high-voltage wire routing within the vehicle, and a detailed wiring diagram and/or electrical schematic for the high-voltage system. Proposer is required to provide a list of applicable industry standards that the proposed propulsion system meets.

TS 9.3.2 Propulsion System Description (All Electric)

The bus shall be powered by an electric propulsion system. To the greatest extent practical, the electric propulsion system shall conform to SAE J2910 and SAE J2344.

The propulsion system shall not be supplemented by any onboard range extenders, including but not limited to internal combustion engines, gas turbines and/or hydrogen fuel cells.

The OEM shall ensure that the bus structure is suitable for the electric propulsion system and can be operated safely on the design operating profile (TS 8) for the service life of the bus (TS 5.3) without a structural failure. The propulsion system shall comply with applicable local, state and/or federal emissions and useful-life requirements.

Labels should be posted on high-voltage devices to identify them as components conducting high-voltage potential. These labels shall be applied in such a way that they can be seen when access doors are opened or closed, so as to protect both emergency and maintenance personnel.

A detailed description of the propulsion system shall be provided with the proposal. The description shall include a written narrative, a block diagram showing major propulsion system components, an illustration showing the physical layout of propulsion components and high-voltage wire routing within the vehicle, and a detailed wiring diagram and/or electrical schematic for the high-voltage system. Proposer is required to provide a list of applicable industry standards that the proposed propulsion system meets.

TS 9.3.3 Propulsion System Service

The propulsion system shall be arranged so that accessibility for all routine maintenance is ensured. No special tools, other than dollies and hoists, shall be required to remove the propulsion system or any subsystems. The Agency recognizes that properly rated test equipment and safe electrical work practices are essential when servicing high-voltage components. The Contractor shall identify safe electrical work practices that are essential when servicing high-voltage components. The Contractor shall provide all specialty tools and diagnostic equipment required for maintaining the propulsion system in accordance with the Special Tools List.

TS 9.3.4 Primary Propulsion Unit and Traction Motor(s)

The propulsion system components may be arranged in a variety of configurations. The traction motor must be capable of providing and retarding mechanical motion.

TS 9.3.5 Energy Storage System

Energy Storage System

The energy storage system (ESS) shall be of a commercial design capable of operating in the Agency transit environment and design operating profile. The ESS shall use battery technology with a field-proven track record of safe, reliable and durable operation in similar transit applications. The ESS shall be designed, sized and selected to ensure that the vehicle performance specifications, compatibility with charging and other related requirements are met or exceeded, bearing in mind cost/benefit and reliability variables as they relate to the characteristics of the different battery types.

The ESS shall comply with ECE R100 Revision 2, UN/DOT 38.3, and/or SAE J2464 requirements for lithium batteries. For non-lithium batteries, the ESS shall comply with similar applicable standards.

The Contractor shall deliver the bus with an installed, functioning ESS charged with sufficient usable energy for delivery and to be maneuvered around the Agency's property. The ESS shall be fully formed, installed and tested in accordance with the battery manufacturer's recommended practices. The ESS design, including containers, module bracing systems, thermal-management systems, battery-management systems, watering/venting systems, interconnections, fusing, and traction-controller and charger interfaces shall be adequately described in the proposal. The proposal shall include a description of all battery maintenance requirements, including any periodic charge requirements necessary for cell balancing. The proposal shall also include a comprehensive statement of the warranty terms relating to the battery, including explanation of

all disclaimers within the warranty. The battery life shall be stated in terms of cyclic life and calendar life in the proposal with a description of all factors that will affect the battery life, including charging, operation and environmental effects. The Agency operating profile shall be considered when making this analysis. A life-cycle cost analysis of the proposed battery system in the specified application shall be provided.

The battery system shall be capable of withstanding the current and voltage profiles necessary to accomplish daily recharge events within the defined operating profile.

Thermal management will be provided as needed to ensure optimal life and performance of the ESS over the environmental operating range. The battery thermal management system shall be adequate to maintain the battery within the battery manufacturer's recommended temperature range during operation in the specified duty cycle and climatic conditions.

Proposals shall include complete descriptions of all life-cycle testing procedures used to validate the life of batteries used for this application at the proposed charging rates, charge durations, and expected ambient temperatures and operating profiles. Proposers shall include documented results of life-cycle testing. Proposers shall include certification of battery life-cycle testing by an independent testing agency.

Energy Storage System Capacity

The ESS shall have sufficient energy storage to meet the requirements of the intended duty cycle when new and up until the degradation has reached warrantable end of life (WEOL), or other such agreed upon End of Life (EOL) capacity, as defined within the warranty terms of this RFP by percent remaining capacity. As an example, if the capacity when new is 300 kWh and the WEOL is at 80 percent, then the useable capacity range shall be from 300 to 240 kWh.

The ESS shall be measured periodically during the 12-year design life of the bus per the following protocol by the bus manufacturer at an interval of at least every [insert number] years. The manufacturer will propose the test method and certify that the results are true and accurate. The test will be performed according to a documented test procedure. The Agency is allowed to engage third parties for capacity testing.

Energy Storage System Safety

The ESS shall be placed on the bus to optimize both interior space and vehicle weight distribution. The batteries shall be load-distributed within the bus to equalize weight between the wheels on the same axles and to achieve appropriate weight distribution between axles so as not to adversely affect handling of the bus.

The bus body shall be designed and constructed to ensure that passengers and the operator will not be exposed to hazardous high voltage. This design will also minimize potential exposure to hazardous electrical current in the event of a vehicle accident. Analysis and test data shall be provided to the Agency. The vehicle and energy storage system shall be designed and constructed to prevent gassing or fumes from the energy storage system from entering the interior of the bus, i.e., a vent path to the exterior, preferably at or above the roof, rearward.

Written confirmation from the battery manufacturer attesting to the safety of the proposed battery system in the specified application and charging profile shall be submitted as part of the proposal, and shall include full disclosure and discussion of any and all relevant issues or prior incidents relating to safety.

Proposals shall include complete descriptions of all safety standards followed in the design and manufacture of the battery system, safety testing procedures used to validate the safety of battery operation in this application, and documented results of safety testing to confirm that standards have been met.

Both automatic and manual battery disconnect devices must be included and documented. Contactors shall be rated to interrupt the full load of the bus. Service and emergency manual disconnects must be included and their usage documented. Contractor shall provide a means to isolate the high-voltage battery during maintenance operations. Manual and automatic disconnects should open both poles of each physical battery pack.

The HV system and ESS shall include isolation protection between the HV and bus chassis system, to include automatic detection of isolation faults, alerts to the operator, diagnostic system and appropriate action to prevent personnel from HV exposure. Detection, alerting and vehicle control shall occur in accordance with SAE J2910. Detection shall be provided at two levels, as per J2910, and detection at any level shall be alerted to the operator and maintenance personnel.

The system described above may also be an integral part of the overall emergency shutdown system, with functions to include the following:

- Offers a quick, safe and organized means for the operator, maintenance personnel and/or first responders to shut down the HV system.
- Shutting down the system shall include at least:
 - “opening” all HV contactors;
 - discharging capacitors (if used); and
 - disconnecting any devices that could provide HV during normal operation and including during charging.
- Devices used to initiate shutdown shall be located within and outside the bus to satisfy ease of use by the mentioned personnel and shall be clearly marked as to location and use.
- In addition to manual use, this same functionality shall extend to the charging operation in the event of a fault sensed by the GFI, to also include termination of charge.

Battery Containers

Battery containers shall be constructed to withstand the rigors of transit service for the design life of the bus. Construction shall be of materials compatible with the battery electrolyte. All electrical connections shall be fully shielded and hand-operable. Connector and cabling design shall be such that inappropriate or unsafe connections are prevented. Vent-and-fill system components for individual packs or containers shall not require any disassembly on removal or installation of the battery packs or containers. Pack design must comprehend the protection of battery cabling and vent/watering system components during pack removal and installation. The batteries, when installed, shall be secured to the chassis to prevent any movement that may cause damage or personal harm while the vehicle is in operation.

Battery Management System

The battery management system must be designed to ISO 26262, as applicable, safety principles to control state of charge, voltage, current and temperatures on a cell-to-cell level and provide diagnostic output at the lowest field-serviceable element. The diagnostic output must be made available to the maintainer.

As a minimum, the battery management system (BMS) must perform the following functions:

1. The BMS must be capable of monitoring the voltage of cells within each battery pack. The BMS must be able to read individual battery or block voltages at a frequency sufficient to ensure reliable, functional and safe operation.
2. The BMS must be capable of monitoring battery temperatures, mitigating damage to the battery and surroundings, and preventing thermal runaway.

3. The BMS must be capable of communicating when a battery fault (as defined by the battery manufacturer) has occurred and must be able to identify and communicate the location of the faulty battery in order to perform maintenance.
4. The BMS must be capable of engaging prudent safety interlocks when an unsafe battery condition has been detected.
5. The BMS must be able to monitor the battery SoC and provide information to the rest of the vehicle.
6. The BMS must be able to communicate all data to the bus level information system (reference TS 84) for storage and communication.

Battery Thermal Management

Thermal management shall be provided to ensure optimal life and performance of the ESS over the environmental operating range.

During operation, battery temperatures must never exceed the manufacturer’s recommended range in the design operating profile and specified ambient conditions. Battery cooling must be sufficient to prevent the temperature from exceeding the battery manufacturer’s recommended maximum temperature.

Battery Charging

The bus shall support an SAE-approved charging standard (SAE J1772 DC and/or SAE J3068 AC). The Manufacturer shall provide a detailed description of its charging system and specify its compliance with one of the above-listed standards. Proposers shall include a description of the charging infrastructure required to install and operate the charging equipment. All charging systems provided for use with the bus and in conjunction with the battery management system must comply with the battery manufacturer’s electrical and thermal limits.

The bus must be immobilized during all charging operations. Upon successful engagement of the charging interface, the bus shall be interlocked such that propulsion is rendered non-tractive and the brakes applied.

The charging receptacle located on the bus shall be at the [add location (front/rear, left/right, approximate area)] and located within a range of height from grade at normal suspension ride height between [add number] and [add number] in.

DEFAULT

Charging

The bus shall support an SAE-approved charging standard. Proposers shall include a detailed description of their charging system and specify its compliance with one of the above-listed standards. Proposers shall include a description of the charging infrastructure required to charge the bus on route and/or at the depot.

DEFAULT

DC Charging

The bus must support SAE J1772 DC. This means the bus would be capable of being charged from a direct current EVSE compliant with SAE J1772, using a Type 1 “J1772” CCS/Combo connector.

DEFAULT AC CHARGING/ALTERNATE DC CHARGING

The bus must support SAE J3068 charging standard. This means that the bus would be capable of being charged from an alternating current or direct current EVSE compliant with SAE J3068, using a Type 2 connector for AC₆ plugs or CCS Combo 2 connector for AC₆ and DC₈/AC₆ plugs.

DEFAULT

Overhead Conductive Charging

The bus must support published standards including [add applicable standards if published, e.g., SAE J3105] for overhead conductive bus charging. Proposers shall include a detailed description of their charging system and specify its compliance with one of the above-listed standards. Proposers shall include a description of the charging infrastructure required to charge the bus on route and/or at the depot. Proposers shall describe the expected level of interoperability of the proposed charging system with other vehicles and transit buses.

DEFAULT

Wireless Inductive Charging

The bus must support published standards including [add applicable standards if published, e.g., SAE J2954/2] for wireless inductive bus charging. Proposers shall include a detailed description of their charging system and specify its compliance with one of the above-listed standards. Proposers shall include a description of the charging infrastructure required to charge the bus on route and/or at the depot. Proposers shall describe the expected level of interoperability of the proposed charging system with other vehicles and transit buses.

TS 9.3.6 Propulsion System Controller (PSC)

The PSC regulates energy flow throughout hybrid system components in order to provide motive performance and accessory loads, as applicable, while maintaining critical system parameters (voltages, currents, temperatures, etc.) within specified operating ranges.

The controller shall monitor and process inputs and execute outputs as appropriate to control the operation of all propulsion system components.

Energy storage system SoC correction methods stated in SAE J2711 shall be used (for all-electric or hybrid only.)

TS 9.3.7 Engine (Hybrid)

The engine and related emission systems shall meet all applicable emissions and design/durability guidelines and standards.

The Contractor shall provide the Agency with expected durability of the engine and related emission systems.

NOTE: The Agency will provide desired fuel type.

DEFAULT

Supplier shall recommend power plant.

ALTERNATIVE

Agency shall define required power plant.

The engine shall be equipped with an electronically controlled management system, compatible with multiplex wiring systems and either 12 or 24 V electrical systems.

The engine shall have onboard diagnostic capabilities, be 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, shall be provided in the operator's area and near or inside the engine compartment. The onboard diagnostic system shall inform the operator via visual and/or audible alarms when out-of-parameter conditions exist for vital engine functions.

The engine starting system shall 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 (−1 °C) for a minimum of 4 hours without the engine in operation. All cold-weather starting aids, engine heating devices and procedures shall be of the type recommended by the engine manufacturer and approved by the Agency.

DEFAULT

Standard Requirements for a Fast Idle Device

The engine shall be equipped with an operator-controlled fast idle device. The fast idle control shall be a two-way switch mounted on the dash or side console and shall activate only with the transmission in neutral and the parking brake applied.

ALTERNATIVE

Automatically Activated Fast Idle as Required

The fast idle device shall be activated and controlled automatically by the control system.

TS 10. Cooling Systems

The capacity of the cooling system shall be adequate to maintain design component temperatures under all operating conditions for the design life of the vehicle in the service area and environment of the agency. The Contractor shall provide evidence that the cooling system selected has the capability to handle peak heat rejection from the traction motor, energy storage system, propulsion control system, and the intermediate and low-voltage power supply with a partially clogged radiator at maximum ambient temperature plus heat reflected off the pavement. The Contractor shall submit an analysis verifying cooling system capabilities. The entire cooling system shall be equipped with an electronic detection device to indicate overheating on the driver's control panel.

Operation of required battery thermal management systems shall be automatically controlled under all normally encountered operating and charging conditions and shall be powered by an onboard source at all times during operation. Thermal management shall be continuously monitored during all periods of charge and discharge with appropriate safety interlocks installed to react to adverse conditions.

Air intakes shall be properly positioned and configured to minimize the intake of water, road dust and debris and shall be adequately filtered.

In the event of a failure of the battery thermal management system (BTMS) subsequently resulting in battery temperature outside the allowable limits, the BMS shall limit, in a manner appropriate to the situation, the operation of the bus including charging. A diagnostic indicator shall accompany any BTMS failure.

A complete description of the battery thermal management systems shall accompany the bid package. Written confirmation from the battery manufacturer attesting to the suitability of the battery thermal management system shall be submitted to the Agency concurrent with or prior to delivery of the first bus.

TS 10.1 Component Thermal Management

Under the vehicle operating temperature range, the thermal management system shall be designed such that each component will remain in its allowed operating range.

Component temperature sensors may be used for monitoring, control or component/system protection. If equipped and serviceable, component temperature sensors shall be easily accessible. Under typical failure modes or out-of-limit conditions, component temperature sensors shall not disable the bus unless there is an immediate risk of hazardous fault propagation (e.g., temperature levels in the motor area known to start fires). In the event that a component temperature sensor must disable the bus, the component/system must comply with the automatic propulsion system protection/shutdown override feature requirement of TS 9.

Motor cooling fans shall be of durable, corrosion-resistant construction and designed so a mechanic can gain access. The cooling fan and mounting bracket shall be designed to withstand the thermal fatigue and vibration associated with the installed configuration.

A means of determining satisfactory component coolant level shall be provided. A spring-loaded, push-button type valve or lever shall be provided to safely release pressure or vacuum in the cooling system with both it and the water filler no more than ± 60 in. above the ground. Both shall be accessible through the same access door.

DEFAULT

The radiator and charge air cooler shall be of durable, corrosion-resistant construction with non-removable tanks.

ALTERNATIVE

The radiator and charge air cooler shall be of durable, corrosion-resistant construction with non-removable radiator headers.

ALTERNATIVE

For roof mounted radiators, a pressure filler will be provided in the engine compartment no more than ± 60 in. above the ground.

ALTERNATIVE

The radiator shall be made of replaceable or serviceable components (i.e., fans, mounting brackets, radiator core).

TS 10.1.1 Radiator Screen

DEFAULT

No screen in front of radiator.

ALTERNATIVE

The radiator input shall be protected by an easily cleanable screen designed to collect large debris. The radiator and charge air cooler cores shall be easily cleaned (to include engine side core surface) with standard pressure-washing equipment.

TS 10.1.2 Coolant

DEFAULT

Standard Requirement for Coolant Filtration

The engine cooling system shall 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. When replacing the water filter, only the water in the filter will be lost.

ALTERNATIVE

No requirement for coolant filtration.

ALTERNATIVE

Coolant Filtration Without Supplemental Additives

The engine cooling system shall be equipped with a properly sized water filter with a spin-on element. The filter shall not release or contain supplemental coolant additives.

TS 10.1.3 Drive Design

DEFAULT

Standard Control and Drive Design

Control and drive of the radiator and charge air cooler fan(s) shall be the Contractor's standard design.

ALTERNATIVE

Electric Fans

The bus shall be equipped with an electric fan drive bus cooling system. A screen guard must be installed on electric motor fans per SAE J1308.

TS 10.1.4 Mounting

DEFAULT

Standard Mounting Design

Mounting location of radiator and charge air cooler shall be the Contractor's standard design.

ALTERNATIVE

Higher Mounting Design

The lower edge of the radiator and charge air cooler core(s) shall be mounted at a height no less than 3 ft above street level to minimize core fouling caused by dirt, debris, leaves, etc.

TS 10.2 Charge Air Cooling

DEFAULT

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

ALTERNATIVE

The charge air radiator shall be stacked ahead of or behind the engine radiator and shall be positioned as close to the engine as possible unless integrated with the radiator.

TS 10.3 Transmission Cooling

If a transmission is present in the bus, the transmission shall be cooled by a heat exchanger sized to maintain operating fluid within the transmission manufacturer's recommended parameters of flow, pressure and temperature. Where applicable, the transmission cooling system shall be matched to the retarder and engine cooling systems to ensure that all operating fluids remain within recommended temperature limits established by each component manufacturer. Where applicable, the engine cooling system should provide coolant bypass flow to the transmission cooling system with the engine thermostats closed.

ALTERNATIVE

The transmission shall not have a cooler.

ALTERNATIVE

If a transmission is present in the bus, then the thermal management system shall ensure that the transmission remains in its manufacturer-specified operating temperature range. See Section TS 10.1 for additional requirements related to component thermal management.

TS 10.4 Hybrid Drive System Cooling

The thermal management system shall maintain hybrid system components within design operating temperature limits.

TS 11. Transmission

NOTE: Not applicable to battery electric buses.

If multiple-speed transmission is used, the transmission shall be automatic shift with torque converter, retarder and electronic controls. Gross input power, gross input torque and rated input speed shall be compatible with the propulsion system. The transmission shall be designed to operate for not less than 300,000 miles on the design operating profile without replacement or major service. The transmission should be easily removable without disturbing the engine and accessible for service.

The electronic controls shall be capable of transmitting and receiving electronic inputs and data from other drivetrain components and of broadcasting that data to other vehicle systems. Communication between electronic drivetrain components and other vehicle systems shall be made using the communications networks. Electronic controls shall be compatible with either 12 or 24 V power distribution, provide consistent shift quality, and compensate for changing conditions, such as variations in vehicle weight and engine or motor power. At a minimum, drivetrain components consisting of the motor(s), motor inverter(s), engine, transmission, retarder, ASR and anti-lock braking systems shall be powered by a dedicated and isolated ignition supply voltage to ensure that data communication among components exists when the vehicle ignition is switched to the “on” position.

The electronically controlled transmission shall have onboard diagnostic capabilities, be able to monitor functions, store and time-stamp out-of-parameter conditions in memory, and communicate faults and vital conditions to service personnel. The transmission shall contain built-in protection software to guard against severe damage. The onboard diagnostic system shall trigger a visual alarm to the driver when the electronic control unit detects a malfunction.

An electronic transmission fluid level monitoring and protection system shall be provided.

DEFAULT

A brake pedal application of 6 to 10 psi shall be required by the driver to engage forward or reverse range from the neutral position to prevent sudden acceleration of the bus from a parked position.

ALTERNATIVE

A brake pedal application of 15 to 20 psi shall be required by the driver to engage forward or reverse range from the neutral position to prevent sudden acceleration of the bus from a parked position.

DEFAULT

No Automatic Neutral Function

The transmission shall not incorporate an automatic neutral shift function.

ALTERNATIVE

Automatic Neutral Function with Manual Reengagement

The transmission shall automatically shift to neutral whenever the door brake interlock is applied or the parking brake is pulled for more than 5 minutes. The driver shall be required to first disengage the parking brake and then apply the service brake to re-engage a forward or reverse range.

ALTERNATIVE

Automatic Neutral Function with Automatic Reengagement

The transmission, when in forward direction, shall automatically shift the transmission to neutral when the vehicle registers zero road speed, engine is idle and service brakes are applied. If the status of any one or more of the three signals changes, then the transmission shall immediately and automatically resume forward mode operation.

ALTERNATIVE

Hill Holder

A vehicle hill holder function shall be integrated with an automatic or reduced engine load state function to prevent inadvertent vehicle movement while the transmission is not in forward range.

TS 12. Retarder (Transit Coach)

NOTE: Not applicable to battery or hybrid electric buses.

The powertrain shall be equipped with a retarder designed to extend brake lining service life. The application of the retarder shall cause a smooth blending of both retarder and service brake function and shall not activate the brake lights.

Actuation of ABS and/or automatic traction control (ATC) shall override the operation of the brake retarder.

DEFAULT

Brake lights shall not illuminate when the retarder is activated.

ALTERNATIVE

Brake lights shall illuminate when the retarder is activated.

DEFAULT

Standard Requirement for Retarder Activation

The retarder shall be adjustable within the limits of the powertrain and activated when the brake pedal is depressed. The Agency will work with the OEM/drive system manufacturer to determine retarder performance settings.

ALTERNATIVE

Throttle Pedal Activation of the Retarder

The retarder shall become partially engaged (approximately one-third of its total application, with a resulting deceleration of no greater than 0.077g) when the throttle pedal is completely released. Maximum retarder shall be achieved when the brake pedal is depressed prior to engagement of service brakes, with a maximum resulting deceleration of approximately 0.20g in an empty bus. The resulting decelerations specified include the effects of engine braking, wind resistance and rolling resistance.

The thermostatically controlled cooling fan shall be activated when the retarder is engaged and the coolant temperature reaches the maximum operating temperature established by the engine and transmission manufacturers.

DEFAULT

Accessible Retarder Disable Switch

The retarder disable switch shall be accessible to the seated driver.

ALTERNATIVE

Retarder Disable Switch Not Accessible

The retarder disable switch is not required to be accessible to the seated driver.

ALTERNATIVE

Disabling retarder shall be recorded for Agency data collection.

ALTERNATIVE

Unless specified by the transmission manufacturer, a retarder disable switch will not be supplied.

TS 13. Engine Brake (Commuter Coach)

The powertrain shall be equipped with an engine brake designed to extend brake lining service life. The application of the engine brake shall cause a smooth blending of both engine brake and service brake function and shall not activate the brake lights.

DEFAULT

Brake lights shall not illuminate when the retarder is activated.

ALTERNATIVE

Brake lights shall illuminate when the retarder is activated.

DEFAULT**Standard Requirement for Retarder Activation**

The retarder shall be adjustable within the limits of the powertrain and activated when the brake pedal is depressed. The Agency will work with the OEM/drive system manufacturer to determine retarder performance settings.

ALTERNATIVE**Throttle Pedal Activation of the Retarder**

The retarder shall become partially engaged (approximately one-third of its total application, with a resulting deceleration of no greater than 0.077g) when the throttle pedal is completely released. Maximum retarder shall be achieved when brake pedal is depressed prior to engagement of service brakes, with a maximum resulting deceleration of approximately 0.20g in an empty bus. The resulting decelerations specified include the effects of engine braking, wind resistance and rolling resistance.

The thermostatically controlled cooling fan shall be activated when the retarder is engaged and the coolant temperature reaches the maximum operating temperature established by the engine and transmission manufacturers.

DEFAULT**Accessible Retarder Disable Switch**

The retarder disable switch shall be accessible to the seated driver.

ALTERNATIVE**Retarder Disable Switch Not Accessible**

The retarder disable switch is not required to be accessible to the seated driver.

ALTERNATIVE

Disabling retarder shall be recorded for Agency data collection.

ALTERNATIVE

Unless specified by the transmission manufacturer, a retarder disable switch will not be supplied.

TS 14. Mounting

All electrical/electronic hardware shall be serviceable. All electrical/electronic hardware mounted in the interior of the vehicle shall be resistant to tampering from passengers.

All electrical/electronic hardware mounted on the exterior of the vehicle that is not designed to be installed in an exposed environment shall be mounted in a protective enclosure. The hardware shall be mounted in such a manner as to protect it from the environment.

All electrical/electronic hardware and its mounting shall comply with the shock and vibration requirements of SAE J1455.

TS 14.1 Service

All systems requiring routine maintenance shall be arranged for ease of access and maintenance. The Contractor shall list all special tools, fixtures or facility requirements recommended for servicing. All fillers shall be easily accessible with standard funnels, pour spouts and automatic dispensing equipment.

The propulsion system shall be arranged for ease of access and maintenance. The Contractor shall list all special tools, fixtures or facility requirements recommended for servicing. The muffler, exhaust system, air cleaner, air compressor, starter, alternator, radiator, all accessories and any other component requiring service or replacement shall be easily removable and independent of the engine and transmission removal. An engine oil pressure gauge and coolant temperature gauge shall be provided in the engine compartment. These gauges shall be easily read during service and mounted in an area where they shall not be damaged during minor or major repairs.

An air cleaner with a dry filter element and a graduated air filter restriction indicator shall be provided. The location of the air intake system shall be designed to minimize the entry of dust and debris and to maximize the life of the air filter. The engine air duct shall be designed to minimize the entry of water into the air intake system. Drainage provisions shall be included to allow any water/moisture to drain prior to entry into the air filter.

DEFAULT

Engine oil and the radiator filler caps shall be hinged to the filler neck and closed with spring pressure or positive locks to prevent leakage. All fluid fill locations shall be properly labeled with permanent metal tags to help ensure that correct fluid is added. All fillers shall be easily accessible with standard funnels, pour spouts and automatic dispensing equipment. All lubricant sumps shall be fitted with magnetic-type drain plugs or magnets in pan.

ALTERNATIVE

Unique Fluid (Lubricant) Fillers

The engine, transmission and hydraulic reservoir shall each incorporate a unique lubricant fill fitting to prevent cross-contamination of lubricant types. Fitting types shall be specified by the Agency.

The engine and transmission shall be equipped with sufficient heavy-duty fuel and oil filters for efficient operation and to protect the engine and transmission between scheduled filter changes. All filters shall be easily accessible, and the filter bases shall be plumbed to ensure correct reinstallation.

DEFAULT

No engine bypass oil filter.

ALTERNATIVE

Centrifugal, non-disposable engine bypass oil filter.

DEFAULT**Engine Oil Pressure and Coolant Temperature Display**

Engine oil pressure and coolant temperature gauges required in engine compartment.

ALTERNATIVE**Oil Pressure and Coolant Temperature Display**

No engine oil pressure and coolant temperature gauges required in engine compartment.

TS 15. Hydraulic Systems

Hydraulic system service tasks shall be minimized and scheduled no more frequently than those of other major coach systems. All elements of the hydraulic system shall be easily accessible for service or unit replacement. Critical points in the hydraulic system shall 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 when applicable. A tamperproof priority system shall prevent the loss of power steering during operation of the bus if other devices are also powered by the hydraulic system.

The hydraulic system shall operate within the allowable temperature range as specified by the lubricant manufacturer.

DEFAULT

No requirement for hydraulic system sensors.

ALTERNATIVE**Hydraulic System Sensors**

Sensors in the main hydraulic system, excluding those in the power steering system, shall indicate on the driver's onboard diagnostic panel conditions of low hydraulic fluid level.

TS 15.1 Fluid Lines

All lines shall be rigidly supported to prevent chafing damage, fatigue failures, degradation and tension strain. Lines should be sufficiently flexible to minimize mechanical loads on the components. Lines passing through a panel, frame or bulkhead shall be protected by grommets (or similar devices) that fit snugly to both the line and the perimeter of the hole that the line passes through to prevent chafing and wear. Pipes and fluid hoses shall not be bundled with or used to support electrical wire harnesses.

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

All hoses, pipes, lines and fittings shall be specified and installed per the manufacturer's recommendations.

TS 15.2 Fittings and Clamps

All clamps shall maintain a constant tension at all times, expanding and contracting with the line in response to temperature changes and aging of the line material. The lines shall be designed for use in the environment

where they are installed (for example, high-temperature resistant in the engine compartment, resistant to road salts near the road surface, and so on).

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

TS 15.3 Charge Air Piping

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

Charge air piping shall be constructed of stainless steel, aluminized steel, or anodized aluminum rated at minimum 1000 hours of salt spray according to ASTM B117, except between the air filter and turbocharger inlet, where piping may be constructed of flexible, heat-resistant material. Connections between all charge air piping sections shall be sealed with a short section of reinforced hose and secured with stainless steel constant tension clamps that provide a complete 360 deg seal.

TS 16. Radiator

If liquid cooling is used, the radiator and/or heat exchanger shall be a heavy-duty metal unit, preferably constructed with a copper core. It is preferred to be of the tube type with bolted-on upper and lower tanks and with no solder-to-coolant contact. The radiator shall be accessible for cleaning. Any radiator shall be easily removable from the bus. Aluminum brazed/soldered radiator and/or heat exchanger may be used for low-temperature coolant systems only.

ALTERNATIVE

Agency to specify location of radiator.

Radiator piping shall be stainless steel, brass tubing or painted steel rated at 1000 hours of salt spray according to ASTM B117. Where practicable, hoses shall be eliminated. Necessary hoses shall be impervious to all bus fluids. All hoses shall be secured with stainless steel clamps that provide a complete 360 deg seal. The clamps shall maintain a constant tension at all times, expanding and contracting with the hose in response to temperature changes and aging of the hose material.

TS 17. Fluid Transfer Lines

All systems requiring lubrication shall meet or exceed component manufacturer's recommendation for installation, operation and maintenance. The fluid transfer lines shall be designed and intended for use in the environment where they are installed (for example, high-temperature resistant in the engine compartment, resistant to road salts near the road surface and so on). Fluid lines shall not be the lowest point of the bus undercarriage.

TS 18. Fuel

TS 18.1 Fuel Lines

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

Manifolds connecting fuel containers shall be designed and fabricated to minimize vibration and shall be installed in protected locations to prevent line or manifold damage from unsecured objects or road debris.

Fuel hose and hose connections, where permitted, shall be made from materials resistant to corrosion and fuel and protected from fretting and high heat. Fuel hoses shall be accessible for ease of serviceability.

DEFAULT

Agency to specify fuel type.

ALTERNATIVE

Fuel of choice.

TS 18.1.1 Fuel Lines, Diesel

Fuel lines shall be capable of carrying the type of fuel specified by the Agency (i.e., up to B20 type fuel).

TS 18.1.2 Fuel Lines, CNG

Fuel lines shall comply with NFPA-52. All tubing shall be a minimum of seamless Type 304 stainless steel (ASTM A269 or equivalent). Fuel lines and fittings shall not be fabricated from cast iron, galvanized pipe, aluminum, plastic or copper alloy with content exceeding 70 percent copper. Pipe fittings and hoses shall be clear and free from cuttings, burrs or scale. Pipe thread joining material that is impervious to CNG shall be used as required. Fuel lines shall be identifiable as fuel lines only.

High-pressure CNG lines shall be pressure tested to a minimum of 125 percent of system working pressure prior to fueling. CNG, nitrogen or clean, dry air shall be used to pressure-test the lines/assembly. The bus manufacturer shall have a documented procedure for testing the high-pressure line assembly.

Fuel lines shall be securely mounted, braced and supported using “split-block” type or stainless steel P clamps; all mounting clamps shall be mounted to a rigid structure to minimize vibration and shall be protected against damage, corrosion or breakage due to strain, rubbing or wear. “Floating clamps” (not mounted to a rigid structure) shall not be permitted. Fuel lines shall not be used to secure other components (wires, air lines, etc.).

Manifolds connecting fuel containers shall be designed and fabricated to minimize vibration and shall be installed in protected locations to prevent line or manifold damage from unsecured objects or road debris.

Fuel hose connections, where permitted, shall be less than 48 in. in length, made from materials resistant to corrosion and action of natural gas, and protected from fretting and high heat, and shall be supported approximately every 12 in.

TS 18.2 Design and Construction

TS 18.2.1 Design and Construction, Diesel

Fuel Tank(s)

DEFAULT

The fuel tank(s) shall be made of corrosion-resistant steel

ALTERNATIVE

The fuel tank(s) shall be made of corrosion-resistant stainless steel. The fuel tank shall be made of sufficiently heavy gauge 300 series or ASTM A240 stainless steel.

ALTERNATIVE

The fuel tank(s) shall be made of aluminum material.

ALTERNATIVE

The fuel tank(s) shall be made of high-density cross-linked polyethylene plastic material with or without baffles.

ALTERNATIVE

Protective shield mounted fully underneath the tank(s).

Installation

The fuel tank(s) shall be securely mounted to the bus to prevent movement during bus maneuvers.

The fuel tank(s) shall be equipped with an external, hex-head drain plug. It shall be at least $\frac{3}{8}$ in. size and shall be located at the lowest point of the tank(s). The fuel tank(s) shall have an inspection plate or easily removable filler neck to permit cleaning and inspection of the tank(s) without removal from the bus. The tank(s) shall be baffled internally to prevent fuel sloshing regardless of fill level. The baffles or fuel pickup location shall ensure continuous full power operation on a 6 percent upgrade for 15 minutes starting with no more than 25 gal of fuel over the unusable amount in the tank(s). The bus shall operate at idle on a 6 percent downgrade for 30 minutes starting with no more than 10 gal of fuel over the unusable amount in the tank(s).

The materials used in mounting shall withstand the adverse effects of road salts, fuel oils and accumulation of ice and snow for the life of the bus.

Labeling

The capacity, date of manufacture, manufacturer name, location of manufacture, and certification of compliance to Federal Motor Carrier Safety Regulations shall be permanently marked on the fuel tank(s). The markings shall be readily visible and shall not be covered with an undercoating material.

Fuel Filler

The fuel filler shall be located 7 to 32 ft behind the centerline of the front door on the curbside of the bus. The filler cap shall be retained to prevent loss and shall be recessed into the body so that spilled fuel will not run onto the outside surface of the bus.

The fuel lines forward of the engine bulkhead shall be in conformance to SAE standards.

DEFAULT

OEM to designate height of fuel filler.

ALTERNATIVE

Agency to specify height of fuel filler.

DEFAULT

Dry-Break Fuel Filler

The fuel filler shall accommodate a nozzle that forms a locked and sealed connection during the refueling process to eliminate spills. Fuel shall not be allowed to flow into the tank unless the nozzle has been properly coupled, locked and sealed to the filler. With the nozzle open, fuel shall enter the tank at a fill rate of not less than 40 gal per minute of foam-free fuel without causing the nozzle to shut off before the tank is full. The nozzle shall automatically shut off when the tank is essentially full. Once disconnected, fuel shall not be allowed to flow through the nozzle at any time. Any pressure over 3 psi shall be relieved from the fuel tank automatically. An audible signal shall indicate when the tank is essentially full. The dry break system shall be compatible with the Agency's system. The fuel filler cap shall be hinged.

ALTERNATIVE

The fuel filler shall accommodate a standard fuel nozzle. The nozzle shall automatically shut off when the tank is essentially full. An audible signal shall indicate when the tank is essentially full. The fuel filler cap shall be a screw-on cap.

ALTERNATIVE

The fuel filler cap shall be hinged.

TS 18.2.2 Design and Construction, CNG

Fuel Containers/Cylinders

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

- NFPA 52, "Standard for Compressed Natural Gas (CNG) Vehicular Fuel Systems"
- FMVSS 304
- Any local standard(s) specifically intended for CNG fuel containers

The design and construction of the fuel system supplied by the OEM shall comply with federal and local regulations.

Installation

Fuel cylinders shall 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 303. In the case of a low-floor transit bus, the

placement of tanks shall 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.

The roof and area above the engine-mounted tanks shall be contained within a skeletal structure resembling a roll cage and contained within an enclosure. The enclosure shall incorporate a hinged clamshell type access. The access panels shall be designed to offer protection from weather and to be sacrificial as a means of providing an escape path to atmosphere upon rapid enclosure pressure rise. The latching method shall use quick-release captive hardware that can be demonstrated to last the life of the bus. Additional shielding shall be provided surrounding end fittings and valves as needed. Shields shall be attached to the bus structure hinged in a manner that permits one mechanic to unlatch and swing the shield open for routine inspections. As practical, electrical components shall not be located within the roof enclosure, and if unavoidable, they shall be intrinsically safe.

CNG-fueled buses shall be equipped with an active automatic gas detection system, which shall annunciate unsafe levels of methane. The automatic gas detection system shall be integrated with an onboard fire suppression system.

DEFAULT

The access panels shall not be interlocked.

ALTERNATIVE

The access panels shall also be interlocked via proximity sensors, such that, if other than in their fully closed/locked position, an interlock will prevent engine starter engagement, prevent selection of forward or reverse transmission, and shall apply the brake interlock at speeds less than 3 mph.

Labeling

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

Pressure Relief Devices (PRDs)

PRDs must be designed, constructed, manufactured and tested in accordance with ANSI/IAS PRD1 (1998), “Pressure Relief Devices for Natural Gas Vehicle (NGV) Fuel Containers” and ANSI/IAS NGV2 (1998), “Basic Requirements for Compressed Natural Gas Vehicle (NGV) Fuel Containers.” All natural gas fuel system piping, including the PRD vent line, shall be stainless steel. All PRDs must be vented to the outside.

Valves

Valves must be installed in accordance with ANSI/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 shall be located 7 to 38 ft (on a 30, 35 and 40 ft coach) behind the centerline of the front door on a side determined by the Agency. The filler cap shall be retained to prevent loss and shall be recessed into the body.

The fill and vent receptacles shall be located within an enclosure on the right side of the bus. The access door shall be sized to allow full viewing of gauges, ease of hookups and maneuver of fuel nozzle.

The fuel fill receptacle and vent receptacle attachment shall be robust and capable of routine fueling connects/disconnects without deflection or metal fatigue, and capable of withstanding mechanical loads induced by a fueling drive-away incident without attachment failure.

DEFAULT

No static ground plug shall be installed.

ALTERNATIVE

The access door interlock shall also power on the fuel level gauges/illumination when in the open position.

ALTERNATIVE

A static ground plug shall be installed near the fueling receptacle for grounding during refueling operations.

Fueling System

The CNG fueling port receptacle shall be an ANSI/AGA NGV1 or NGV2 certified receptacle as designated by the Agency. The coach shall be capable of being fueled by a nozzle determined by the Agency. The fueling port receptacle location shall be such that connection by fueling personnel can be performed without physical strain or interference. A dust cap shall be permanently “tethered” to the fueling port receptacle. The fueling port receptacle access door shall be equipped with an interlock sensor that disables the engine starting system when the access door is open, to prevent drive-aways. The interlock shall be of the type such that if the sensor fails, the coach will not start.

Fueling site characteristics such as pressure, flow rate and temperature shall be provided by the Agency.

Defueling System

The CNG defueling port shall be an NGV-3.1/CGA-12.3 certified receptacle. The CNG defueling port shall be located on the curbside of the coach, in a location compatible with the Agency’s defueling station operation. The defueling system shall incorporate the following characteristics:

- Dust cap permanently “tethered” to the defueling port.
- Device(s) to prevent inadvertent defueling. Specifications to be provided by Agency.
- Components compatible with Agency’s defueling operation.
- The piping and fittings onboard the bus shall be sized to allow the fueling station to meet the following operating parameters:

DEFAULT

Fuel system shall be sized to allow a bus with 20,000 scf on board to defuel within 2.5 hours.

ALTERNATIVE

The atmospheric-vent system shall allow a bus with 20,000 scf of onboard CNG storage to defuel to atmospheric pressure within 80 minutes.

ALTERNATIVE

Location/method of attaching CNG fuel system to earth ground.

TS 19. Emissions and Exhaust**TS 19.1 Emissions (All-Electric)**

The vehicle shall not have any EPA-regulated exhaust emissions except as noted in TS 55.1, “Auxiliary Heater.”

TS 19.2 Exhaust Emissions

The engine and related systems shall meet all applicable emission and engine design guidelines and standards.

TS 19.3 Exhaust System (HFC)

The exhaust pipe shall be of sufficient height to prevent exhaust gases and waste heat from discoloring or causing heat deformation to the bus. The entire exhaust system shall be adequately shielded to prevent heat damage to any bus component, including the exhaust after treatment compartment area. The exhaust outlet shall be designed to minimize rain, snow or water generated from high-pressure washing systems from entering into the exhaust pipe.

DEFAULT

Exhaust gases and waste heat shall be discharged from the street-side rear corner of the roof.

ALTERNATIVE

Exhaust gases and waste heat shall be discharged from the street-side under-rear bumper.

TS 19.4 Exhaust Aftertreatment

An exhaust aftertreatment system will be provided to ensure compliance to all applicable EPA regulations in effect.

TS 19.4.1 Diesel Exhaust Fluid Injection

If required by the engine manufacturer to meet NOx level requirements specified by the EPA, a DEF injection system will be provided. The DEF system will minimally include a tank, an injector, a pump, an ECM and a selective catalytic converter. The tanks shall be designed to store DEF in the operating environment described in the “Operating Environment” section.

DEFAULT

The DEF filler shall accommodate a standard nozzle. The nozzle shall automatically shut off when the tank is essentially full. The DEF filler cap shall be a screw-on cap and located curbside.

ALTERNATIVE

The DEF filler shall accommodate a nozzle that forms a locked and sealed connection during the refueling process to eliminate spills. DEF shall not be allowed to flow into the tank unless the nozzle has been properly coupled, locked and sealed to the filler. With the nozzle open, DEF shall enter the tank at a fill rate of not less than 5 gal per minute without causing the nozzle to shut off before the tank is 85 percent full. The nozzle shall automatically shut off when the tank is essentially 85 percent full. Once disconnected, fluid shall not be allowed to flow through the nozzle at any time. The filler cap shall be installed on the receiver.

DEFAULT

The DEF fluid lines shall be designed to prevent the DEF from freezing. The DEF injection system shall not be damaged from a cold soak at 10 °F (−12 °C).

ALTERNATIVE

The DEF fluid lines shall be designed with heated lines for temperatures up to −20 °F (−28 °C).

ALTERNATIVE

An audible signal shall indicate when the tank is essentially full.

TS 19.5 Particulate Aftertreatment

If required by the engine manufacturer to meet particulate level requirements specified by the EPA, a particulate trap will be provided. The particulate trap shall regenerate itself automatically if it senses clogging. Regeneration cycles and conditions will be defined by the engine manufacturer.

STRUCTURE**TS 20. General****TS 20.1 Design**

The structure of the bus shall be designed to withstand the transit service conditions typical of an urban or intercity duty cycle throughout its service life. The vehicle structural frame shall be designed to operate with minimal maintenance throughout the 12-year design operating profile. The design operating profile specified by the Agency shall be considered for this purpose.

TS 21. Altoona Testing

Prior to acceptance of the first bus, the vehicle must have completed FTA-required Altoona testing. 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 that any and all such failures will not occur shall be submitted to the Agency.

DEFAULT

If available, the Altoona Test Report shall be provided to the Agency with the Proposal submittal. If not available, then the report shall be provided prior to first acceptance of bus.

ALTERNATIVE

Altoona Test Report Provided to Agency Prior to Start of Bus Production

Prior to the start of any bus manufacturing or assembly processes, the structure of the proposed bus model shall have undergone appropriate structural testing and/or analysis, including the complete regimen of FTA-required Altoona tests. Prior to assembly of the first bus, the OEM shall provide the Agency with a completed report of Altoona testing for the proposed bus model, along with a plan of corrective action to address deficiencies, breakdowns and other issues identified during Altoona testing. The bus model tested shall match the bus model proposed for procurement, including structure, axles and drivetrain. Base model and partial Altoona test reports are acceptable when the combination of these tests adequately represents the proposed bus model.

TS 21.1 Structural Validation

DEFAULT

Baseline Structural Analysis

The structure of the bus shall have undergone appropriate structural testing and/or analysis. At minimum, appropriate structural testing and analysis shall include Altoona testing or finite element analysis (FEA).

ALTERNATIVE

Detailed Structural Analysis

The structure of the proposed bus model shall have undergone structural testing prior to assembly of the first bus. The OEM shall provide the Agency with completed reports of other structural tests as specified by the Agency.

TS 22. Distortion

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

TS 23. Resonance and Vibration

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

TS 23.1 Propulsion Compartment Bulkheads

The passenger and propulsion system compartments shall be separated by a fire-resistant bulkhead. This bulkhead shall preclude or retard propagation of a compartment fire into the passenger compartment and shall be in accordance with the Recommended Fire Safety Practices defined in FTA Docket 90A, dated Oct. 20, 1993. Only necessary openings shall be allowed in the bulkhead, and these shall be fire-resistant. Any

passageways for the climate control system air shall be separated from the engine compartment by fire-resistant material. Piping through the bulkhead shall have fire-resistant fittings sealed at the bulkhead. Wiring may pass through the bulkhead only if connectors or other means are provided to prevent or retard fire propagation through the bulkhead. Engine access panels in the bulkhead shall be fabricated of fire-resistant material and secured with fire-resistant fasteners. These panels, their fasteners and the bulkhead shall be constructed and reinforced to minimize warping of the panels during a fire that will compromise the integrity of the bulkhead.

ALTERNATIVE

If the propulsion system doesn't contain combustion operations, then a fire-resistant bulkhead is not needed.

TS 23.2 Crashworthiness (Transit Coach)

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

The bus shall withstand a 25 mph impact by a 4000 lb automobile at any side, excluding doorways, along either side of the bus and the articulated joint, if applicable, with no more than 3 in. of permanent structural deformation at seated passenger hip height. This impact shall not result in sharp edges or protrusions in the bus interior.

Exterior panels below 35 in. from ground level shall withstand a static load of 2000 lb applied perpendicular to the bus by a pad no larger than 5 sq. in. This load shall not result in deformation that prevents installation of new exterior panels to restore the original appearance of the bus.

TS 24. Corrosion

The bus flooring, sides, roof, understructure and axle suspension components shall be designed to resist corrosion or deterioration from atmospheric conditions and deicing materials for a period of 12 years or 500,000 miles, whichever comes first. It shall maintain structural integrity and nearly maintain original appearance throughout its service life, with the Agency's use of proper cleaning and neutralizing agents.

All materials that are not inherently corrosion resistant shall be protected with corrosion-resistant coatings. All joints and connections of dissimilar metals shall be corrosion resistant and shall be protected from galvanic corrosion. Representative samples of all materials and connections shall withstand a two-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.

DEFAULT

Corrosion-Resistance Requirements

All exposed surfaces and the interior surfaces of tubing and other enclosed members below the lower window line shall be corrosion resistant through application of a corrosion protection system.

ALTERNATIVE

Corrosion Resistance Requirements

All exposed surfaces and the interior surfaces of tubing and other enclosed members shall be corrosion resistant through application of a corrosion protection system.

ALTERNATIVE

Additional Corrosion Resistance Requirements

The vehicle shall be constructed using only inherently corrosion-resistant materials and fasteners such as stainless steel or composites to minimize deterioration. The structure shall not require corrosion-preventive coatings or aftertreatments, either during construction or throughout the service life of the vehicle.

TS 25. Towing

Each towing device shall withstand, without permanent deformation, tension loads up to 1.2 times the curb weight of the bus within 20 deg of the longitudinal axis of the bus. If applicable, the rear towing device(s) shall not provide a toehold for unauthorized riders. The method of attaching the towing device shall not require the removal or disconnection of front suspension or steering components. Removal of the bike rack is permitted for attachment of towing devices. The OEM shall provide a towing procedure that ensures the traction motor does not generate high voltage during towing.

DEFAULT

Shop air connectors shall be provided at the front and rear of the bus and shall be capable of supplying all pneumatic systems of the bus with externally sourced compressed air. The location of these shop air connectors shall facilitate towing operations.

ALTERNATIVE

A plug connector permanently mounted at the front of the bus shall provide for bus tail lamp, marker, stop and turn signal lamp operation as controlled from the towing vehicle. The connector shall include a spring-loaded dust- and water-resistant cap.

DEFAULT

No Provision of Glad-Hand Type Connectors for Towing

No glad-hand type connector shall be provided.

ALTERNATIVE

Provision of Glad-Hand Type Connectors for Towing

Glad-hand type connectors shall be provided at the front of the bus to allow the towing vehicle to control and operate the bus braking system during a towing operation.

DEFAULT

Lifted (Supported) Front Axle and Flat Towing Capability

The front towing devices shall allow attachment of adapters for a rigid tow bar and shall permit the lifting of the bus until the front wheels are clear off the ground in order to position the bus on the towing equipment by the front wheels. These devices shall also permit common flat towing.

ALTERNATIVE

Lifted (Unsupported) Front Axle and Flat Towing Capability

The front towing devices shall allow attachment of adapters for a rigid tow bar and shall permit the lifting and towing of the bus, at curb weight, while the front wheels are clear off the ground. These devices shall also permit common flat towing.

Two rear recovery devices/tie-downs shall 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 the bus. The method of attaching the tow bar or adapter shall require the specific approval of the Agency. Any tow bar or adapter exceeding 50 lb should have means to maneuver or allow for ease of use and application. Each towing device shall accommodate a crane hook with a 1 in. throat.

TS 26. Jacking

It shall 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 shall permit raising the bus sufficiently high to remove and reinstall a wheel and tire assembly. Jacking pads located on the axle or suspension near the wheels shall permit easy and safe jacking with the flat tire or dual set on a 6 in. high run-up block not wider than a single tire. The bus shall withstand such jacking at any one or any combination of wheel locations without permanent deformation or damage.

DEFAULT

Yellow Pads

Jacking pads shall be painted safety yellow.

ALTERNATIVE

Decals

Apply decals to identify location of jacking pads.

ALTERNATIVE

Alternate Color Pads

Jacking pad color to be specified by the Agency.

TS 27. Hoisting

The bus axles or jacking plates shall accommodate the lifting pads of a two-post (or three-post if 60 ft. articulated bus) hoist system. Jacking plates, if used as hoisting pads, shall be designed to prevent the bus

from falling off the hoist. Other pads or the bus structure shall support the bus on jack stands independent of the hoist.

The vehicle shall be capable of lifting by the wheels and, as necessary to meet tire load requirements, the proper number for wheel lifts and/or adapters must be used.

TS 28. Floor

TS 28.1 Design (Transit Coach)

The floor shall be essentially a continuous plane, except at the wheel housings and platforms. Where the floor meets the walls of the bus, as well as other vertical surfaces such as platform risers, the surface edges shall be blended with a circular section of radius not less than ¼ in. or installed in a fully sealed butt joint. Similarly, a molding or cover shall prevent debris accumulation between the floor and wheel housings. The vehicle floor in the area of the entrance and exit doors shall have a lateral slope not exceeding 2 deg to allow for drainage.

DEFAULT

Bi-Level Floor Design

The floor design shall 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 no more than 21 in. above the lower level, with equally spaced steps. An increased slope shall be allowed on the upper level, not to exceed 3.5 deg off the horizontal.

ALTERNATIVE

Sloped Floor Design

The floor of the bus shall be of a sloped low-floor design. Aft of the rear door extending to the rear settee riser, the floor may be sloped but shall not exceed 5.5 deg off the horizontal.

ALTERNATIVE

Floor Drain

A floor drain of noncorrosive materials shall be provided on the bus behind the front, curbside wheelhouse near the wall to help drain any water that may accumulate due to ice, snow, rain, etc. The drain pipe shall be approximately 1½ in. in diameter and shall extend no more than 5 in. below the floor. The drain pipe shall be fitted with a rubber drain spout to minimize or prevent air drafts to the interior of the bus. The strainer shall be firmly retained but also removable to allow flushing of any accumulated debris.

TS 28.2 Design (Commuter Coach)

The floor shall be essentially a continuous plane, except at the wheel housings and platforms. Where the floor meets the walls of the bus, as well as other vertical surfaces such as platform risers, the surface edges shall be blended with a circular section of radius not less than ¼ in. or installed in a fully sealed butt joint. Similarly, a molding or cover shall prevent debris accumulation between the floor and wheel housings. The vehicle floor in the area of the entrance and exit doors shall have a lateral slope not exceeding 2 deg to allow for drainage.

The aisle of the bus shall be a sloped floor design and shall not exceed 5.5 deg off the horizontal or include one step not to exceed entrance door step heights. The floor shall be a continuous plane over the wheel housings. Where the floor meets the walls of the bus, as well as other vertical surfaces such

as platform risers, the surface edges shall be blended with a circular section of radius not less than ¼ in. or installed in a fully sealed butt joint.

TS 28.3 Design (Articulated Transit Coach)

The floor shall be essentially a continuous plane, except at the wheel housings and platforms. Where the floor meets the walls of the bus, as well as other vertical surfaces such as platform risers, the surface edges shall be blended with a circular section of radius not less than ¼ in. or installed in a fully sealed butt joint. Similarly, a molding or cover shall prevent debris accumulation between the floor and wheel housings. The vehicle floor in the area of the entrance and exit doors shall have a lateral slope not exceeding 2 deg to allow for drainage.

DEFAULT

Sloped Floor

Slope ahead aft the articulated joint shall not exceed 5.5 percent.

ALTERNATIVE

Floor Drain

A floor drain of noncorrosive materials shall be provided on the bus behind the front, curbside wheelhouse near the wall to help drain any water that may accumulate due to ice, snow, rain, etc. The drain pipe shall be approximately 1½ in. in diameter and shall extend no more than 5 in. below the floor. The drain pipe shall be fitted with a rubber drain spout to minimize or prevent air drafts to the interior of the bus. The strainer shall be firmly retained but also removable to allow flushing of any accumulated debris.

TS 28.4 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 shall not be used to retain the floor, and all floor fasteners shall be serviceable from one side only. Any adhesives, bolts or screws used to secure the floor to the structure shall last and remain effective throughout the life of the coach. Tapping plates, if used for the floor fasteners, shall be no less than the same thickness as a standard nut, and all floor fasteners shall be secured and protected from corrosion for the service life of the bus.

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 0.60 in. from the normal plane. The floor shall withstand the application of 2.5 times gross load weight without permanent detrimental deformation. The floor, with coverings applied, shall withstand a static load of at least 150 lb applied through the flat end of a ½ in. diameter rod, with 1/32 in. radius, without permanent visible deformation.

TS 28.5 Construction

The floor shall consist of the subfloor and the floor covering that will last the life of the bus. The floor as assembled, including the sealer, attachments and covering, shall be waterproof, non-hygroscopic and resistant to mold growth. The subfloor shall be resistant to the effects of moisture, including decay (dry rot). It shall be impervious to wood-destroying insects such as termites.

DEFAULT**Pressure-Preserved Plywood Panel**

Plywood shall 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 shall be of a thickness adequate to support design loads, shall be manufactured with exterior glue, shall 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 shall be of a grade manufactured with a solid face and back. Plywood shall be installed with the highest grade, veneer side up. Plywood shall be pressure-treated with a preservative chemical and process such as alkaline copper quaternary (ACQ) that prevents decay and damage by insects. Preservative treatments shall use no EPA-listed hazardous chemicals. The concentration of preservative chemicals shall 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 shall have a moisture content at or below 15 percent.

ALTERNATIVE

Composite flooring.

ALTERNATIVE

Flooring with manufactured noise-reduction characteristics.

TS 28.6 Construction (Commuter Coach)

The floor shall consist of the subfloor and the floor covering that will last the life of the bus. The floor as assembled, including the sealer, attachments and covering, shall be waterproof, non-hygroscopic and resistant to mold growth. The subfloor shall be resistant to the effects of moisture, including decay (dry rot). It shall be impervious to wood-destroying insects such as termites.

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 in. (10 mm) from the normal plane. The floor shall withstand the application of 3.0 times gross load weight without permanent detrimental deformation.

TS 29. Platforms**TS 29.1 Driver’s Area**

The covering of platform surfaces and risers, except where otherwise indicated, shall be the same material as specified for floor covering. Trim shall be provided along top edges of platforms unless integral nosing is provided.

DEFAULT

No specific trim material specified.

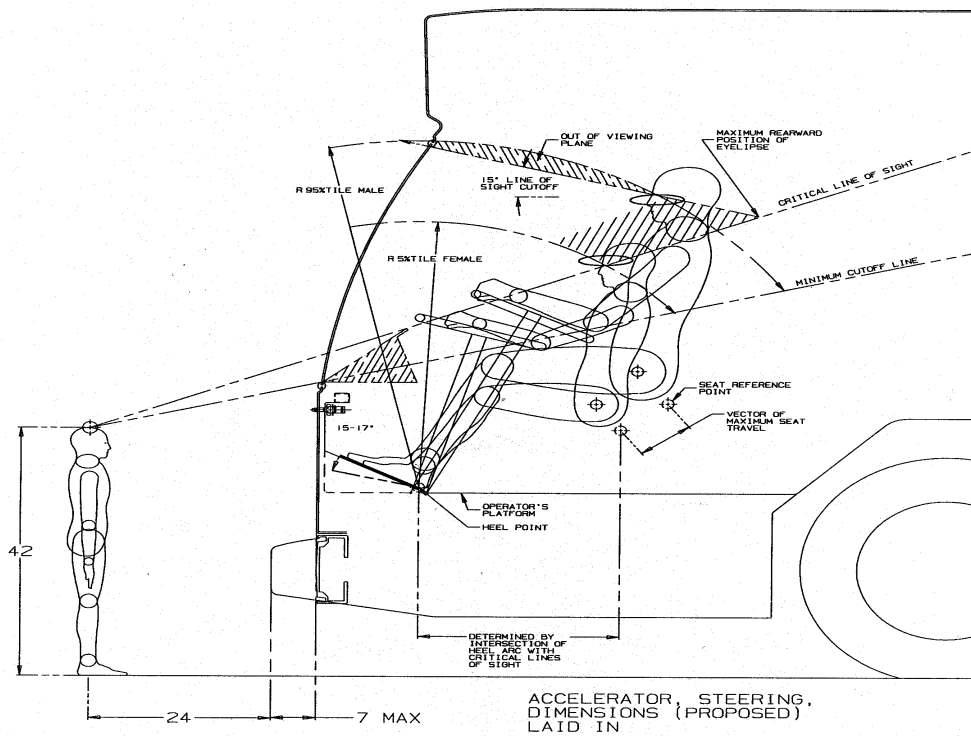
ALTERNATIVE

Specific trim required to be specified by the Agency.

TS 29.2 Driver's Platform

The driver's platform shall be of a height such that, in a seated position, the driver can see an object located at an elevation of 42 in. above the road surface, 24 in. from the leading edge of the bumper or bike rack. Notwithstanding this requirement, the platform height shall not position the driver such that the driver's vertical upward view is less than 15 deg. A warning decal or sign shall be provided to alert the driver to the change in floor level. **Figure 2** illustrates a means by which the platform height can be determined, using the critical line of sight.

FIGURE 2
Determining Platform Height



TS 29.3 Farebox

Farebox placement should minimize impact to passenger access and minimize interference with the driver's line of sight.

DEFAULT

Driver Interface Required; Platform Needed to Bring Height to Driver Access

If the driver's platform is higher than 12 in., then the farebox is to be mounted on a platform of suitable height to provide accessibility for the driver without compromising passengers' access.

ALTERNATIVE

No interface, no platform.

ALTERNATIVE**Stanchions**

Stanchions shall be located around the farebox.

TS 29.4 Rear Step Area to Rear Area (Transit Coach)

If the vehicle is of a bi-level floor design, then a rear step area shall be provided along the center aisle of the bus to facilitate passenger traffic between the upper and lower floor levels. This step area shall be cut into the rear platform and shall be approximately the aisle width, a minimum 12 in. deep and approximately half the height of the upper level relative to the lower level. The horizontal surface of this platform shall be covered with skid-resistant material with a visually contrasting nosing and shall be sloped slightly for drainage. A warning decal or sign shall be provided at the immediate platform area to alert passengers to the change in floor level.

TS 30. Wheel Housing**TS 30.1 Design and Construction**

Sufficient clearance and air circulation shall be provided around the tires, wheels and brakes to preclude overheating when the bus is operating on the design operating profile. Wheel housings shall be constructed of corrosion-resistant and fire-resistant material.

Wheel housings, as installed and trimmed, shall withstand impacts of a 2 in. steel ball with at least 200 ft-lb of energy without penetration.

TS 30.2 Design and Construction (Transit Coach)

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

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

The finish of the front wheel housings shall be scratch-resistant and complement interior finishes of the bus to minimize the visual impact of the wheel housing. If fiberglass wheel housings are provided, then they shall be color-impregnated to match interior finishes. The lower portion extending to approximately 10 to 12 in. above the floor shall be equipped with scuff-resistant coating or stainless steel trim.

Wheel housings not equipped with seats or equipment enclosure shall have a horizontal assist mounted on the top portion of the housing no more than 4 in. higher than the wheel well housing.

Where wheel housings are equipped with seats or equipment enclosures, all fasteners passing through to the outside of the coach shall be fully sealed to prevent the intrusion of water into the coach.

DEFAULT

No provision shall be made to chain buses.

ALTERNATIVE

The wheel housing shall be designed to have the ability to chain buses.

TS 30.3 Articulated Joint (Articulated Transit Coach)

60 ft articulated buses shall be equipped with a turntable that permanently joins the lead unit and trailing unit sections, allows relative motion between the sections about the pitch and yaw axes, and allows a small amount of relative roll between the sections without damage. A rotating turntable connection shall be provided between the lead unit and trailing unit to serve as a floor and to allow passenger access between the sections of the bus under all operating conditions. The turntable design shall provide for all horizontal and vertical turns that the bus is capable of making without introducing discontinuities between the turntable and adjacent vehicle floors.

The structures and finishes in the interconnecting section shall be designed to prevent passenger injury under all conditions. The turntable floor cover plate shall be supported so that there will be no honing of the floor plate, making it sharp at the outer edge. The gap between the floor and the turntable shall be minimized in order to prevent a tripping hazard. It shall be designed for ease of access for inspection and repairs of all devices that are part of it or devices that pass through the turntable area. Underfloor turntable components shall be easily accessible. Floor plates must be easily lifted and secured in the open position by one person for inspection and repairs. Turntable seats shall be quickly and easily removable by one person. The underfloor turntable area shall be completely enclosed by the bellows and bulkheads on the lead and trailing units to prevent drafts into the passenger compartment. The area between the turntable floor and the bellows shall be closed to prevent collection of trash in the bottom of the bellows. Closeouts shall be attached with removable fasteners. An access hatch shall be provided for routine maintenance (i.e., greasing, adjusting potentiometer, maintenance items).

An anti-jackknife joint shall be provided. This joint—by sensing vehicle speed, relative angle between the lead and trailing sections, throttle and braking actions, and any other necessary inputs—will control the degree of stiffness in the joint to ensure that the bus does not jackknife or operate in a dangerous or unsafe condition. The Agency shall approve the anti-jackknife joint. The interconnecting structure shall be designed to prevent separation of the lead and trailing units as a result of a road accident with a commercial or private vehicle. A means shall be provided so that the driver can override the control or recover from the situation. The bus shall be equipped with a reverse speed governor that shall apply the brake and accelerator interlocks when the bus speed in reverse gear exceeds 1.5 mph, but the bus shall have sufficient power in reverse to back out of wheel locator depressions at a floor hoist. The proposed configuration of these devices and the reverse-speed requirements shall be submitted for approval of the Agency.

Easy access shall be provided to overhead lines (electric, air, hydraulic, refrigerant) passing through the turntable. Hydraulic fittings shall be suitable for the given application and must be compatible with other fittings throughout the vehicle.

In order to prevent damage to the structure and electrical, air, hydraulic and refrigerant lines when the vertical or horizontal bending capabilities of the hinge are exceeded, the bus shall be provided with appropriate

warning devices, brake interlocks and positive mechanical stops. These devices shall operate when the maximum bend angle is being approached in either plane.

TS 30.4 Raceway (Articulated Transit Coach)

A raceway shall be provided through the turntable area to accommodate to maximum deflection of the turntable. The raceway shall prevent chafing, binding, rubbing, crimping or leakage of all hydraulic, air, fuel and system support lines, as well as all electrical and electronic cabling through or to the turntable area. Lines shall be secured, separated and labeled at the lead and trailing unit bulkheads. Separation shall be maintained on the flexible portion of all lines through the use of a raceway. All electrical terminations and hose fittings shall be easily visible and easily tightened or removed without removing any other component. Lines, routing, securement and labeling shall be approved by the Agency.

Bulkhead fitting shall be provided for all lines: air, coolant, electrical, hydraulic and AC at both ends of the raceway. The bulkhead area shall be easily accessible for servicing.

TS 30.5 Bellows

Replacement fabric type bellows with draft-free, no-sag bottom closure and water drains shall be provided between the lead and trailing sections to seal the bus interior and keep it free of water, dirt and drafts. Bellows hardware shall be corrosion resistant, and the underfloor area of the bellows shall be easy to clean when necessary. The passageway between the lead unit and trailing unit shall have an inside cross-section that is as nearly equal as possible to the inside cross-section of the bus bodies, with no tripping or pinching hazards created by the turntable cross-section or closeouts. The bellows shall be durable, and its supporting structure and stiffeners shall support the bellows material in a neat, sag-free manner. The Contractor shall supply information on the actual service life achieved by the type of bellows being proposed. A sample of the bellows and attaching hardware may be requested for evaluation at the Agency's option. Bellows shall be approved by the Agency.

DEFAULT

No bellows liner required.

ALTERNATIVE

Bellows liner shall be provided.

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TS 31. Suspension

TS 31.1 General Requirements

The front, rear and mid (if articulated) suspensions shall be pneumatic type. The basic suspension system shall last the service life of the bus without major overhaul or replacement. Adjustment points shall be minimized and shall not be subject to a loss of adjustment in service. Routine adjustments shall be easily accomplished by limiting the removal or disconnecting the components.

TS 31.2 Alignment

All axles should be properly aligned so the vehicle tracks accurately within the size and geometry of the vehicle.

TS 31.3 Springs and Shock Absorbers

TS 31.3.1 Suspension Travel

The suspension system shall permit a minimum wheel travel of 2.75 in. jounce-upward travel of a wheel when the bus hits a bump (higher than street surface), and 2.75 in. rebound-downward travel when the bus comes off a bump and the wheels fall relative to the body. 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. Suspensions shall 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 ½ in. at any point from the height required. The safe operation of a bus cannot be impacted by ride height up to 1 in. from design normal ride height.

TS 31.3.2 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 three cycles or fewer after hitting road perturbations. The shock absorber bushing shall be made of elastomeric material that will last the life of the shock absorber. The damper shall incorporate a secondary hydraulic rebound stop.

TS 31.3.3 Lubrication

DEFAULT

Standard Grease Fittings

All elements of steering, suspension and drive systems requiring scheduled lubrication shall be provided with grease fittings conforming to SAE J534. These fittings shall be located for ease of inspection and shall be accessible with a standard grease gun from a pit or with the bus on a hoist. Each element requiring lubrication shall have its own grease fitting with a relief path. The lubricant specified shall be standard for all elements on the bus serviced by standard fittings and shall be required no fewer than every 6000 miles.

ALTERNATIVE

Auto-lube.

ALTERNATIVE

Remote grease manifold.

TS 31.3.4 Kneeling

DEFAULT

A kneeling system shall lower the entrance(s) of the bus a minimum of 2 in. during loading or unloading operations regardless of load up to GVWR, measured at the longitudinal centerline of the entrance door(s) by the driver. The kneeling control shall provide the following functions:

- Downward control must be held to allow downward kneeling movement.
- Release of the control during downward movement must completely stop the lowering motion and hold the height of the bus at that position.
- Upward control actuation must allow the bus to return to normal floor height without the driver having to hold the control.

The brake and throttle interlock shall prevent movement when the bus is kneeled. The bus shall kneel at a maximum rate of 1.25 in. per second at essentially a constant rate. After kneeling, the bus shall rise within 4 seconds to a height permitting the bus to resume service and shall rise to the correct operating height within 7 seconds regardless of load up to GVWR. During the lowering and raising operation, the maximum vertical acceleration shall not exceed 0.2g, and the jerk shall not exceed 0.3g per second.

An indicator visible to the driver shall 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, a minimum 2.5 in. diameter amber lens, shall be provided that will blink when the kneel feature is activated. Kneeling shall not be operational while the wheelchair ramp is deployed or in operation.

ALTERNATIVE

Allow upward kneel actuation with ramp deployed.

ALTERNATIVE

Full right-side kneel capabilities.

ALTERNATIVE

Full four-wheel kneel capabilities.

TS 32. Wheels and Tires

TS 32.1 Wheels

All wheels shall be interchangeable except for the middle axle of an artic where a super single tire size is used and shall be removable without a puller. Wheels shall be compatible with tires in size and load-carrying capacity. Front wheels and tires shall be balanced as an assembly per SAE J1986.

DEFAULT

Painted Steel

Wheels and rims shall be hub-piloted with powder-coated steel (maximum 3.5 mil) and shall resist rim flange wear.

ALTERNATIVE

Brushed aluminum.

ALTERNATIVE

One-sided polished aluminum.

ALTERNATIVE

Two-sided polished aluminum rims.

DEFAULT

No tire-pressure monitoring system.

ALTERNATIVE

Tire-pressure monitoring system.

DEFAULT

Standard non-locking lug nut.

ALTERNATIVE

Three-piece captive locking lug nut.

TS 32.2 Tires

Tires shall 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 shall not exceed the tire supplier's rating.

DEFAULT

The tires shall be provided under a lease agreement between the Agency and the tire supplier and shall be the appropriate size and load range for the vehicle.

ALTERNATIVE

The tires shall be supplied by the Contractor.

ALTERNATIVE

Super single tire should be used. The Agency should designate preferences for the tire size.

TS 33. Steering

DEFAULT

Hydraulically assisted steering shall be provided. The steering gear shall be an integral type with the number and length of flexible lines minimized or eliminated. Engine-driven hydraulic pump shall be provided for power steering.

ALTERNATIVE

On battery-electric and hybrid coaches capable of supporting it, electrically driven hydraulic power steering may be used.

ALTERNATIVE

Electrically assisted steering shall be provided to reduce steering effort.

TS 33.1 Steering Axle (Transit Coach)

DEFAULT

Solid Beam Axle and Grease-Type Front Bearings and Seals

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

ALTERNATIVE

Oiled-Type Front Bearings

The front axle shall be non-driving with a load rating sufficient for the bus loaded to GVWR and shall be equipped with sealed, oiled-type front wheel bearings.

ALTERNATIVE

Independent Suspension Axle

The front axle shall be of an independent suspension design, non-driving, with a load rating sufficient for the bus loaded to GVWR and shall be equipped with sealed, oiled-type front wheel bearings.

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

The steering geometry of the outside (front lock) wheel shall be within 2 deg of true Ackerman up to 50 percent lock measured at the inside (back lock) wheel. The steering geometry shall be within 3 deg of true Ackerman for the remaining 100 percent lock measured at the inside (back lock) wheel.

TS 33.2 Steering and Tag Axles (Commuter Coach)

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

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

The steering geometry of the outside (front lock) wheel shall be within 2 deg of true Ackerman up to 50 percent lock measured at the inside (back lock) wheel. The steering geometry shall be within 3 deg of true Ackerman for the remaining 100 percent lock measured at the inside (back lock) wheel.

TS 33.3 Steering Wheel

TS 33.3.1 Turning Effort

Steering effort shall 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.

Under these conditions, the torque required to turn the steering wheel 10 deg shall be no less than 5 ft-lb and no more than 10 ft-lb. Steering torque may increase to 70 ft-lb when the wheels are approaching the steering stops, as the relief valve activates.

Power steering failure shall not result in loss of steering control. With the bus in operation, the steering effort shall not exceed 55 lb at the steering wheel rim, and perceived free play in the steering system shall not materially increase as a result of power assist failure. Gearing shall require no more than seven turns of the steering wheel lock-to-lock.

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.

TS 33.3.2 Steering Wheel, General

The steering wheel diameter shall be approximately 18 to 20 in.; the rim diameter shall be $\frac{7}{8}$ to $1\frac{1}{4}$ in. and shaped for firm grip with comfort for long periods of time.

Steering wheel spokes and wheel thickness shall ensure visibility of the dashboard so that vital instrumentation is clearly visible at center neutral position (within the range of a 95th-percentile male, as described in SAE 1050a, Sections 4.2.2 and 4.2.3). Placement of steering column must be as far forward as possible, but either in line with or behind the instrument cluster.

TS 33.3.3 Steering Column Tilt

The steering column shall have full tilt capability with an adjustment range of no less than 40 deg from the vertical and easily adjustable by the driver and shall be accessible by a 5th percentile female and 95th percentile male. Driver's knees shall not contact wheel spokes at any adjustment.

ALTERNATIVE

Steering Column Tilt

The steering column shall have two separate tilt locations, one near the top of the column and one at the universal joint below the floor where the column is connected to the right angle steering box; tilt and telescope are controlled by levers on the left side of the column.

TS 33.3.4 Steering Wheel Telescopic Adjustment

The steering wheel shall have full telescoping capability and have a minimum telescopic range of 2 in. and a minimum low-end adjustment of 29 in., measured from the top of the steering wheel rim in the horizontal position to the cab floor at the heel point.

TABLE 4

Steering Wheel Height¹ Relative to Angle of Slope

| At Minimum Telescopic Height Adjustment (29 in.) | | At Maximum Telescopic Height Adjustment (5 in.) | |
|--|----------|---|----------|
| Angle of Slope | Height | Angle of Slope | Height |
| 0 deg | 29 in. | 0 deg | 34 in. |
| 15 deg | 26.2 in. | 15 deg | 31.2 in. |
| 25 deg | 24.6 in. | 25 deg | 29.6 in. |
| 35 deg | 22.5 in. | 35 deg | 27.5 in. |

1. Measured from bottom portion closest to driver.

TS 34. Drive Axle

The bus shall be driven by a heavy-duty axle with a load rating sufficient for the bus loaded to GVWR. The drive axle shall have a design life to operate for not less than 300,000 miles on the design operating profile without replacement or major repairs. The lubricant drain plug shall be magnetic type. If a planetary gear design is employed, then the oil level in the planetary gears shall be easily checked through the plug or sight gauge. The axle and driveshaft components shall be rated for both propulsion and retardation modes with respect to duty cycle. If a planetary gear design is employed, then the planetary gear drain plugs shall also be magnetic.

NOTE: The retardation duty cycle can be more aggressive than propulsion.

The drive shaft shall be guarded to prevent hitting any critical systems, including brake lines, coach floor or the ground, in the event of a tube or universal joint failure.

TS 34.1 Non-Drive Axle

The non-drive axle is the drive axle without the drive gear with a load rating sufficient for the load to GVWR.

TS 35. Tag Axles (Commuter Coach)

A tag axle shall be located behind the drive axle. The tag axle shall 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 lb. With full passenger seating capacity, load on any axle shall not exceed 22,400 lb. Combined load capacity weight on the drive and tag axles shall not exceed 36,500 lb. 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.

ALTERNATIVE

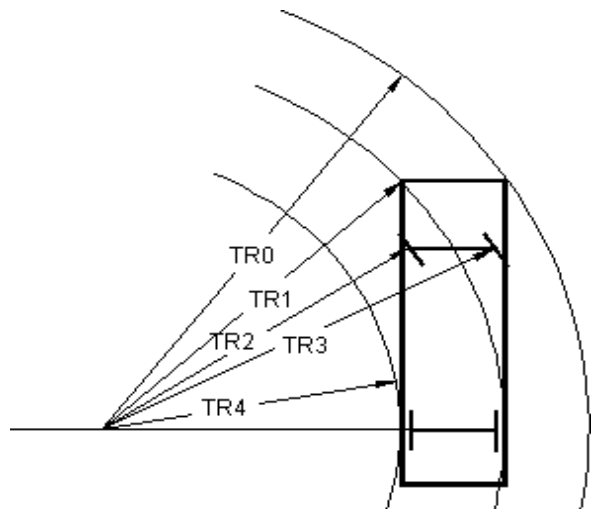
Steerable tag axle will be provided.

TS 36. Turning Radius

TABLE 5
Maximum Turning Radius

| Bus Length (approximate) | Maximum Turning Radius (see Figure 3) | Agency Requirement |
|--------------------------|--|--------------------|
| 30 ft | 31 ft (TR0) | |
| 35 ft | 39 ft (TR0) | |
| 40 ft | 44 ft (TR0) | |
| 45 ft | 49 ft (TR0) | |
| 60 ft | 44.5 ft (outside front axle, TR0) 17 ft (inside rearmost axle, TR4) | |

FIGURE 3
Turning Radius



TS 37. Brakes

TS 37.1 Service Brake

DEFAULT

Brakes shall be self-adjusting. Brake wear indicators (visible brake sensors) shall be provided on exposed push rods.

ALTERNATIVE

Visible stroke indicators may be combined with electronic brake monitoring system and vehicle brake warning system to notify driver and maintenance personnel of unsafe brake conditions.

TS 37.1.1 Regenerative Braking (Electric or Hybrid)

In addition to traditional mechanical friction service braking, the bus shall be equipped with regenerative braking designed to improve energy efficiency and extend brake lining service life. The application of regenerative braking shall cause a smooth blending of both regenerative and service brake function. Actuation of ABS and/or automatic traction control (ATC) shall override the operation of the regenerative brake. To protect the ESS system from over-charge, regenerative braking should be limited to above a certain SOC which is defined by the manufacturer; a written document and training should be provided to the Agency.

TS 37.2 Actuation

DEFAULT

Service brakes shall be controlled and actuated by a compressed air system. Force to activate the brake pedal control shall be an essentially linear function of the bus deceleration rate and shall not exceed 75 lb at a point 7 in. above the heel point of the pedal to achieve maximum braking. The heel point is the location of the driver’s heel when his or her foot is rested flat on the pedal and the heel is touching the floor or heel pad of the pedal. The ECU for the ABS system shall be protected, yet in an accessible location to allow for ease of service.

The total braking effort shall be distributed among all wheels in such a ratio as to ensure equal friction material wear rate at all wheel locations. The manufacturer shall demonstrate compliance by providing a copy of a thermodynamic brake balance test upon request.

ALTERNATIVE

Air or hydraulic brakes.

DEFAULT

No automatic traction control.

ALTERNATIVE

Microprocessor-controlled ATC shall be provided.

ALTERNATIVE

The ABS/EBC controller must support EBC1 (PGN 61441) “Brake Pedal Position” (SPN 521) to support and enhance fuel savings technologies.

TS 37.3 Friction Material

The brake linings shall 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 a chamfer indicating the thickness at which replacement becomes necessary shall be provided on each brake lining. The complete brake lining wear indicator shall be clearly visible from the hoist or pit without removing backing plates.

DEFAULT

No remote brake wear indicator shall be required.

ALTERNATIVE

Remote brake wear indicator shall be provided.

TS 37.4 Hubs and Drums/Discs

Replaceable wheel bearing seals shall run on replaceable wear surfaces or be of an integral wear surface sealed design. Wheel bearing and hub seals and unitized hub assemblies shall not leak or weep lubricant when operating on the design operating profile for the duration of the initial manufacturer's warranty.

DEFAULT

Drum Brakes

The bus shall be equipped with brake drums. Brake drums shall allow machining for oversized linings per manufacturer's specifications.

ALTERNATIVE

Disc Brakes on Front Axle

The bus shall be equipped with brake drums on the rear axle and disc brakes on the front axle. The brake drums shall allow machining for oversize linings per manufacturer's specifications, and brake discs shall allow machining of each side of the disc to obtain smooth surfaces per manufacturer's specifications.

ALTERNATIVE

Disc Brakes on All Axles

The bus shall be equipped with disc brakes on all axles, and the brake discs shall allow machining of each side of the disc to obtain smooth surfaces per manufacturer's specifications.

The brake system material and design shall be selected to absorb and dissipate heat quickly so that the heat generated during braking operation does not glaze the brake linings.

TS 37.5 Hubs and Drums (Commuter Coach)

Replaceable wheel bearing seals shall run on replaceable wear surfaces or be of an integral wear surface sealed design. Wheel bearing and hub seals and unitized hub assemblies shall not leak or weep lubricant when operating on the design operating profile for the duration of the initial manufacturer's warranty.

The bus shall be equipped with disc brakes on all axles, and the brake discs shall allow machining of each side of the disc to obtain smooth surfaces per manufacturer's specifications.

TS 37.6 Parking/Emergency Brake

DEFAULT

Air Brakes

The parking brake shall 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.

ALTERNATIVE

Emergency Brake

An emergency brake release shall be provided to release the brakes in the event of automatic emergency brake application. The driver shall 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 driver releases the emergency brake release valve, the brakes shall engage to hold the bus in place. Air to the emergency brake release system shall be provided by a dedicated emergency air tank.

ALTERNATIVE

Hydraulic Brakes

If the bus is equipped with hydraulic brakes, then the braking system must comply with FMVSS 105, including both service and parking brake features.

TS 38. Interlocks

TS 38.1 Passenger Door Interlocks

To prevent opening mid and rear passenger doors while the bus is in motion, a speed sensor shall be integrated with the door controls to prevent the mid/rear doors from being enabled or opened unless the bus speed is less than 2 mph.

To preclude movement of the bus, an accelerator interlock shall lock the accelerator in the closed position, and a brake interlock shall engage the service brake system to stop movement of the bus when the driver's door control is moved to a mid/rear door enable or open position, or a mid or rear door panel is opened more than 3 in. from the fully closed position (as measured at the leading edge of the door panel). The interlock engagement shall bring the bus to a smooth stop and shall be capable of holding a fully loaded bus on a 6 percent grade with the transmission in gear until the interlocks are released. These interlock functions shall be active whenever the vehicle master run switch is in any run position.

All door systems employing brake and accelerator interlocks shall be supplied with supporting failure mode effects analysis (FEMA) documentation, which demonstrates that failure modes are of a failsafe type, thereby never allowing the possibility of release of interlock while an interlocked door is in an unsecured condition, unless the door master switch has been actuated to intentionally release the interlocks.

DEFAULT

Non-adjustable brake interlock regulator.

ALTERNATIVE

Braking effort adjustable with hand tools.

DEFAULT

No requirements for accelerator and brake interlocks whenever front doors are open.

ALTERNATIVE**Requiring Accelerator Interlock Whenever Front Doors Are Open**

An accelerator interlock shall lock the accelerator in the closed position, and a brake interlock shall engage the service brake system to stop movement of the bus whenever front doors are open.

TS 39. Pneumatic System

TS 39.1 General

The bus air system shall operate the air-powered accessories and the braking system with reserve capacity. New buses shall not leak down more than 5 psi over a 15-minute period of time as indicated on the dash gauge.

Provision shall be made to apply shop air to the bus air systems. A quick disconnect fitting shall be easily accessible and located in the engine compartment and near the front bumper area for towing. Retained caps shall be installed to protect fitting against dirt and moisture when not in use. Air for the compressor shall be filtered. The air system shall be protected per FMVSS 121.

TS 39.2 Air Compressor

DEFAULT

The engine-driven air compressor shall be sized to charge the air system from 40 psi to the governor cut-off pressure in less than 4 minutes while not exceeding the fast idle speed setting of the engine.

ALTERNATIVE

The electrically driven air compressor shall be sized to charge the air system from 40 psi to the governor cut-off pressure in less than 4 minutes while not exceeding the fast idle speed setting of the engine.

TS 39.3 Air Lines and Fittings

Air lines, except necessary flexible lines, shall conform to the installation and material requirements of SAE J1149 for copper tubing with standard, brass, flared or ball sleeve fittings, or SAE J844 for nylon tubing if not subject to temperatures over 200 °F. The air on the delivery side of the compressor where it enters

nylon housing shall not be above the maximum limits as stated in SAE J844. Nylon tubing shall be installed in accordance with the following color-coding standards:

DEFAULT

- **Green:** Indicates primary brakes and supply.
- **Red:** Indicates secondary brakes.
- **Brown:** Indicates parking brake.
- **Yellow:** Indicates compressor governor signal.
- **Black:** Indicates accessories.

ALTERNATIVE

Contractor to designate color coding.

Line supports shall prevent movement, flexing, tension, strain and vibration. Copper lines shall 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 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 at no more than 5 ft intervals. Nylon lines may be grouped and shall be supported at 30 in. intervals or less.

The compressor discharge line between power plant and body-mounted equipment shall 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 shall be flexible Teflon hose with a braided stainless steel jacket. End fittings shall be standard SAE or JIC brass or steel, flanged, 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 bus except for the supporting grommets. Flexible lines shall be supported at 2 ft intervals or less.

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

TS 39.4 Air Reservoirs

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

TS 39.5 Air System Dryer

An air dryer shall prevent accumulation of moisture and oil in the air system. The air dryer system shall include one or more replaceable desiccant cartridges.

DEFAULT

No requirements for additional oil separator provision.

ALTERNATIVE

Requirement for Additional Oil Separator Provision

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

ALTERNATIVE

The air system shall be equipped with an air dryer located before the No. 1 air tank and as far from the compressor as possible to allow air to cool prior to entering the air dryer.

ELECTRICAL, ELECTRONIC AND DATA COMMUNICATION SYSTEMS

TS 40. Overview

The electrical system will consist of vehicle battery systems and components that generate, distribute and store power throughout the vehicle (e.g., generator, voltage regulator, wiring, relays and connectors).

Electronic devices are individual systems and components that process and store data, integrate electronic information or perform other specific functions.

The data communication system consists of the bidirectional communications networks that electronic devices use to share data with other electronic devices and systems. Communication networks are essential to integrating electronic functions, both onboard the vehicle and off.

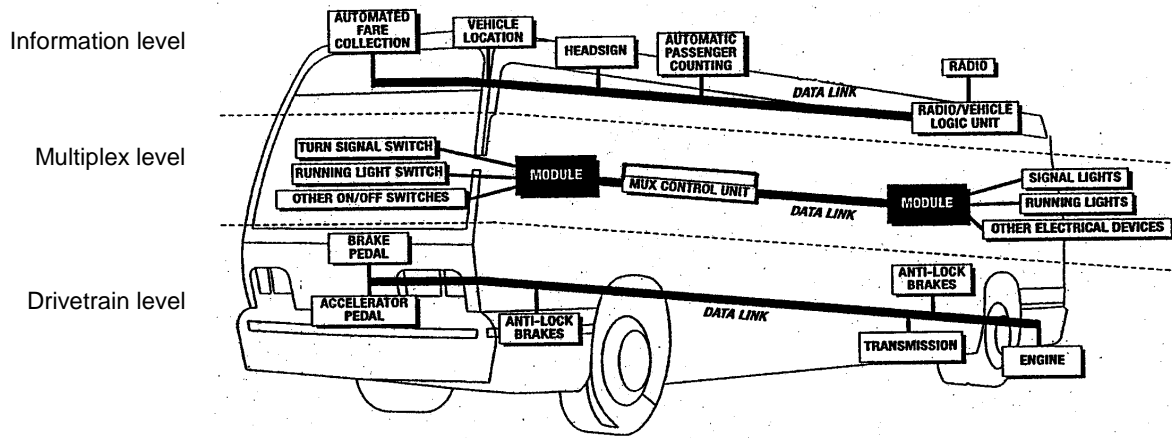
Information level systems that require vehicle information for their operations or provide information shall adhere to J1939 data standard.

Data communications systems are divided into three level store the use of multiple data networks (see **Figure 4**):

- **Powertrain level:** Components related to the powertrain, including the propulsion system components (engine, transmission and hybrid units) and anti-lock braking system (ABS), which may include traction control. At a minimum, powertrain components consisting of the engine, transmission, retarder, ASR and anti-lock braking systems shall be powered by a dedicated and isolated ignition supply voltage to ensure data communication between components exists when the vehicle ignition is switched to the “on” position.
- **Information level:** Components whose primary function is the collection, control or display of data that is not necessary to the safe drivability of the vehicle (i.e., the vehicle will continue to operate when those functions are inoperable). These components typically consist of those required for automatic vehicle location (AVL) systems, destination signs, fareboxes, passenger counters, radio systems, automated voice and signage systems, video surveillance and similar components.
- **Multiplex level:** Electrical or electronic devices controlled through input/output signals such as discrete, analog and serial data information (i.e., on/off switch inputs, relay or relay control outputs). Multiplexing is used to control components not typically found on the drivetrain or information levels, such as lights; wheelchair lifts; doors; heating, ventilation and air conditioning (HVAC) systems (if applicable); and gateway devices.

FIGURE 4

Data Communications Systems Levels



TS 40.1 Modular Design

Design of the electrical, electronic and data communication systems shall be modular so that each electronic device, apparatus panel or wiring bundle is easily separable from its interconnect by means of connectors.

TS 41. Environmental and Mounting Requirements

The electrical system and its electronic components shall be capable of operating in the area of the vehicle in which they will be installed, as recommended in SAE J1455.

Electrical and electronic equipment shall not be located in an environment that will reduce the performance or shorten the life of the component or electrical system when operating within the design operating profile.

The Agency shall follow recommendations from bus manufacturers and subsystem suppliers regarding methods to prevent damage from voltage spikes generated from welding, jump-starts, shorts, etc.

All electrical/electronic hardware mounted on the interior and exterior of the vehicle that is not designed to be installed in an exposed environment shall be protected.

All electrical/electronic hardware and its mounting shall comply with the shock and vibration requirements of published industry standards (SAE, ISO, etc.).

TS 42. General Electrical Requirements

TS 42.1 Low-Voltage (SLI) Batteries

Selected or specified batteries shall have a sufficient capacity to execute start after the as-delivered bus has been parked and off for a minimum of 48 hours.

TS 42.1.1 Low-Voltage Batteries (24 V)

DEFAULT

Four Group 31 Maintenance-Free Batteries

Four Group 31 Series deep-cycling maintenance-free battery units shall be provided. Each battery shall have a minimum of 700 cold-cranking amps. Each battery shall have a purchase date no more than one year from the date of release for shipment to the Agency.

ALTERNATIVE

Two 8D Battery Units

Two 8D battery units conforming to SAE J537 shall be provided. Each battery shall have a minimum of 1150 cold cranking amps. Each battery shall have a purchase date no more than 120 days from the date of release, and shall be fully maintained prior to shipment to the Agency. The battery compartment must be well-ventilated to prevent hydrogen buildup while protecting the compartment from road spray, water intrusion and deicing chemicals.

ALTERNATIVE

Two 8D Maintenance-Free Batteries

Each battery shall have a purchase date no more than 120 days from date of release and shall be fully maintained prior to shipment to the Agency. Battery compartment must be well-ventilated to prevent hydrogen build up while protecting the compartment from road spray, water intrusion and deicing chemicals.

DEFAULT

Same Size Terminal Ends

Positive and negative terminal ends shall be the same size.

ALTERNATIVE

Different Size Terminal Ends

Positive and negative terminal ends shall be different sizes.

ALTERNATIVE

Capacitor Start System

A capacitor start system will be provided to assist with starting the bus. This system will be isolated from the regular starting system to prevent the capacitors from draining during regular operation or long periods of downtime.

NOTE: Agency to specify post size if different sized terminal ends are use.

ALTERNATIVE

Four Group 31 AGM Batteries

Four Group 31 Series deep-cycling sealed nonspillable maintenance-free absorbed glass mat (AGM) batteries shall be provided. Each battery shall have a minimum of 1000 cold-cranking amps (CCA) at 0 °F. The batteries shall be designed and installed to withstand the operating environment. Each battery shall have a purchase date no more than one year from the date of release for shipment to the Agency.

ALTERNATIVE (BATTERY ELECTRIC VEHICLES)

Two Group 31 AGM Batteries

Two Group 31 Series deep-cycling sealed nonspillable maintenance-free absorbed glass mat (AGM) batteries shall be provided. Each battery shall have a minimum of 1000 cold cranking amps (CCA) at 0 °F. The batteries shall be designed and installed to withstand the operating environment. Each battery shall have a purchase date no more than one year from the date of release for shipment to the Agency.

ALTERNATIVE (BATTERY ELECTRIC VEHICLES)

Two Appropriately Sized Batteries

Two appropriately sized deep-cycling sealed nonspillable maintenance-free absorbed glass mat (AGM) batteries shall be provided. The batteries shall be designed and installed to withstand the operating environment. Each battery shall have a purchase date no more than one year from the date of release for shipment to the Agency.

ALTERNATIVE

Two Group 31 AGM Batteries with Ultracapacitors

Two Group 31 Series deep-cycling sealed nonspillable maintenance-free absorbed glass mat (AGM) batteries shall be provided. Each battery shall have a minimum of 1000 cold cranking amps (CCA) at 0 °F. Ultracapacitors (supercapacitors) shall be used in conjunction with the AGM batteries to provide effective power storage and to ensure successful engine starting. Ultracapacitor technology is to be used for cranking applications and then employing AGM battery technology to manage auxiliary loads. Ultracapacitors shall deliver their storage electrical energy at a high crank rate in a variety of extreme temperatures to provide reliable and consistent starting. The ultracapacitors shall be rated at a minimum of 120 kJ for cold climates and 75 kJ for warmer climates. The batteries and ultracapacitors shall be designed and installed to withstand the operating environment. Each battery shall have a purchase date no more than one year from the date of release for shipment to the Agency.

TS 42.1.2 Low-Voltage Battery Cables

The battery terminal ends and cable ends shall be color-coded with red for the primary positive, black for negative and another color for any intermediate voltage cables. Positive and negative battery cables shall not cross each other if at all possible, shall be flexible, shall be sufficiently long to reach the batteries with the tray in the extended position without stretching or pulling on any connection, and shall not lie directly on top of the batteries. Except as interrupted by the master battery switch, battery and starter wiring, where applicable, shall be continuous cables with connections secured by bolted terminals and shall conform to specification requirements of SAE J1127–Type SGR, SGT, SGX or GXL, and SAE J541 as applicable.

DEFAULT

No color code is for voltage is required.

ALTERNATIVE

Color-code each voltage.

TS 42.1.3 Jump-Start Connector**DEFAULT**

No requirements for jump-start connector.

ALTERNATIVE**Jump-Start Connector**

A jump-start connector, red for 24 V and blue for 12 V, shall be provided in the engine compartment, equipped with dust cap and adequately protected from moisture, dirt and debris.

ALTERNATIVE**Jump-Start Connector**

A jump-start connector shall be located next to the battery disconnect switch.

TS 42.1.4 Battery Compartment

The battery compartment shall prevent accumulation of snow, ice and debris on top of the batteries and shall be vented and self-draining. It shall be accessible only from the outside of the vehicle. All components within the battery compartment, and the compartment itself, shall be protected from damage or corrosion from the electrolyte. The inside surface of the battery compartment's access door shall 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. The battery compartment temperature should not exceed manufacturer's specification.

The vehicle shall be equipped with one or more 12 VDC and 24 VDC quick disconnect switches. The battery compartment door shall conveniently accommodate operation of 12 VDC and 24 VDC quick disconnect switches.

The battery quick disconnect access door shall be identified with a decal. The decal size shall not be less than 3.5 × 5 in. (8.89 × 12.7 cm).

The door shall be flush-fitting and incorporate a spring tensioner or equal to retain the door in a closed position when not in use.

DEFAULT**Non-Locking Access Door**

The access door shall not require any special locking devices to gain access to the switch, and it shall be accessible without removing or lifting the panel.

ALTERNATIVE**Locking Access Door**

The access door shall require an Agency-specified locking device (e.g., square key) to gain access to the switch, and it shall be accessible without removing or lifting the panel.

The batteries shall be securely mounted on a stainless steel or equivalent tray that can accommodate the size and weight of the batteries. The battery tray, if applicable, shall pull out easily and properly support the batteries while they are being serviced. The tray shall allow each battery cell to be easily serviced. A locking device shall retain the battery tray to the stowed position.

If not located in the engine compartment, the same fire-resistant properties must apply to the battery compartment. No sparking devices should be located within the battery box.

TS 42.1.5 Auxiliary Electronic Power Supply

If required, gel-pack, or any form of sealed (non-venting) batteries used for auxiliary power are allowed to be mounted on the interior of the vehicle if they are contained in an enclosed, non-airtight compartment and accessible only to maintenance personnel. This compartment shall contain a warning label prohibiting the use of vented (flooded) lead-acid batteries.

TS 42.1.6 Master Battery Switch

The location of the master battery switch shall be clearly identified on the exterior access panel, be accessible in less than 10 seconds for deactivation, and prevent corrosion from fumes and battery acid when the batteries are washed off or are in normal service.

The master switch shall be capable of carrying and interrupting the total circuit load.

DEFAULT**Single Switch**

The batteries shall be equipped with a single switch for disconnecting both 12 V and 24 V power.

ALTERNATIVE**Separate Switches**

The batteries shall be equipped with separate switches for disconnecting 12 V and 24 V power.

ALTERNATIVE**Solenoid Battery Cutoff**

A multiplex system activated battery cutoff solenoid to disconnect battery except critical items.

TS 42.1.7 Low-Voltage Generation and Distribution

The low-voltage generating systems shall maintain the charge on fully charged batteries, except in combustion engine cases, when the vehicle is at standard idle to allow-voltage generator load exceeding 70 percent of the low-voltage generator name plate rating.

Voltage monitoring and over-voltage output protection (recommended at 32 V) shall be provided. Charging profile shall be maintained within battery manufacturer's guidelines or specifications.

Dedicated power and ground shall be provided as specified by the component or system manufacturer. Cabling to the equipment must be sized to supply the current requirements with no greater than a 5 percent volt drop across the length of the cable.

TS 42.1.8 Circuit Protection

All branch circuits, except battery-to-starting-motor and battery-to-generator/alternator circuits, shall be protected by current-limiting devices such as circuit breakers, fuses or solid-state devices sized to the requirements of the circuit. The circuit breaker fuses shall be easily accessible for authorized personnel. Fuses shall be used only where it can be demonstrated that circuit breakers are not practicable. This requirement applies to inline fuses supplied by either the Contractor or a supplier. Fuse holders shall be constructed to be rugged and waterproof. All manual reset circuit breakers critical to the operation of the bus shall be mounted in a location convenient to the Agency mechanic with visible indication of open circuits. The Agency shall consider the application of automatic reset circuit breakers on a case-by-case basis. The Contractor shall show all in-line fuses in the final harness drawings. Any manually resettable circuit breakers shall provide a visible indication of open circuits.

Circuit breakers or fuses shall be sized to a minimum of 15 percent larger than the total circuit load. The current rating for the wire used for each circuit must exceed the size of the circuit protection being used.

TS 42.2 Grounds

The battery shall be grounded to the vehicle chassis/frame at one location only, as close to the batteries as possible. When using a chassis ground system, the chassis shall be grounded to the frame in multiple locations, evenly distributed throughout the vehicle to eliminate ground loops. No more than three ring terminal connections shall be made per ground stud with spacing between studs ensuring conductivity and serviceability. Electronic equipment requiring an isolated ground of the battery (i.e., electronic ground) shall not be grounded through the chassis.

TS 42.3 Low-Voltage and High-Voltage Wiring and Terminals

All power and ground wiring shall conform to specification requirements of SAE J1127, J1128 and J1292. All high-voltage power and ground wiring shall conform to specification requirements of SAE J1763, J1654 and J2910. In the case of conflicts with the requirements below, SAE standards shall apply. Double insulations shall be maintained as close to the junction box, electrical compartment or terminals as possible. The requirement for double insulations shall be met by wrapping the harness with plastic electrical tape or by sheathing all wires and harnesses with nonconductive, rigid or flexible conduit.

The bus shall be manufactured so that high-voltage systems and cabling do not interfere with the operation of low-voltage control systems. To this end, high-voltage cabling and low-voltage control wiring must be separated as far as practicable. Cabling and wiring must be installed damage-free. Additionally, parallel runs of high-voltage cabling and low-voltage control wiring shall be minimized.

Wiring shall be grouped, numbered and/or color-coded. Wiring harnesses shall not contain wires of different voltage classes unless all wires within the harness are insulated for the highest voltage presenting the harness. Kinking, grounding at multiple points, stretching, and exceeding minimum bend radius shall be prevented.

Strain-relief fittings shall be provided at all points where wiring enters electrical compartments. Grommets or other protective material shall be installed at points where wiring penetrates metal structures outside of electrical enclosures. Wiring supports shall be protective and nonconductive at areas of wire contact and shall not be damaged by heat, water, solvents or chafing.

To the extent practicable, wiring shall not be located in environmentally exposed locations under the vehicle. Wiring and electrical equipment necessarily located under the vehicle shall be insulated from water, heat, corrosion and mechanical damage. Where feasible, front-to-rear electrical harnesses should be installed above the window line of the vehicle.

All wiring harnesses over 5 ft long and containing at least five wires shall include 10 percent (minimum one wire) excess wires for spares. This requirement for spare wires does not apply to datalinks and communication cables. Wiring harness length shall allow end terminals to be replaced twice without pulling, stretching or replacing the wire. Terminals shall be crimped to the wiring according to the connector manufacturer's recommendations for techniques and tools. All cable connectors shall be locking type, keyed and sealed, unless enclosed in watertight cabinets or vehicle interior. Pins shall be removable, crimp contact type, of the correct size and rating for the wire being terminated. Unused pin positions shall be sealed with sealing plugs. Adjacent connectors shall use either different inserts or different insert orientations to prevent incorrect connections.

Terminals shall be crimped, corrosion-resistant and full ring type or interlocking lugs with insulating ferrules. When using pressure type screw terminal strips, only stranded wire shall be used. Insulation clearance shall ensure that wires have a minimum of "visible clearance" and a maximum of two times the conductor diameter or 1/16 in., whichever is less. When using shielded or coaxial cable, upon stripping of the insulation, the metallic braid shall be free from frayed strands that can penetrate the insulation of the inner wires.

Ultra-sonic and T-splices may be used with 8 AWG or smaller wire. When a T-splice is used, it shall meet these additional requirements:

- It shall include a mechanical clamp in addition to solder on the splice.
- The wire shall support no mechanical load in the area of the splice.
- The wire shall be supported to prevent flexing.

All splicing shall be staggered in the harness so that no two splices are positioned in the same location within the harness.

The instrument panel and wiring shall be easily accessible for service from the driver's seat or top of the panel. The instrument panel shall be separately removable and replaceable without damaging the instrument panel or gauges. Wiring shall have sufficient length and be routed to permit service without stretching or chafing the wires.

TS 42.4 Electrical Components

All electrical components, including switches, relays, flashers and circuit breakers, shall be heavy-duty designs with either a successful history of application in heavy-duty vehicles or design specifications for an equivalent environment.

All electric motors shall be heavy-duty brushless type where practical and have a continuous duty rating of no fewer than 40,000 hours (except cranking motors, washer pumps, auxiliary heater pumps, defroster and wiper motors). All electric motors shall be easily accessible for servicing.

TS 42.5 Electrical Compartments

All relays, controllers, flashers, circuit breakers and other electrical components shall be mounted in easily accessible electrical compartments. All compartments exposed to the outside environment shall be corrosion-resistant and sealed. The components and their functions in each electrical compartment shall be identified and their location permanently recorded on a drawing attached to the inside of the access panel or door. The drawing shall be protected from oil, grease, fuel and abrasion.

The front compartment shall be completely serviceable from the driver's seat, vestibule or from the outside. For vehicles with an internal combustion engine, "Rear start and run" controls shall be mounted in an accessible location in the engine compartment and shall be protected from the environment.

TS 43. General Electronic Requirements

If an electronic component has an internal real-time clock, it shall provide its own battery backup to monitor time when battery power is disconnected, and/or it may be updated by a network component. If an electronic component has an hour meter, it shall record accumulated service time without relying on battery backup.

All electronic component suppliers shall ensure that their equipment is self-protecting in the event of shorts in the cabling, and also in over-voltage (over 32 VDC on a 24 VDC nominal voltage rating with a maximum of 50 VDC) and reverse polarity conditions. If an electronic component is required to interface with other components, it shall not require external pull-up and/or pull-down resistors. Where this is not possible, the use of a pull-up or pull-down resistor shall be limited as much as possible and easily accessible and labeled.

TS 43.1 Wiring and Terminals

Kinking, grounding at multiple points, stretching and reducing the bend radius below the manufacturer's recommended minimum shall not be permitted.

TS 43.1.1 Discrete I/O (Inputs/Outputs)

All wiring to I/O devices, either at the harness level or individual wires, shall be labeled or color-coded in a fashion that allows unique identification at a spacing not exceeding 4 in. Wiring for each I/O device shall be bundled together. If the I/O terminals are the same voltages, then jumpers may be used to connect the common nodes of each I/O terminal.

TS 43.1.2 Shielding

All wiring that requires shielding shall meet the following minimum requirements. A shield shall be generated by connecting to a ground, which is sourced from a power distribution bus bar or chassis. A shield shall be connected at one location only, typically at one end of the cable. However, certain standards or special

requirements, such as SAE J1939 or RF applications, have separate shielding techniques that also shall be used as applicable.

NOTE: A shield grounded at both end forms a ground loop, which can cause intermittent loss of control or faults.

When using shielded or coaxial cable, upon stripping of the insulation, the metallic braid shall be free from frayed strands, which can penetrate the insulation of the inner wires. To prevent the introduction of noise, the shield shall not be connected to the common side of a logic circuit.

TS 43.1.3 Communications

The data network cabling shall be selected and installed according to the selected protocol requirements. The physical layer of all network communications systems shall not be used for any purpose other than communication among the system components, unless provided for in the network specifications.

Communications networks that use power line carriers (e.g., data modulated on a 24 V power line) shall meet the most stringent applicable wiring and terminal specifications.

TS 43.1.4 Radio Frequency (RF)

RF components, such as radios, video devices, cameras, global positioning systems (GPS), etc., shall use coaxial cable to carry the signal. All RF systems require special design consideration for losses along the cable. Connectors shall be minimized, since each connector and crimp has a loss that will contribute to attenuation of the signal. Cabling should allow for the removal of antennas or attached electronics without removing the installed cable between them. If this cannot be done, then a conduit of sufficient size shall be provided for ease of attachment of antenna and cable assembly. The corresponding component vendors shall be consulted for proper application of equipment, including installation of cables.

TS 43.1.5 Audio

Cabling used for microphone level and line level signals shall be 22 AWG minimum with shielded twisted pair. Cabling used for amplifier level signals shall be 18 AWG minimum.

TS 44. Multiplexing

TS 44.1 General

Versatility and future expansion shall be provided for by expandable system architecture. The multiplex system shall be capable of accepting new inputs and outputs through the addition of new modules and/or the utilization of existing spare inputs and outputs. All like components in the multiplex system shall be modular and interchangeable with self-diagnostic capabilities. The modules shall be easily accessible for troubleshooting electrical failures and performing system maintenance. Multiplex input/output modules shall use solid-state devices to provide extended service life and individual circuit protection.

DEFAULT

Ten percent of the total number of inputs and outputs, or at least one each for each voltage type utilized (0 V, 12 V, 24 V) at each module location shall be designated as spares.

ALTERNATIVE

No spares shall be designated.

TS 44.2 System Configuration

Multiplexing may either be distributed or centralized. A distributed system shall process information on multiple control modules within the network. A centralized system shall process the information on a single control module. Either system shall consist of several modules connected to form a control network.

TS 44.2.1 I/O Signals

The input/output for the multiplex system may contain four types of electrical signals: discrete, modulating, analogue, serial data.

Discrete signals shall reflect the on/off status of switches, levers, limit switches, lights, etc. Analog signals shall reflect numerical data as represented by a voltage signal (0–12 V, 10–24 V, etc.) or current signal (4 to 20 mA). Both types of analog signals shall represent the status of variable devices such as rheostats, potentiometers, temperature probes, etc. Serial data signals shall reflect ASCII or alphanumeric data used in the communication between other onboard components.

TS 45. Data Communications**TS 45.1 General**

All data communication networks shall be either in accordance with a nationally recognized interface standard, such as those published by SAE, IEEE or ISO, or shall be published to the Agency with the following minimum information:

- Protocol requirements for all timing issues (bit, byte, packet, inter-packet timing, idle line timing, etc.) packet sizes, error checking and transport (bulk transfer of data to/from the device).
- Data definition requirements that ensure access to diagnostic information and performance characteristics.
- The capability and procedures for uploading new application or configuration data.
- Access to revision level of data, application software and firmware.
- The capability and procedures for uploading new firmware or application software.
- Evidence that applicable data shall be broadcast to the network in an efficient manner such that the overall network integrity is not compromised.

Any electronic vehicle components used on a network shall be conformance tested to the corresponding network standard.

TS 45.2 Drivetrain Level

Drivetrain components, consisting of the motor(s), motor inverter(s), engine, transmission, retarder, antilock braking system and all other related components, shall be integrated and communicate fully with respect to vehicle operation with data using SAE Recommended Communications Protocols such as J1939 and/or J1708/J1587, with forward and backward compatibilities or other open protocols. At a minimum, drivetrain components shall be powered by a dedicated and isolated ignition supply voltage to ensure that data communication among components exists when the vehicle ignition is switched to the “on” position.

TS 45.2.1 Diagnostics, Fault Detection and Data Access

Drivetrain performance, maintenance and diagnostic data, and other electronic messages shall be formatted and transmitted on the communications networks.

The drivetrain level shall have the ability to record abnormal events in memory and provide diagnostic codes and other information to service personnel. At a minimum, this network level shall provide live/fail status, current hardware serial number, software/data revisions and uninterrupted timing functions.

TS 45.2.2 Programmability (Software)

The drivetrain-level components shall be programmable by the Agency with limitations as specified by the subsystem Supplier.

TS 45.3 Multiplex Level

TS 45.3.1 Data Access

At a minimum, information shall be made available via a communication port on the multiplex system. The location of the communication port shall be easily accessible. A hardware gateway and/or wireless communications system are options if requested by the Agency. The communication port(s) shall be located as specified by the Agency.

TS 45.3.2 Diagnostics and Fault Detection

The multiplex system shall have a proven method of determining its status (system health and input/output status) and detecting either active (online) or inactive (offline) faults through the use of onboard visual/audible indicators.

In addition to the indicators, the system shall employ an advanced diagnostic and fault detection system, which shall be accessible via either a personal computer or a handheld unit. Either unit shall have the ability to check logic function.

DEFAULT

No requirement for mock-up board.

ALTERNATIVE

Provide Mock-Up Board

A mock-up board, where key components of the multiplexing system are replicated on a functional model, shall be provided as a tool for diagnostic, design verification and training purposes. If required, the mock-up board should be priced separately in the Pricing Schedule.

TS 45.3.3 Programmability (Software)

The multiplex system shall have security provisions to protect its software from unwanted changes. This shall be achieved through any or all of the following procedures:

- Password protection
- Limited distribution of the configuration software

- Limited access to the programming tools required to change the software
- Hardware protection that prevents undesired changes to the software

Provisions for programming the multiplex system shall be possible through a PC or laptop. The multiplex system shall have proper revision control to ensure that the hardware and software are identical on each vehicle equipped with the system. Revision control shall be provided by all of the following:

- Hardware component identification where labels are included on all multiplex hardware to identify components
- Hardware series identification where all multiplex hardware displays the current hardware serial number and firmware revision employed by the module
- Software revision identification where all copies of the software in service display the most recent revision number
- A method of determining which version of the software is currently in use in the multiplex system

DEFAULT

Revision control labels shall be electronic.

ALTERNATIVE

Revision control labels shall be physically located near the programming port.

TS 45.4 Electromagnetic Compatibility (EMC)

Electrical and electronic subsystems and components on all buses shall not emit electromagnetic radiation that will interfere with onboard systems, components or equipment, telephone service, radio or TV reception, or violate regulations of the Federal Communications Commission.

Electrical and electronic subsystems on the coaches shall not be affected by external sources of RFI/EMI. This includes, but is not limited to, radio and TV transmission, portable electronic devices including computers in the vicinity of or onboard the buses, AC or DC power lines, and RFI/EMI emissions from other vehicles.

As a recommendation, no vehicle component shall generate or be affected by RFI/EMI that can disturb the performance of electrical/electronic equipment as defined in CAN/CSA-CISPR 12-10, SAE J1113, SAE J1455 or UNECE Council Directive 95/54(R10).

DRIVER PROVISIONS, CONTROLS AND INSTRUMENTATION

TS 46. Driver's Area Controls

TS 46.1 General

In general, when designing the driver's area, it is recommended that SAE J833, "Human Physical Dimensions," be used.

Switches and controls shall be divided into basic groups and assigned to specific areas, in conformance with SAE J680, "Location and Operation of Instruments and Controls in Motor Truck Cabs," and be essentially within the hand reach envelope described in SAE J287, "Driver Hand Control Reach."

TS 46.2 Glare

The driver's work area shall be designed to minimize glare to the extent possible. Objects within and adjacent to this area shall 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 driver's area shall be avoided.

TS 46.3 Visors/Sun Shades

DEFAULT

Front and Side Sun Shade/Visor

Adjustable sun visor(s) shall be provided for the driver's windshield and the driver's side window. Visors shall be shaped to minimize light leakage between the visor and windshield pillars. Visors shall store out of the way and shall not obstruct airflow from the climate control system or interfere with other equipment, such as the radio handset or the destination control. Deployment of the visors shall not restrict vision of the rearview mirrors. Visor adjustments shall be made easily by hand with positive locking and releasing devices and shall not be subject to damage by over-tightening. Sun visor construction and materials shall be strong enough to resist breakage during adjustments. Visors may be transparent but shall not allow a visible light transmittance in excess of 10 percent. Visors, when deployed, shall be effective in the driver's field of view at angles more than 5 deg above the horizontal.

ALTERNATIVE

Driver's Window Sunscreens

An adjustable roller type sunscreen shall be provided over the driver's windshield and/or the driver's side window. The sunscreen shall be capable of being lowered to the midpoint of the driver's window. When deployed, the screen shall be secure, stable, and shall not rattle, sway or intrude into the driver's field of view due to the motion of the coach or as a result of air movement. Once lowered, the screen shall remain in the lowered position until returned to the stowed position by the driver. Sunscreen shall be shaped to minimize light leakage between the visor and windshield pillars to the extent possible.

TS 46.4 Driver's Controls

Frequently used controls must be in easily accessible locations. These include the door control, kneel control, windshield wiper/washer controls, ramp, and lift and run switch. Any switches and controls necessary for the safe operation of the bus shall be conveniently located and shall provide for ease of operation. They shall be identifiable by shape, touch and permanent markings. Controls also shall be located so that passengers may not easily tamper with control settings.

All panel-mounted switches and controls shall be marked with easily read identifiers. Graphic symbols shall conform to SAE J2402, "Road Vehicles – Symbols for Controls, Indicators, and Tell Tales," where available and applicable. Color of switches and controls shall be dark with contrasting typography or symbols.

Mechanical switches and controls shall be replaceable, and the wiring at these controls shall be serviceable from a convenient location. Switches, controls and instruments shall be dust- and water-resistant.

DEFAULT

All switches/controls in the driver's control area shall be mounted in an angled panel steep enough to discourage drivers from using it as a personal storage area for items like food, drinks, cell phones, etc.

ALTERNATIVE

The transmission shift selector shall be mounted in an angled panel steep enough to discourage drivers from using it as a personal storage area for electronic devices such as cell phones, music players, navigation systems, etc.

TS 46.5 Normal Bus Operation Instrumentation and Controls

The following list identifies bus controls used to operate the bus. These controls are either frequently used or critical to the operation of the bus. They shall be located within easy reach of the operator. The operator shall not be required to stand or turn to view or actuate these controls unless specified otherwise.

Systems or components monitored by onboard diagnostics system shall be displayed in clear view of the operator and provide visual and/or audible indicators. The intensity of indicators shall permit easy determination of on/off status in bright sunlight but shall not cause a distraction or visibility problem at night. All indicators shall be illuminated using backlighting.

The indicator panel shall be located in Area 1 or Area 5, within easy view of the operator instrument panel. All indicators shall have a method of momentarily testing their operation. The audible alarm shall be tamper-resistant and shall have an outlet level between 80 and 83 dBA when measured at the location of the operator's ear.

Onboard displays visible to the operator shall be limited to indicating the status of those functions described herein that are necessary for the operation of the bus. All other indicators needed for diagnostics and their related interface hardware shall be concealed and protected from unauthorized access. **Table 6** represents instruments and alarms. The intent of the overall physical layout of the indicators shall be in a logical grouping of systems and severity nature of the fault.

Consideration shall be provided for future additions of spare indicators as the capability of onboard diagnostic systems improves. Blank spaces shall contain LEDs.

TABLE 6 (Transit Coach)
Transit Bus Instruments and Alarms

| Device | Description | Location | Function | Visual/Audible |
|---------------------|--|--------------------|---|----------------|
| Master run switch | Rotary, four-position detent | Side console | Master control for bus, off, day run, night run and clearance ID lights | |
| System start, front | Approved momentary switch | Side console | Activates vehicle systems | |
| System start, rear | Approved momentary switch (not required for vehicles without an ICE) | Engine compartment | Activates vehicle systems | |

TABLE 6 (Transit Coach)
Transit Bus Instruments and Alarms

| Device | Description | Location | Function | Visual/Audible |
|------------------------------|---|--------------------------------------|--|--|
| System run, rear | Three-position toggle switch (not required for vehicles without an ICE) | Rear system compartment | Permits activating vehicle system from rear start, normal front run position and off | Amber light |
| Drive selector | Touch panel switch | Side console | Provides selection of propulsion: forward, reverse and neutral | Gear selection |
| HVAC | Switch or switches to control HVAC | Side console | Permits selection of passenger ventilation: off, cool, heat, low fan, high fan or full auto with on/off only | |
| Driver's ventilation | Switch or switches to control driver ventilation | Side console or dash left wing | Permits supplemental ventilation: fan off, low or high | |
| Defroster fan | Switch or switches to control defroster fan | Side console or dash left wing | Permits defroster: fan off, low, medium or high | |
| Defroster temperature | Variable position | Side console or dash left wing | Adjusts defroster water flow and temperature | |
| Windshield wiper | One-variable position switch operating both wipers | Dash left wing | Variable speed control of left and right windshield wipers | |
| Windshield washer | Push button | Dash left wing | Activates windshield washers | |
| Dash panel lights | Rotary rheostat or stepping switch | Side console or dash left wing | Provides adjustment for light intensity in night run position | |
| Interior lights | Three-position switch | Side console | Selects mode of passenger compartment lighting: off, on or reduced lighting | |
| WC ramp/kneel enable | Two-position switch ¹ | Side console or dash right wing | Permits operation of ramp and kneel operations at each door remote panel | Amber light |
| Front door ramp/kneel enable | Two-position keyed switch ¹ | Front door remote or dash right wing | Permits ramp and kneel activation from front door area, key required ¹ | Amber light |
| Front door ramp | Three-position momentary switch | Right side of steering wheel | Permits deploy and stow of front ramp | Red light |
| Front kneel | Three-position momentary switch | Front door remote | Permits kneeling activation and raise and normal at front door remote location | Amber or red dash indicator exterior alarm and amber light |
| Rear door ramp/kneel enable | Two-position keyed switch ¹ | Rear door remote | Permits ramp and kneel activation from rear door area; key required ¹ | Red light |
| Rear door ramp | Three-position momentary switch | Rear door remote | Permits deploy and stow of rear ramp | |
| Rear kneel | Three-position momentary switch | Rear door remote | Permits kneeling activation and raise and normal at rear door remote location | |

TABLE 6 (Transit Coach)
Transit Bus Instruments and Alarms

| Device | Description | Location | Function | Visual/Audible |
|----------------------------|---|---------------------------------|---|--|
| Silent alarm | Recessed momentary push button | Side console | Activates emergency radio alarm at dispatch and permits covert microphone and/or enables destination sign emergency message | |
| Video system event switch | Momentary on/off switch with plastic guard | Side console | Triggers event equipment and event light on dash | Amber light |
| Left remote mirror | Four-position toggle type | Side console | Permits two-axis adjustment of left exterior mirror | |
| Right remote mirror | Four-position toggle type | Side console | Permits two-axis adjustment of right exterior mirror | |
| Mirror heater | Switch or temperature activated | Side console | Permits heating of outside mirrors when required | |
| Passenger door control | Five-position handle type detent or two momentary push buttons | Side console, forward | Permits open/close control of front and rear passenger doors | Red light |
| Rear door override | Two-position switch in approved location | Side console, forward | Allows driver to override activation of rear door passenger tape switches | |
| System shutdown override | Momentary switch with operation protection | Side console | Permits driver to override auto system shutdown | |
| Hazard flashers | Two-position switch | Side console or dash right wing | Activates emergency flashers | Two green lights |
| Fire suppression | Red push button with protective cover | Dash left wing or dash center | Permits driver to override and manually discharge fire suppression system | Red light |
| Mobile data terminal | Mobile data terminal coach operator interface panel | Above right dash wing | Facilitates driver interaction with communication system and master log-on | LCD display with visual status and text messages |
| Farebox interface | Farebox coach operator interface panel | Near farebox | Facilitates driver interaction with farebox system | LCD display |
| Destination sign interface | Destination sign interface panel | In approved location | Facilitates driver interaction with destination sign system, manual entry | LCD display |
| Turn signals | Momentary push button (two required) raised from other switches | Left foot panel | Activates left and right turn signals | Two green lights and optional audible indicator |
| PA manual | Momentary push button | In approved location | Permits driver to manually activate public address microphone | |
| Low-profile microphone | Low-profile discrete mounting | Steering column | Permits driver to make announcements with both hands on the wheel and focusing on road conditions | |

TABLE 6 (Transit Coach)
Transit Bus Instruments and Alarms

| Device | Description | Location | Function | Visual/Audible |
|------------------------------------|---|---|--|-------------------------------|
| High beam | Push button | In approved location | Permits driver to toggle between low and high beam | Blue light |
| Parking brake | Pneumatic PPV | Side console or dash left wing | Permits driver to apply and release parking brake | Red light |
| Hill holder | Two-position momentary switch | Side console | Applies brakes to prevent bus from rolling | |
| Master door/interlock | Multi-pole toggle, detented | Out of operator's reach | Permits driver override to disable door and brake/throttle interlock | Red light |
| Warning interlocks deactivated | Red indicator light | Dash panel center | Illuminates to warn driver that interlocks have been deactivated | Red light |
| Retarder disable | Two-position switch | Within reach of operator or approved location | Permits driver override to disable brake retardation/regeneration | Red light |
| Alarm acknowledge | Push button momentary | Approved location | Permits driver to acknowledge alarm condition | |
| Rear door passenger sensor disable | Two-position switch | In sign compartment or driver's barrier compartment | Permits driver to override rear door passenger sensing system | |
| Indicator/ alarm test button | Momentary switch or programming ¹ | Dash center panel | Permits driver to activate test of sentry, indicators and audible alarms | All visuals and audibles |
| Auxiliary power | 110 V power receptacle | Approved location | Property to specify what function to supply | |
| Speedometer | Speedometer, odometer, and diagnostic capability, 5-mile increments | Dash center panel | Visual indication of speed and distance traveled, accumulated vehicle mileage, fault condition display | Visual |
| Air pressure gauge | Primary and secondary, 5 psi increments | Dash center panel | Visual indication of primary and secondary air systems | Red light and buzzer |
| Fire detection | Coach operator display | Property specific or dash center | Indication of fire detection activation by zone/location | Buzzer and red light |
| Door obstruction | Sensing of door obstruction | Dash center | Indication of rear door sensitive edge activation | Red light and buzzer |
| Door ajar | Door not properly closed | Property specific or dash center | Indication of rear door not properly closed | Buzzer or alarm and red light |
| Low system air pressure | Monitors primary and secondary air tank pressure | Dash center | Indication of low air system pressure | Buzzer and red light |

TABLE 6 (Transit Coach)
Transit Bus Instruments and Alarms

| Device | Description | Location | Function | Visual/Audible |
|--|---|-----------------------|---|---|
| System coolant indicator | Low coolant indicator may be supplied as audible alert and visual and/or text message | Within driver's sight | Detects low coolant condition | Amber light |
| Hot system indicator | Temperature indicator may be supplied as audible alert and visual and/or text message | Within driver's sight | Detects system overheat condition and initiates time delay shutdown | Red light |
| ABS indicator | Detects system status | Dash center | Displays system failure | Amber light |
| HVAC indicator | Detects system status | Dash center | Displays system failure | Amber or red light |
| LV charging system indicator (12/24 V) | Detect charging system status | Dash center | Detects no-charge condition and optionally detects battery high, low, imbalance, no-charge condition, and initiates time-delayed shutdown | Red light flashing or solid based on condition |
| Bike rack deployed indicator | Detects bike rack position | Dash center | Indicates bike rack not being in fully stowed position | Amber or red light |
| HV charging system indicator (ESS) | Detects charging system status | Dash center | Indicates when bus is connected to off-board charger and ESS is accepting charge | Visual |
| State of charge indicator | Gauge, graduated based on SoC | Dash center | Indicates usable SoC of ESS | Visual |
| Regenerative braking indicator | Detects status | Dash center | Indicates when regenerative braking is being used | Visual |
| Turntable | Detects status | Dash center | Warning indication for hinge locking | Audible and amber warning and red light if locked |
| Turntable | Interlock momentary switch | Side console | Momentarily release interlock brakes due to overangled condition | |

1. Indicate area by drawing. Break up switch control from indicator lights.

TABLE 6 (ALTERNATIVE, Transit Coach)
Transit Bus Instruments and Alarms

| Device | Description | Location | Function | Visual/ Audible |
|-------------------------|-------------|----------|----------|-----------------|
| [Contractor to provide] | | | | |

TS 46.6 Driver Foot Controls

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

TS 46.6.1 Pedal Angle

The vertical angle of the accelerator and brake pedals shall be determined from a horizontal plane regardless of the slope of the cab floor. The accelerator and brake pedals shall be positioned at an angle of 37 to 50 deg at the point of initiation of contact and extend downward to an angle of 10 to 18 deg at full throttle.

The location of the brake and accelerator pedals shall be determined by the manufacturer, based on space needs, visibility, lower edge of windshield and vertical H-point.

TS 46.6.2 Pedal Dimensions and Position

The floor-mounted accelerator pedal shall be 10 to 12 in. long and 3 to 4 in. wide. Clearance around the pedal must allow for no interference precluding operation.

The accelerator and brake pedals shall be positioned such that the spacing between them, measured at the heel of the pedals, is between 1 and 2 in. Both pedals should be located approximately on the same plane coincident to the surface of the pedals.

TS 46.7 Brake and Accelerator Pedals

DEFAULT

Brake Pedal

Non-adjustable brake pedal.

ALTERNATIVE

Adjustable Brake and Accelerator Pedals

Both pedals shall be adjustable forward and rearward a minimum of 3 in. The adjustment shall be made by use of a dash-mounted toggle or rocker switch. The switch shall be clearly labeled to identify it as pedal adjustment and shall be within easy reach of the driver. Pedal adjustment shall be enabled only when the bus is stationary and the parking brake engaged.

TS 46.8 Driver Foot Switches

Floor-Mounted Foot Control Platform

The angle of the turn signal platform shall be determined from a horizontal plane, regardless of the slope of the cab floor. The turn signal platform shall be angled at a minimum of 10 deg and a maximum of 37 deg. It shall be located no closer to the seat front than the heel point of the accelerator pedal.

DEFAULT

Turn Signal Controls

Turn signal controls shall be floor-mounted, foot-controlled, water-resistant, heavy-duty, momentary contact switches.

ALTERNATIVE

Turn Signal Controls

Adjustable turn signal platform.

DEFAULT

Foot Switch Control

The control switches for the turn signals shall be mounted on an inclined, floor-mounted stainless steel enclosure or metal plate mounted to an incline integrated into the driver's platform, located to the left of the steering column. The location and design of this enclosure shall be such that foot room for the operator is not impeded. The inclined mounting surface shall be skid-resistant. All other signals, including high beam and public address system, shall be in approved locations.

The foot switches shall be UL-listed, heavy-duty type, of a rugged, corrosion-resistant metal construction. The foot switches for the directional signals shall be momentary type, while those for the PA system and the high beam shall be latching type. The spacing of the switches shall be such that inadvertent simultaneous deflection of switches is prevented.

ALTERNATIVE

Other Floor-Mounted Controls

The following may be floor mounted, momentary or latching, as identified by the Agency:

- hazard
- silent alarm
- PA system

ALTERNATIVE

Steering wheel mounted (self-canceling)

TS 47. Driver's Amenities

TS 47.1 Coat Hanger

DEFAULT

Coat Hanger

A suitable hanger shall be installed in a convenient, approved location for the driver's coat.

ALTERNATIVE

Coat Hook

A hook and loop shall be provided to secure the driver's coat.

TS 47.2 Drink Holder

DEFAULT

No drink holder.

ALTERNATIVE

Drink Holder

A device shall be provided to securely hold the driver's drink container, which may vary widely in diameter. It must be mounted within easy reach of the driver and must have sufficient vertical clearance for easy removal of the container. When the container is in the device, the driver's view of the road must not be obstructed, and leakage from the container must not fall on any switches, gauges or controls.

TS 47.3 Storage Box

DEFAULT

Storage Box

An enclosed driver storage area shall be provided with a positive latching door and/or lock. The minimum size is 2750 cu in.

ALTERNATIVE

No storage box.

TS 48. Windshield Wipers and Washers

TS 48.1 Windshield Wipers

The bus shall be equipped with a windshield wiper for each half of the windshield. At 60 mph, no more than 10 percent of the wiped area shall be lost due to windshield wiper lift. For two-piece windshields, both wipers shall park along the center edges of the windshield glass. For single-piece windshields, wipers shall park along the bottom edge of the windshield. Windshield wiper motors and mechanisms shall be easily accessible for repairs or service. The fastener that secures the wiper arm to the drive mechanism shall be corrosion-resistant.

DEFAULT

Single-control, electric two-speed intermittent wiper.

ALTERNATIVE

Wiper Powered by Compressed Air

If powered by air, exhaust from the wiper motors shall be muffled or piped under the floor of the bus.

DEFAULT

Single control for air-operated system.

ALTERNATIVE

Dual controls for air-operated system.

ALTERNATIVE

Intermittent Wiper with Variable Control

A variable-speed feature shall be provided to allow adjustment of wiper speed for each side of the windshield between approximately five and 25 cycles per minute.

ALTERNATIVE

Multiple wiper systems and controls.

ALTERNATIVE

Non-Synchronized Wipers

For non-synchronized wipers, separate controls for each side shall be supplied.

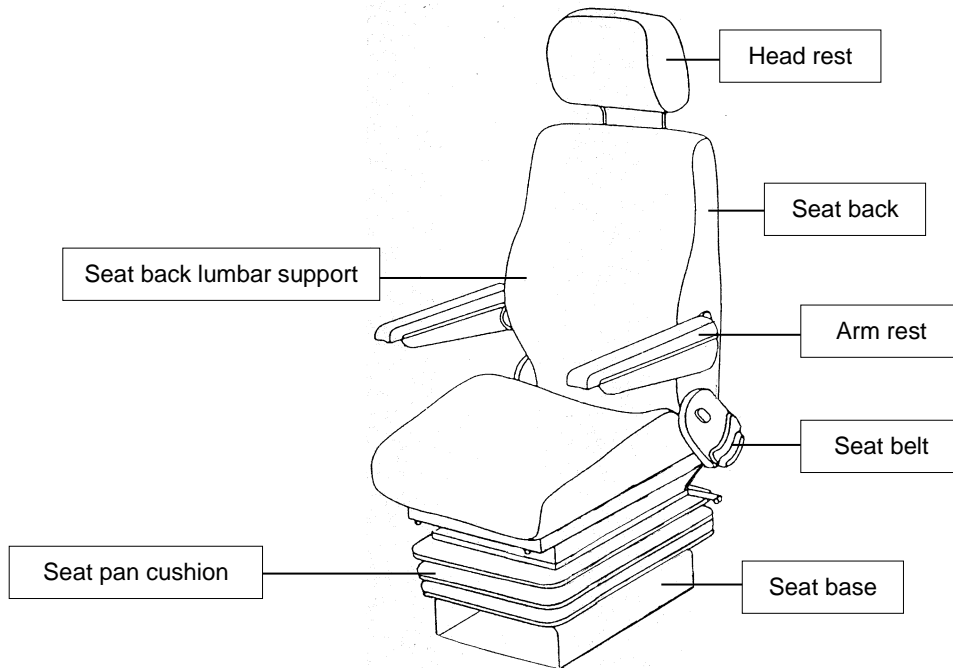
TS 48.2 Windshield Washers

The windshield washer system, when used with the wipers, shall deposit washing fluid evenly and completely wet the entire wiped area.

The windshield washer system shall have a minimum 3-gallon reservoir, located for easy refilling from outside the bus. Reservoir pumps, lines and fittings shall be corrosion-resistant and must include a means to determine fluid level.

TS 49. Driver's Seat

FIGURE 5
Driver's Seat



TS 49.1 Dimensions

The driver's seat shall be comfortable and adjustable so that people ranging in size from a 95th-percentile male to a 5th-percentile female may operate the bus.

TS 49.1.1 Seat Pan Cushion Length

Measurement shall be from the front edge of the seat pan to the rear at its intersection with the seat back. The adjustment of the seat pan length shall be no less than 16.5 in. at its minimum length and no more than 20.5 in. at its maximum length.

TS 49.1.2 Seat Pan Cushion Height

DEFAULT

Dimensions

Measurement shall be from the cab floor to the top of the level seat at its center midpoint. The seat shall adjust in height from a minimum of 14 in., with a minimum 6 in. vertical range of adjustment.

ALTERNATIVE

H-Point

The reference point for seat height shall be determined by establishing the H-point.

TS 49.1.3 Seat Pan Cushion Slope

Measurement is the slope of the plane created by connecting the two high points of the seat, one at the rear of the seat at its intersection with the seat back and the other at the front of the seat just before it waterfalls downward at the edge. The slope can be measured using an inclinometer and shall be stated in degrees of incline relative to the horizontal plane (0 deg). The seat pan shall adjust in its slope from no less than plus 12 deg (rearward “bucket seat” incline) to no less than minus 5 deg (forward slope).

TS 49.1.4 Seat Base Fore/Aft Adjustment

Measurement is the horizontal distance from the heel point to the front edge of the seat. The minimum and maximum distances shall be measured from the front edge of the seat when it is adjusted to its minimum seat pan depth (approximately 15 in.). On all low-floor buses, the seat base shall travel horizontally a minimum of 9 in. It shall adjust no closer to the heel point than 6 in. On all high-floor buses, the seat base shall travel a minimum of 9 in. and adjust no closer to the heel point than 6 in.

TS 49.1.5 Seat Pan Cushion Width

Measurement is the horizontal distance across the seat cushion. The seat pan cushion shall be 17 to 21 in. across at the front edge of the seat cushion and 20 to 23 in. across at the side bolsters.

TS 49.1.6 Seat Suspension

The driver’s seat shall be appropriately dampened to support a minimum weight of 380 lb. The suspension shall be capable of dampening adjustment in both directions.

Rubber bumpers shall be provided to prevent metal-to-metal contact.

TS 49.1.7 Seat Back

Width

Measurement is the distance between the outermost points of the front of the seat back, at or near its midpoint in height. The seat back width shall be no less than 19 in. Seat back will include dual recliner gears on both sides of the seat.

Height

Standard height seat back.

TS 49.1.8 Headrests

DEFAULT

Adjustable headrest.

ALTERNATIVE

No headrest.

TS 49.1.9 Seat Back Lumbar Support

Measurement is from the bottom of the seat back at its intersection with the seat pan to the top of the lumbar cushioning. The seat back shall provide adjustable-depth lumbar back support with three individual operating lumbar cells within a minimum range of 7 to 11 in.

TS 49.1.10 Seat Back Angle Adjustment

The seat back angle shall be measured relative to a level seat pan, where 90 deg is the upright position and 90 deg-plus represents the amount of recline.

The seat back shall adjust in angle from a minimum of no more than 90 deg (upright) to at least 105 deg (reclined), with infinite adjustment in between.

TS 49.2 Seat Belt

The belt assembly should be an auto-locking retractor (ALR). All seat belts should be stored in automatic retractors. The belts shall be mounted to the seat frame so that the driver may adjust the seat without resetting the seat belt.

The seat and seatbelt assemblies as installed in the bus shall withstand static horizontal forces as required in FMVSS 207 and 210.

DEFAULT

Lap seat belt only.

DEFAULT

Seatbelt webbing shall be black in color.

ALTERNATIVE

Lap and Shoulder (Three-Point) Seat Belt

Seat belts shall be provided across the driver's lap and diagonally across the driver's chest. The driver shall be able to use both belts by connecting a single buckle on the right side of the seat cushion. Three-point seatbelts must be emergency locking retractor (ELR) in design.

ALTERNATIVE

Adjustable-height D-ring.

ALTERNATIVE

All seatbelt assemblies shall come equipped with a warning switch device to remind operators to buckle up.

ALTERNATIVE

Orange three-point seatbelt webbing.

Lap Belt Length

DEFAULT

72 in.

The lap belt assembly shall be a minimum of 72 in. in length.

ALTERNATIVE

72 in. with Extension

The lap belt assembly shall be 72 in. in length with an 8 in. extension

TS 49.3 Adjustable Armrest

DEFAULT

No armrests.

ALTERNATIVE

One armrest, right side.

ALTERNATIVE

One armrest, left side.

ALTERNATIVE

Two armrests.

TS 49.4 Seat Control Locations

While seated, the driver shall be able to make seat adjustments by hand without complexity, excessive effort or being pinched. Adjustment mechanisms shall hold the adjustments and shall not be subject to inadvertent changes.

TS 49.5 Seat Structure and Materials

Cushions

Cushions shall be fully padded with at least 3 in. of materials in the seating areas at the bottom and back.

Cushion Materials

DEFAULT

Open-cell polyurethane (FMVSS 302).

ALTERNATIVE

Foam and fabric that meets FTA Docket 90A.

TS 49.6 Pedestal

DEFAULT

Powder-coated steel.

ALTERNATIVE

Stainless steel.

TS 49.7 Seat Options

Choose among the following:

- heated seat
- seat alarm
- fabric options
- seat air vent
- side bolsters adjustments
- silicone seat cushion

TS 49.8 Mirrors

TS 49.8.1 Exterior Mirrors

The bus shall be equipped with corrosion-resistant, outside rearview mirrors mounted with stable supports to minimize vibration. Mirrors shall be firmly attached to the bus to minimize vibration and to prevent loss of adjustment with a breakaway mounting system. Mirrors shall permit the driver to view the roadway along the sides of the bus, including the rear wheels. Mirrors should be positioned to prevent blind spots.

Mirrors shall retract or fold sufficiently to allow bus washing operations but avoid contact with windshield.

DEFAULT

Exterior mirrors shall be installed without a breakaway mounting system.

ALTERNATIVE

Exterior mirrors shall be installed with a breakaway mounting system.

ALTERNATIVE

Spring-loaded mirror heads auto return.

DEFAULT

Flat Mirrors on Both Sides

The bus shall be equipped with two flat outside mirrors, each with not less than 50 sq in. of reflective surface. The mirrors shall be located so as to provide the driver a view to the rear along both sides of the bus and shall be adjustable both in the horizontal and vertical directions to view the rearward scene. The roadside rearview mirror shall be positioned so that the driver's line of sight is not obstructed.

ALTERNATIVE

Combination of flat and convex mirrors referred to as transit-specific.

ALTERNATIVE

Combination of Mirrors and CCTV Cameras

The bus shall be equipped with a combination of mirrors and CCTV cameras. The configuration will be Agency specific.

Curbside Mirrors

The curbside rearview mirror shall be mounted so that its lower edge is no less than 76 in. above the street surface. A lower mount may be required due to mirror configuration requests.

DEFAULT

Remote Adjustment of Curbside Mirror

The driver shall be able to adjust the curbside mirror remotely while seated in the driving position. The control for remote positioning of the mirror shall be a single switch or device.

ALTERNATIVE

Standard mirror, not heated, no remote adjustment.

ALTERNATIVE

Heated and Remote Mirrors

The heaters shall be energized whenever the driver's heater and/or defroster is activated or activated independently.

Street-Side Mirrors

DEFAULT

Standard mirror, not heated, no remote adjustment.

ALTERNATIVE

Remote Adjustment of Street-Side Mirror

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

ALTERNATIVE

Heated Street-Side Mirrors

The street-side mirrors shall have heaters that energize whenever the driver's heater and/or defroster is activated, or can be activated independently.

ALTERNATIVE

Mirrors with integrated turn signal, one side.

ALTERNATIVE

Mirrors with external mounted turn signal, one side.

ALTERNATIVE

Mirrors with integrated turn signal, both sides.

ALTERNATIVE

Mirrors with external mounted turn signal, one side.

ALTERNATIVE

Mirrors with external mounted turn signal, both sides.

TS 49.8.2 Interior Mirrors

Mirrors shall be provided for the driver to observe passengers throughout the bus without leaving the seat and without shoulder movement. The driver shall be able to observe passengers in the front/entrance and rear/exit areas (if applicable), anywhere in the aisle, and in the rear seats.

WINDOWS**TS 50. General**

Use with 30 ft length: A minimum of 6000 sq in. of window area, including operator and door windows, shall be required on each side of the standard configuration bus.

Use with 35 ft length: A minimum of 8000 sq in. of window area, including operator and door windows, shall be required on each side of the standard configuration bus.

Use with 40 ft length: A minimum of 10,000 sq in. of window area, including operator and door windows, shall be required on each side of the standard configuration bus.

Use with 45 ft length: A minimum of 12,000 sq in. of window area, including operator and door windows, shall be required on each side of the standard configuration bus.

Use with 60 ft length: A minimum of 16,000 sq in. of window area, including operator and door windows, shall be required on each side of the standard configuration bus.

TS 51. Windshield

The windshield shall permit an operator's field of view as referenced in SAE J1050. The vertically upward view shall be a minimum of 14 deg, measured above the horizontal and excluding any shaded band. The vertically downward view shall permit detection of an object 3½ ft high no more than 2 ft in front of the bus. The horizontal view shall be a minimum of 90 deg above the line of sight. Any binocular obscuration due to a center divider may be ignored when determining the 90 deg requirement, provided that the divider does not exceed a 3 deg angle in the operator's field of view. Windshield pillars shall not exceed 10 deg of binocular obscuration. The windshield shall be designed and installed to minimize external glare as well as reflections from inside the bus.

The windshield shall be easily replaceable by removing zip-locks from the windshield retaining moldings. Bonded-in-place windshields shall not be used. Winglets may be bonded.

TS 51.1 Glazing

The windshield glazing material shall have a ¼ in. nominal thickness laminated safety glass conforming to the requirements of ANSI Z26.1 Test Grouping AS-1 and the recommended practices defined in SAE J673.

DEFAULT

Shaded Band

The upper portion of the windshield above the driver's field of view shall have a dark, shaded band and marked AS-3, with a minimum luminous transmittance of 5 percent when tested in accordance to ASTM D1003.

ALTERNATIVE

Partial band required to allow view for camera and mirror viewing.

ALTERNATIVE

No band required.

DEFAULT

Two-piece windshield.

ALTERNATIVE

One-piece windshield.

TS 52. Driver's Side Window

The driver's side window shall be the sliding type, requiring only the rear half of the sash to latch upon closing, and shall open sufficiently to permit the seated operator to easily adjust the street-side outside rearview mirror. When in an open position, the window shall not rattle or close during braking. This window section shall slide in tracks or channels designed to last the service life of the bus. The operator's side window shall not be bonded in place and shall be easily replaceable. The glazing material shall have a single-density tint.

The driver's view, perpendicular through the operator's side window glazing, should extend a minimum of 33 in. (840 mm) to the rear of the heel point on the accelerator, and in any case must accommodate a 95th percentile male operator. The view through the glazing at the front of the assembly should begin not more than 26 in. (560 mm) above the operator's floor to ensure visibility of an under-mounted convex mirror. Driver's window construction shall maximize ability for full opening of the window.

DEFAULT

The driver's side window glazing material shall have a ¼ in. nominal thickness laminated safety glass conforming to the requirements of ANSI Z26.1-1996 Test Grouping AS-2 and the recommended practices defined in SAE J673.

ALTERNATIVE

The driver's side window glazing material shall have a ¼ in. nominal thickness tempered safety glass conforming to the requirements of ANSI Z26.1-1996 Test Grouping AS-2 and the recommended practices defined in SAE J673.

The design shall prevent sections from freezing closed in the winter. Light transmittance shall be 75 percent on the glass area below 53 in. from the operator platform floor. On the top-fixed-over-bottom-slider configuration, the top fixed area above 53 in. may have a maximum 5 percent light transmittance.

DEFAULT

Standard Driver's Side Window, Traditional Frame

Agency to choose from the following options:

- full slider
 - egress
 - non-egress
- top fixed over bottom slider
 - egress
 - non-egress

ALTERNATIVE

Hidden Frame (Flush "Euro-Look") Driver's Side Window

Agency to choose from the following options:

- full slider
 - egress
 - non-egress
- top fixed over bottom slider
 - egress
 - non-egress

ALTERNATIVE

Quick Change Operator's Side Window

Glazing in the window assembly shall be replaced without removing the window from its installed position on the bus or manipulation of the rubber molding surrounding the glazing. The glazing shall be held in place mechanically by a formed metal extruded ring constructed to last the life of the vehicle.

ALTERNATIVE

Standard Driver's Side Window, Traditional Frame

Agency to choose from the following options:

- full slider
 - egress
 - non-egress
- top fixed over bottom slider
 - egress
 - non-egress

TS 53. Side Windows

TS 53.1 Configuration

Side windows shall not be bonded in place, but shall be easily replaceable without disturbing adjacent windows and shall be mounted so that flexing or vibration from engine operation or normal road excitation is not apparent. All aluminum and steel material will be treated to prevent corrosion.

TS 53.2 Emergency Exit (Egress) Configuration

DEFAULT

Minimum Egress

All side windows shall be fixed in position, except as necessary to meet the emergency escape requirements.

ALTERNATIVE

Maximum Egress

Every window shall be capable of being made an egress window.

DEFAULT

Standard Passenger Side Window Configurations

Agency to choose from the following options:

- traditional frame
 - full fixed
 - openable windows with inward-opening transom panels
 - openable windows with sliding transom panels
 - openable windows with a fixed transom panel and sliding lower panels
 - openable windows with full-height sliding panels
- hidden frame (flush "Euro-look")
 - full fixed
 - openable windows with inward-opening transom panels.

ALTERNATIVE

Quick Change Passenger Side Windows

Glazing in the window assembly shall be replaced without removing the window from its installed position on the bus or manipulation of the rubber molding surrounding the glazing. The glazing shall be held in place mechanically by a formed metal extruded ring constructed to last the life of the vehicle.

DEFAULT

Traditional Frame

Agency to choose from the following options:

- full fixed
- operable windows with inward-opening transom panels
- operable windows with sliding transom panels
- operable windows with a fixed transom panel and sliding lower panels
- operable windows with full-height sliding panels

ALTERNATIVE

Hidden Frame (Seamless)

Agency to choose from the following options:

- full fixed
- operable windows with inward-opening transom panels

TS 53.3 Configuration

DEFAULT

Fixed Side Windows

All side windows shall be fixed in position, except as necessary to meet the emergency escape requirements.

ALTERNATIVE

Operable Side Window Configurations

All side windows, except windows in passenger doors and those smaller than 500 sq in., shall have window panels that are operable by passengers. Operable window panels shall be equipped with latches that secure the window in the fully open and fully closed positions.

ALTERNATIVE

Operable Windows with Inward-Opening Transom Panels (Fixed Bottom, Tip-In Top)

Each operable side window shall incorporate an upper transom portion. The transom shall be between 25 and 35 percent of the total window area. The lower portion of the window shall be fixed. The transom portion shall be hinged along the lower edge and open inward.

ALTERNATIVE**Operable Windows with Sliding Transom Panels**

Each operable side window shall incorporate an upper transom portion. The transom shall be between 25 and 35 percent of the total window area. The lower portion of the window shall be fixed. The transom portion shall consist of two horizontally sliding panels.

ALTERNATIVE**Operable Windows with a Fixed Transom Panel and Sliding Lower Panels (Top Fixed, Bottom Slide)**

Each operable side window shall incorporate an upper transom side. The transom shall be between 25 and 35 percent of the total window area. The transom portion of the window shall be fixed. The lower portion shall consist of two horizontally sliding panels.

ALTERNATIVE**Operable Windows with Operable Transom Panel and Sliding Lower Panels**

Each operable side window shall incorporate an upper transom portion. The transom shall be between 25 and 35 percent of the total window area. The transom portion of the window shall be hinged at the lower edge and open inward. The lower portion shall consist of two horizontally sliding panels.

ALTERNATIVE**Operable Windows with Full-Height Sliding Panels**

Each operable side window shall consist of two full-height horizontally sliding panels. All side windows shall be easily replaceable without disturbing adjacent windows and shall be mounted so that flexing or vibration from engine operation or normal road excitation is not apparent. The windows shall be designed and constructed to enable a mechanic to remove and replace one window in less than 15 minutes.

TS 53.4 Materials**DEFAULT****Safety Glass Glazing Panels**

Side windows glazing material shall have a minimum of 3/16 in. nominal thickness tempered safety glass. The material shall conform to the requirements of ANSI Z26.1-1996 Test Grouping 2 and the recommended practices defined in SAE J673.

ALTERNATIVE**Polycarbonate Glazing Panels**

Side window glazing material shall have a minimum 3/16 in. nominal thickness. The material shall conform with the requirements of ANSI Z26.1-1996, "Standard for Type AS-5 Safety Glazing Materials," except for Test Number 17, which shall subject the specimens to 100 cycles with less than 4 percent hazing and 500 cycles with less than 12 percent hazing. Windows shall be polycarbonate sheet with an abrasion-resistant coating on both sides of the window.

ALTERNATIVE

Acrylic Glazing Panels

Side window glazing material shall have a minimum of 3/16 in. nominal thickness. The material shall conform with the requirements of ANSI Z26.1-1996, "Standard for Type AS-5 Safety Glazing Materials," except for Test Number 17, which shall subject the specimens to 100 cycles with less than 4 percent hazing and 500 cycles with less than 12 percent hazing. Windows shall be cell cast acrylic sheet with an abrasion-resistant coating on both sides of the window.

ALTERNATIVE

Laminated Glazing Panels; Not Available on Hidden Frame (Seamless) Windows

Side windows glazing material shall have a minimum of 3/16 in. nominal thickness laminated safety glass. The material shall conform to applicable requirements of ANSI Z26.1-1996 and the recommended practices defined in SAE J673.

ALTERNATIVE

Laminated and Tempered Safety Glazing with Anti-Vandalism Polyester Sacrificial Film

All glazing material that is aft of the standee line shall be equipped with 6 mm laminated polyester film. Material shall be easily installed and removed without the use of specialized tools. Polyester film shall adhere to the window and be resistant to peeling, curling and discoloration by ultraviolet rays. The film shall withstand normal cleaning operations.

ALTERNATIVE

Anti-Vandalism Sacrificial Liner ("Quick Change")

All glazing material aft of the standee line shall be equipped with necessary bracketry, fasteners and clear acrylic liner that shall be easily removable in the event of vandalism. The acrylic liner shall be clear and shall have minimal effect on the transmittance of the underlying glazing. This material shall not be adversely affected by ultraviolet rays and shall withstand normal cleaning practices. The installation of the liner shall prevent clouding or fogging. This acrylic sacrificial liner must be replaced without removing the window from its installed position on the bus, without removing the tempered glazing from the sash, and without the removal or manipulation of the window assembly's rubber molding.

DEFAULT

Windows on the bus sides and in the rear door shall be tinted a neutral color, complementary to the bus exterior. The maximum solar energy transmittance shall not exceed 37 percent, as measured by ASTM E424. Luminous transmittance shall be measured by ASTM D1003. Windows over the destination signs shall not be tinted.

ALTERNATIVE

All side and door windows shall be heat-rejecting glass with a solar heat gain coefficient (SHGC) of no greater than 40 percent and a visible light transmission of no less than 75 percent. Lower light transmission may be considered if SHGC values of less than 40 percent can be attained.

DEFAULT (LIGHT)

55 percent luminous transmittance.

ALTERNATIVE (LIGHT)

75 percent luminous transmittance.

DEFAULT (DARK)

27 percent luminous transmittance.

ALTERNATIVE

Property to specify, but no less than 12 percent.

DEFAULT**Safety Glass Glazing Panels**

Side windows glazing material shall have a minimum of 3/16 in. nominal thickness tempered safety glass. The material shall conform to the requirements of ANSI Z26.1 Test Grouping 2 and the recommended practices defined in SAE J673.

ALTERNATIVE**Polycarbonate Glazing Panels**

Side window glazing material shall have a minimum of 3/16 in. nominal thickness. The material shall conform to the requirements of ANSI Z26.1-1977, "Standard for Type AS-5 Safety Glazing Materials," except for Test Number 17, which shall subject the specimens to 1000 cycles, and the arithmetic mean of the percentages of light scattered shall not exceed 5 percent. Windows shall be polycarbonate sheet with an abrasion-resistant coating on both sides of the window.

ALTERNATIVE**Acrylic Glazing Panels**

Side window glazing material shall have a minimum of 3/16 in. nominal thickness. The material shall conform to the requirements of ANSI Z26.1-1977, "Standard for Type AS-5 Safety Glazing Materials," except for Test Number 17, which shall subject the specimens to 1000 cycles and the arithmetic mean of the percentages of light scattered shall not exceed 5 percent. Windows shall be cell cast acrylic sheet with an abrasion-resistant coating on both sides of the window.

ALTERNATIVE**Laminated Glazing Panels**

Side windows glazing material shall have a minimum of 3/16 in. nominal thickness laminated safety glass. The material shall conform to applicable requirements of ANSI Z26.1 and the recommended practices defined in SAE J673.

ALTERNATIVE

Anti-Vandalism Polyester Sacrificial Film

All glazing material that is aft of the standee line shall be equipped with 6 mm laminated polyester film. This material shall be easily installed and removed without the use of specialized tools. Polyester film shall adhere to the window and be resistant to peeling, curling and discoloration by ultraviolet rays. The film shall withstand normal cleaning operations.

ALTERNATIVE

Anti-Vandalism Sacrificial Liner (“Storm Window Type”)

All glazing material aft of the standee line shall be equipped with necessary bracketry, fasteners and clear acrylic liner that shall be easily removable in the event of vandalism. The acrylic material shall be clear and shall have minimal effect on the transmittance of the underlying glazing. This material shall not be adversely affected by ultraviolet rays and shall withstand normal cleaning practices. The installation of the liner shall prevent clouding or fogging. A mechanic shall be able to easily remove and replace the acrylic liner without the use of any specialized tools in 5 minutes or less.

NOTE: All glass treatments must be permanent, within the glass and/or in the center membrane. Surface films are not permitted.

SHGC and light transmission performance shall be defined by the National Fenestration Rating Council.

TS 53.5 Rear Window

DEFAULT

No requirement for rear window.

NOTE: A requirement for a rear-mounted HVAC unit will preclude a rear window.

ALTERNATIVE

Rear Window Requirement

A rear window shall be provided. The rear window shall be glazed with the same material (including anti-vandalism provision if required) and tint as side windows. The glazing shall be set in rubber channels or be push-out type to meet FMVSS 217. If push-out type, it shall be one-piece, rugged sash design, meeting specifications for side windows.

HEATING, VENTILATING AND AIR CONDITIONING

TS 54. Capacity and Performance

The HVAC climate control system shall be capable of controlling the temperature and maintaining the humidity levels of the interior of the bus as defined in the following paragraphs.

DEFAULT

HVAC equipped. See below for configuration.

ALTERNATIVE

No Requirements for Cooling

All requirements relevant to the HVAC cooling mode contained in this section, as well as throughout this specification, need not apply. All other requirements for heating and ventilation still apply.

DEFAULT

Allow Either Roof- or Rear-Mounted HVAC Unit

The HVAC unit may either be roof or rear-mounted. Note that a rear-mounted unit will preclude a rear window and that the term “roof-mounted unit” includes units mounted on top of or beneath the roof surface.

ALTERNATIVE (TC)

Require Roof-Mounted HVAC Unit

The HVAC unit shall be roof-mounted.

NOTE: This includes units mounted on top of or beneath the roof surface.

ALTERNATIVE

Require Rear-Mounted HVAC Unit

The HVAC unit shall be rear-mounted.

ALTERNATIVE

Require Underfloor HVAC Unit

The HVAC unit shall be mounted under the floor.

ALTERNATIVE (ARTIC)

Require roof- and rear-mounted HVAC unit (articulated buses).

ALTERNATIVE (ARTIC)

Require roof- mounted HVAC units in both bus sections (articulated buses).

ALTERNATIVE (HYBRID OR ELECTRIC BUSES)

AC or DC electrically driven A/C system with hermetic compressor(s), condenser fan and evaporator blower motors.

ALTERNATIVE (DIESEL OR CNG BUSES)

AC or DC electrically driven A/C system with hermetic compressor(s), condenser fan, evaporator blower motors and brushless AC generators.

ALTERNATIVE

AC Shore Power Connection

Accessibility and serviceability of preventative maintenance components shall be provided, minimizing the maintenance personnel needed to work 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 shall control the average passenger compartment temperature within arrange between 65 and 80 °F, while maintaining the relative humidity to a value of 50 percent or less. The system shall maintain these conditions while subjected to any outside ambient temperatures within a range of 10 to 95 °F and at any ambient relative humidity levels between 5 and 50 percent. Demonstrate this requirement after first reaching a stabilized interior temperature of 70 ±3 °F with full passenger and solar load.

When the bus is operated in outside ambient temperatures of 95 to 115 °F, the interior temperature of the bus shall be permitted to rise 0.5 °F for each degree of exterior temperature in excess of 95 °F.

When the bus is operated in outside ambient temperatures in the range of –10 to 10 °F, the interior temperature of the bus shall not fall below 55 °F while the bus is running on the design operating profile.

NOTE: 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 the immediate path of an air duct outlet. In general, the locations are intended to accurately represent the interior passenger area.

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

DEFAULT (DIESEL AND CNG)

Capacity and Performance Requirements

The air-conditioning portion of the HVAC system shall be capable of reducing the passenger compartment temperature from 115 to 95 °F in less than 20 minutes after engine startup. Engine temperature shall be within the normal operating range at the time of startup of the cooldown test, and the engine speed shall be limited to fast idle, which may be activated by a driver-controlled device. During the cooldown period, the refrigerant pressure shall not exceed safe high-side pressures, and the condenser discharge air temperature, measured 6 in. from the surface of the coil, shall be less than 45 °F above the condenser inlet air temperature.

ALTERNATIVE (TROLLEY BUS/BATTERY ELECTRIC BUS/FUEL CELL BUS)

Capacity and Performance Requirements

The air conditioning portion of the HVAC system shall be capable of reducing the passenger compartment temperature from 110 to 90 °F in less than 20 minutes after system startup in a 100 °F ambient temperature. During the cooldown period, the refrigerant pressure shall not exceed safe high-side pressures, and the condenser discharge air temperature, measured 6 in. from the surface of the coil, shall be less than 45 °F above the condenser inlet air temperature. The appropriate solar load as recommended in the APTA “Recommended Instrumentation and Performance Testing for Transit Bus Air Conditioning System,” representing 4 p.m. on Aug. 21, shall be used. There shall be no passengers on board, and the doors, windows and fresh air opening shall be closed.

ALTERNATIVE

Hotter Ambient Conditions

The air conditioning portion of the HVAC system shall be capable of reducing the passenger compartment temperature from 110 to 70 °F \pm 3 °F in less than 30 minutes after system engagement for 30, 35 and 40 ft buses. Engine temperature shall be within the normal operating range at the time of startup of the cooldown test, and the engine speed shall be limited to fast idle at three-quarters max governed speed that may be activated by a driver-controlled device. During the cooldown period, the refrigerant pressure shall not exceed safe high-side pressures, and the condenser discharge air temperature, measured 6 in. from the surface of the coil, shall be less than 45 °F above the condenser inlet air temperature. No simulated solar load shall be used. There shall be no passengers on board, and the doors and windows shall be closed.

ALTERNATIVE

Colder Ambient Conditions

The pull-up requirements for the heating system shall be in accordance with Section 11.1 of APTA’s *recommended practice* “Transit Bus HVAC System Instrumentation and Performance Testing.” With ambient temperature at -20 °F, and vehicle cold soaked at that temperature, the bus heating system shall warm the interior passenger compartment to an average temperature of 70 °F \pm 2 °F within 70 minutes.

ALTERNATIVE

R134a

The air conditioning system shall meet these performance requirements using R134a.

ALTERNATIVE

R407C

The air conditioning system shall meet these performance requirements using R407C.

ALTERNATIVE

Other

Agency to specify how the air conditioning system shall meet these performance requirements using [specify refrigerant].

NOTE: Selection of this refrigerant may impact pull-down performance.

TS 55. Controls and Temperature Uniformity

The HVAC system excluding the driver's heater/defroster shall be centrally controlled with an advanced electronic/diagnostic control system with provisions for extracting/reading data. The system shall be compliant with J1939 Communication Protocol for receiving and broadcasting of data.

HVACs that use coolant pumps for driver's defroster/heat shall be sized for the required flow and be brushless, having a minimum maintenance-free service life for both the brushless motor and the pump of at least 40,000 hours at full power.

DEFAULT

Manual Mode Selection of Climate Control System

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

ALTERNATIVE

Fully Automatic Climate Control System

The climate control system shall be fully automatic and control the interior average temperature to within ± 2 °F of specified temperature control setpoint.

DEFAULT

Single Control Setpoint at 70 °F

The temperature control setpoint for the system shall be 70 °F.

ALTERNATIVE

Dual-Temperature Control Setpoint

The temperature control setpoint for the system shall be [insert temperature] °F in the cooling mode and [insert temperature] °F in the heating mode.

ALTERNATIVE (BATTERY ELECTRIC BUS/FUEL CELL BUS)

Reduced Energy Consumption Setpoint

The HVAC system must be able to accommodate both fixed setpoints and the following sliding scale temperature control set points. The temperature control setpoint for the system shall be 70 °F when the ambient temperature is between 40 and 80 °F. The temperature control setpoint in the cooling mode shall be allowed to rise by 0.9 °F for each degree of exterior temperature in excess of 80 °F, with a maximum allowed setpoint of 78 °F. The temperature control setpoint in the heating mode shall be allowed to decrease by 0.667 °F for each degree of exterior temperature below 40 °F, with a minimum allowed setpoint of 60 °F.

The sliding scale temperature control provides additional energy savings by adjusting the temperature setpoint based upon ambient temperature. The fixed setpoint allows temperature controls independent of ambient temperature. Having both control options allows the operator to apply the most appropriate control method for its operation.

ALTERNATIVE

Manually Adjustable Temperature Control Setpoint

The climate control system shall have the provision to allow the driver to adjust the temperature control setpoint at a minimum of between 68 and 72 °F. From then on, all interior climate control system requirements shall be attained automatically, unless readjusted by the driver.

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

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

TS 55.1 Auxiliary Heater

DEFAULT

No auxiliary heater.

ALTERNATIVE

Auxiliary Heater

An auxiliary heater may be provided to supplement the heating system.

ALTERNATIVE (TROLLEY BUS/BATTERY ELECTRIC BUS/FUEL CELL BUS)

Electric Grid Type Heaters

The heating system will consist of electric grid type heaters.

ALTERNATIVE (BATTERY ELECTRIC BUS/FUEL CELL BUS)

Optional Heating System for Low Ambient Temperatures

The optional heating system will consist of one or more liquid heat exchangers, which will use heated coolant from a fuel fired coolant heater to supplement or replace heat provided by the electric grid heater. This reduces battery consumption for passenger compartment heating in low ambient conditions.

TS 55.2 Load Shedding and Derating

DEFAULT (DIESEL AND CNG)

No Load Shedding or Derating

No provisions shall be made in the HVAC system for load shedding. Proposer will provide information on load shedding based on geographic location.

ALTERNATIVE (DIESEL AND CNG)

Default Load Shedding or Derating

Default provisions shall be made in the HVAC system for full on/full off load shedding.

ALTERNATIVE (BATTERY ELECTRIC BUS/FUEL CELL BUS)

Optional Multistage Load Shedding or Derating

HVAC control must include a method to provide multistage load shedding when required to conserve battery power. The HVAC system may be operated with reduced performance to allow the bus to operate when the high-voltage batteries are below critical levels.

TS 56. Air Flow

TS 56.1 Passenger Area

The cooling mode of the interior climate control system shall 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 shall be evenly distributed throughout the bus, with air velocity not exceeding 100 ft per minute on any passenger. The ventilating mode shall 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 shall not activate until the heating element has warmed sufficiently to ensure at least 70 °F air outlet temperature. The heating air outlet temperature shall not exceed 120 °F under any normal operating conditions.

The climate control blower motors and fan shall be designed such that their operation complies with the interior noise level requirements.

DEFAULT**No “Fresh Air” Requirements**

To be used by agencies with an operating profile where the door opening cycle results in effectively providing an adequate “fresh air” mixture.

ALTERNATIVE**Requirement for 10 Percent “Fresh Air” Mixture**

The air shall be composed of no less than 10 percent outside air.

ALTERNATIVE

Air purification system.

ALTERNATIVE

Ionization system.

ALTERNATIVE

Ultraviolet system.

TS 56.2 Driver’s Area

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

TS 56.3 Controls for the Climate Control System (CCS)

The controls for the driver’s compartment for heating, ventilation and cooling systems shall be integrated and shall meet the following requirements:

- The heat/defrost system fan shall be controlled by a separate switch that has an “off” position and at least two positions for speed control. All switches and controls shall preclude the possibility of clothing becoming entangled, and shields shall be provided, if required. If the fans are approved by the Agency, an “on/off” switch shall be located to the right of or near the main defroster switch.
- A manually operated control valve shall control the coolant flow through the heater core.
- If a cable-operated manual control valve is used, then the cable length shall be kept to a minimum to reduce cable seizing. Heater water control valves shall be “positive” type, closed or open. The method of operating remote valves shall require the concurrence of the Agency project manager.

TS 56.4 Driver's Compartment Requirements

A separate heating, ventilation and defroster system for the driver's area shall be provided and shall be controlled by the driver. The system shall meet the following requirements:

- The heater and defroster system shall provide heating for the driver and heated air to completely defrost and defog the windshield, driver's side window and the front door glasses in all operating conditions. Fan(s) shall be able to draw air from the bus body interior and/or exterior through a control device and pass it through the heater core to the defroster system and over the driver's feet. A minimum capacity of 100 cfm shall be provided. The driver shall have complete control of the heat and fresh airflow for the driver's area.
- The defroster supply outlets shall be located at the lower edge of the windshield. These outlets shall be durable and shall be free of sharp edges that can catch clothes during normal daily cleaning. The system shall be such that foreign objects such as coins or tickets cannot fall into the defroster air outlets. Adjustable ball vents or louvers shall be provided at the left of the driver's position to allow direction of air onto the side windows.

A ventilation system shall be provided to ensure driver comfort and shall be capable of providing fresh air in both the foot and head areas. Vents shall be controllable by the driver from the normal driving position. Decals shall be provided, indicating "operating instructions" and "open" and "closed" positions. When closed, vents shall be sealed to prevent the migration of water or air into the bus.

TS 56.5 Driver's Cooling

DEFAULT

No dedicated evaporator.

ALTERNATIVE

Separate Dedicated Evaporator

Using a separate, dedicated evaporator, the climate control system shall be designed to maintain the driver's compartment temperatures within the range specified for the passenger compartment. The unit shall operate when the climate control switch is in the "Cool" position. It shall have a separate thermostatic control.

ALTERNATIVE

A separate fan unit shall provide 100 cfm of air to the driver's area through directionally adjustable nozzles and an infinitely variable fan control, both of which shall be located above and ahead of the driver.

ALTERNATIVE

Air from the evaporator shall be provided to the driver's area through vents located on the dash in front of the driver.

ALTERNATIVE

Driver's booster blower.

TS 57. Air Filtration

Air shall be filtered before entering the AC system and being discharged into the passenger compartment. The filter shall meet the ANSI/ASHRAE 52.1 requirement for 5 percent or better atmospheric dust spot efficiency, 50 percent weight arrestance, and a minimum dust holding capacity of 120 g per 1000 cfm cell. Air filters shall be easily removable for service.

DEFAULT

Cleanable Filters

Air filters shall be cleanable.

ALTERNATIVE

Disposable Type Filters

Air filters shall be of disposable type.

ALTERNATIVE

Other Type Filters

Air filters shall be [insert type].

TS 58. Roof Ventilators

Each ventilator shall be easily opened and closed manually. When open with the bus in motion, this ventilator shall provide fresh air inside the bus. The ventilator shall cover an opening area no less than 425 sq in. and shall be capable of being positioned as a scoop with either the leading or trailing edge open no less than 4 in., or with all four edges raised simultaneously to a height of no less than 3½ in. An escape hatch shall be incorporated into the roof ventilator. Roof ventilator(s) shall be sealed to prevent entry of water when closed.

DEFAULT

One Roof Ventilator

One ventilator shall be provided in the roof of the bus.

ALTERNATIVE

Two Roof Ventilators

Two roof ventilators shall 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.

ALTERNATIVE

Three Roof Ventilators

(Used in articulated buses.)

ALTERNATIVE

An electronically controlled hatch shall be installed.

ALTERNATIVE

A tool shall be provided to manually open and close the hatch.

TS 59. Maintainability

Manually controlled shutoff valves in the refrigerant lines shall allow isolation of the compressor and dehydrator filter for service. To the extent practicable, self-sealing couplings using O-ring seals shall be used to break and seal the refrigerant lines during removal of major components, such as the refrigerant compressor. Shutoff valves may be provided in lieu of self-sealing couplings. The condenser shall be located to efficiently transfer heat to the atmosphere and shall 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 shall preclude its obstruction by wheel splash, road dirt or debris. HVAC components located within 6 in. of floor level shall be constructed to resist damage and corrosion.

DEFAULT

High and low refrigerant pressure electronic gauges to be located in the return air area.

ALTERNATIVE

High and low refrigerant pressure analog gauges to be located in the return air area.

NOTE: The Agency may include the following sections if an alternative for colder ambient performance is specified above.

TS 60. Entrance/Exit Area Heating

DEFAULT

No requirements for entrance/exit area heating.

ALTERNATIVE

Entrance/Exit Area Heating

Heat shall be supplied to the entrance and exit areas to maintain a tread surface temperature no less than 35 °F in an ambient temperature of -10 °F to prevent accumulation of snow, ice or slush with the bus operating under design operating profile and corresponding door opening cycle.

TS 61. Floor-Level Heating

TS 61.1 Transit Coach

DEFAULT

No requirements for floor-level heating.

ALTERNATIVE**Floor-Level Heating**

Sufficient floor-level heaters shall be provided. Control of the floor-level heating shall be through the main heating system.

ALTERNATIVE**Warm Wall Heating**

Sufficient heaters shall be provided with ducting to blow warm air upward through a cavity in the wall and discharge the warm air at the base of the windows. Control of the warm wall heating should be through the main heating system electronic control.

TS 61.2 Commuter Coach

Sufficient heaters shall be provided with ducting to blow warm air upward through a cavity in the wall and discharge the warm air at the base of the windows. Control of the warm wall heating shall be through the main heating system electronic control.

EXTERIOR PANELS, FINISHES AND EXTERIOR LIGHTING**TS 62. Design**

The bus shall have a clean, smooth, simple design, primarily derived from bus performance requirements and passenger service criteria. The exterior and body features, including grilles and louvers, shall be shaped to facilitate cleaning by automatic bus washers without snagging washer brushes. Water and dirt shall 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 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 bus.

Exterior panels shall be sufficiently stiff to minimize vibration, drumming or flexing while the bus is in service. When panels are lapped, the upper and forward panels shall act as a watershed. However, if entry of moisture into the interior of the vehicle is prevented by other means, then rear cap panels may be lapped otherwise. The windows, hatches and doors shall be able to be sealed. Accumulation of spray and splash generated by the bus's wheels shall be minimized on windows and mirrors.

TS 62.1 Materials

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

DEFAULT

No requirement for protection against graffiti/vandalism for body material surfaces.

ALTERNATIVE

Requirements for protection against graffiti/vandalism for body material surfaces.

TS 62.2 Roof-Mounted Equipment (Transit Coach)

A nonskid, clearly marked walkway or steps shall be incorporated on the roof to provide access to equipment without damaging any system or bus paneling.

TS 63. Pedestrian Safety

Exterior protrusions along the side and front of the bus greater than ½ in. and within 80 in. of the ground shall have a radius no less than the amount of the protrusion. The exterior rearview mirrors, cameras and required lights and reflectors are exempt from the protrusion requirement. Advertising frames shall protrude no more than ⅞ in. from the body surface. Grilles, doors, bumpers and other features on the sides and rear of the bus shall be designed to minimize toeholds or handholds.

Exterior protrusions shall not cause a line-of-sight blockage for the driver.

TS 64. Repair and Replacement

TS 64.1 Side Body Panels (Transit Coach)

Structural elements supporting exterior body panels shall allow side body panels below the windows to be repaired in lengths not greater than 12.5 ft.

DEFAULT

Standard attachment of side body panels.

ALTERNATIVE

Easily Replaceable Lower Side Body Panels

The lower section (approximately 17.5 in.) of the side body panels (low-floor buses) or skirt panels (high-floor buses) shall be made of impact-resistant material and shall be easily and quickly replaceable.

ALTERNATIVE

Easily Replaceable Full-Height Side Body Panels

Full-height side body panels between the window and floor shall be easily and quickly replaceable in sections.

TS 64.2 Side Body Panels (Commuter Coach)

Structural elements supporting exterior body panels shall allow side body panels below the windows to be repaired.

TS 65. Rain Gutters

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

TS 66. License Plate Provisions

Provisions shall be made to mount standard-size U.S./Canada license plates per SAE J686 on the front and rear of the bus. These provisions shall direct-mount or recess the license plates so that they can be cleaned by automatic bus-washing equipment without being caught by the brushes. The rear license plate provision shall be illuminated per SAE J587.

DEFAULT

No plate or holder provision is required.

ALTERNATIVE

Front Plate or Holder Required

Location to be provided to OEM.

TS 66.1 Rub rails

DEFAULT

No requirement for rub rails.

ALTERNATIVE

Requirement for Rub Rails

Rub rails composed of flexible, resilient material shall be provided to protect both sides of the bus body from damage caused by minor sideswipe accidents with automobiles. Rub rails shall have vertical dimensions of no less than 2 in. (50 mm) with the centerline no higher than 35 in. above the ground between the wheel wells. The rub rails shall withstand impacts of 200 ft-lb of energy from a steel-faced spherical missile no less than 9 in. in diameter and of a 500 lb load applied anywhere along their length by a rigid plate 1 ft in length, wider than the rub rail, and with a ¼ in. end radii, with no visible damage to the rub rail, retainer or supporting structure.

The rub rail may be discontinued at doorways, wheel wells and articulated joints if applicable. A damaged portion of the rub rail shall be replaceable without requiring removal or replacement of the entire rub rail.

NOTE: Installation of rub rails may preclude the installation and/or size of exterior advertising signs or racks.

TS 67. Fender Skirts

DEFAULT

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

ALTERNATIVE

No fender skirts required.

TS 68. Wheel Covers (Transit Coach)

DEFAULT

Wheel covers not required.

ALTERNATIVE

Wheel covers required.

TS 68.1 Splash Aprons

DEFAULT

Standard Splash Aprons

Splash aprons, composed of ¼ in. minimum composition or rubberized fabric, shall be installed behind and/or in front of wheels as needed to reduce road splash and to protect underfloor components. The splash aprons shall extend downward to within 6 in. off the road surface at static conditions. Apron widths shall be no less than tire widths. Splash aprons shall be bolted to the bus understructure. Splash aprons and their attachments shall be inherently weaker than the structure to which they are attached. The flexible portions of the splash aprons shall not be included in the road clearance measurements. Splash apron shall be installed as necessary to protect the wheelchair loading device from road splash. Other splash aprons shall be installed where necessary to protect bus equipment.

ALTERNATIVE (TRANSIT COACH)

Full-width rear splash apron.

ALTERNATIVE

Other Locations Required

Splash apron in front of either or both front wheels to reduce splashing on ramp/lift and left mirror.

TS 69. Service Compartments and Access Doors

TS 69.1 Access Doors (Transit 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 maintain mechanical integrity and function under normal operations throughout the service life of the bus. They shall close flush with the body surface. All 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 bus washing operations. All access doors shall be retained in the open position by props or counterbalancing with overcenter or gas-filled springs with safety props and shall be easily operable by one person. Springs and hinges shall be corrosion resistant. Latch handles shall be flush with, or recessed behind, the body contour and shall be sized to provide an adequate grip for opening. Access doors, when opened, shall not restrict access for servicing other components or systems.

If precluded by design, the manufacturer shall provide door design information specifying how the requirements are met.

TS 69.2 Access Doors (Commuter Coach)

Conventional 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 and transmission fluid. 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 maintain mechanical integrity and function under normal operations throughout the service life of the bus. They shall close flush with the body surface. All 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 bus washing operations. All access doors shall be retained in the open position. Latch handles shall be flush with, or recessed behind, the body contour and shall be sized to provide an adequate grip for opening. Access doors, when opened, shall not restrict access for servicing other components or systems.

If precluded by design, the manufacturer shall provide door design information specifying how the requirements are met.

TS 69.3 Access Door Latch/Locks

DEFAULT

Requirement for Latches on Access Doors

Access doors larger than 100 sq in. in area shall be equipped with corrosion-resistant flush-mounted latches or locks except for coolant and fuel fill access doors. All such access doors that require a tool to open shall be standardized throughout the vehicle and will require a nominal 5/16 in. square male tool to open or lock.

ALTERNATIVE

Other Locks and Latches

Agency may define any required locks or latches for access doors.

TS 70. Bumpers

TS 70.1 Location

Bumpers shall provide impact protection for the front and rear of the bus with the top of the bumper being 27 in., ± 2 in., above the ground. Bumper height shall be such that when one bus is parked behind another, a portion of the bumper faces will contact each other.

TS 70.2 Front Bumper

No part of the bus, including the bumper, shall 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's longitudinal centerline. The bumper shall return to its pre-impact shape within 10 minutes of the impact. The bumper shall 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 4000 lb parallel to the longitudinal centerline of the bus. It shall protect the bus from damage as a result of 5.5 mph impacts into the corners at a 30 deg angle to the longitudinal centerline of the bus. The energy absorption system of the bumper shall be independent of every power system of the bus and shall not require service or maintenance in normal operation during the service life of the bus. The bumper may increase the overall bus length specified by no more than 7 in.

DEFAULT

Standard bumper.

ALTERNATIVE**Integrated Design with Recessed Middle Portion**

The bumper shall be an integrated design with the coach styling and be recessed in the middle portion to provide for mounting of a bike rack if necessary.

DEFAULT

No provisions for installing a bike rack shall be made.

ALTERNATIVE

Mounting provisions for integrated bike rack.

TS 70.3 Rear Bumper

No part of the bus, including the bumper, shall 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 shall return to its pre-impact shape within 10 minutes of the impact. When using a yard tug with a smooth, flat plate bumper 2 ft wide contacting the horizontal centerline of the rear bumper, the bumper shall provide protection at speeds up to 5 mph, over pavement discontinuities up to 1 in. high, and at accelerations up to 2 mph per second. The rear bumper shall 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 4000 lb, at 4 mph parallel to or up to a 30 deg angle to the longitudinal centerline of the bus. The rear bumper shall be shaped to prevent unauthorized riders standing on the bumper. The bumper shall not require service or maintenance in normal operation during the service life of the bus. The bumper may increase the overall bus length specified by no more than 7 in.

TS 70.4 Bumper Material

Bumper material shall be corrosion-resistant and shall withstand repeated impacts of the specified loads without sustaining damage. These bumper qualities shall be sustained throughout the service life of the bus.

TS 71. Finish and Color**TS 71.1 Appearance**

All exterior surfaces shall be smooth and free of wrinkles and dents. Exterior surfaces to be painted shall be properly prepared as required by the paint system Supplier prior to application of paint to ensure 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 shall be made prior to cleaning, priming and painting, where possible, to prevent corrosion. The bus shall be painted prior to installation of exterior lights, windows, mirrors and other items that 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 shall be applied smoothly and evenly with the finished surface free of visible dirt and the following other imperfections:

- blisters or bubbles appearing in the topcoat film
- chips, scratches or gouges of the surface finish
- cracks in the paint film
- craters where paint failed to cover due to surface contamination
- overspray
- peeling
- runs or sags from excessive flow and failure to adhere uniformly to the surface
- chemical stains and water spots
- dry patches due to incorrect mixing of paint activators
- buffing swirls

All exterior finished surfaces shall be impervious to diesel fuel, gasoline and commercial cleaning agents. Finished surfaces shall resist damage by controlled applications of commonly used graffiti-removing chemicals.

Proper adhesion between the basic surface and successive coats of the original paint shall be measured using an Elcometer adhesion tester as outlined in ASTM D4541-85. Adhesion shall be a minimum 300 ft-lb. The bus manufacturer shall supply test samples of the exterior surface for each step of the painting process that may be subject to adhesion testing per ASTM G4541-87 and ASTM D4145-85. ASTM D4541-93 may be used for inspection testing during assembly of the vehicle.

DEFAULT

Standard Contractor exterior paint finish quality.

ALTERNATIVE

High Gloss External Paint Finish Quality

Painted surfaces shall have a minimum 95 gloss and an orange peel rating of 7 or more on the Advanced Coating Technologies Inc., orange peel standard panels set #APR 14941 or Agency-accepted wave scan equipment. Paint shall last a minimum of six years with a minimum gloss of 90 as measured in ASTM E97-92, "Standard Test Method For Directional Reflectance."

DEFAULT

Base coat/clear coat paint system.

ALTERNATIVE

Standard OEM exterior paint system.

ALTERNATIVE

Maintenance-Free Exterior Finish, Color Impregnated Panels or Unpainted Panels

Except for periodic cleaning, exterior surfaces of the bus shall be maintenance free, permanently colored and not require refinish/repaint for the life of the vehicle. In general, the exterior surfaces shall be white. Durable, peel-resistant, pressure-sensitive appliqué shall be used for any striping and coloring required.

NOTE: The Agency should insert approved paints, color scheme and graphics.

TS 72. Decals, Numbering and Signing

Energy storage and delivery systems shall be identified in accordance with federal, state and local requirements, codes and standards.

ALTERNATIVE

Agency-Specified

Monograms, numbers and other special signing shall be applied to the inside and outside of the bus as required. Signs shall be durable and fade-, chip- and peel-resistant. They may be painted signs, decals or pressure-sensitive appliqué. All decals shall be installed per the decal Supplier recommendations. Signs shall be provided in compliance with the ADA requirements defined in 49 CFR Part 38, Subpart B, 38.27.

NOTE: The Agency should supply a list of interior and exterior decals including size and location.

TS 72.1 Passenger Information

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

Requirements for a public information system in accordance with 49 CFR shall be provided.

TS 73. Exterior Lighting

All exterior lights shall be designed to prevent entry and accumulation of moisture or dust. Lamps, lenses and fixtures shall be interchangeable to the extent practicable. Two hazard lamps at the rear of the bus shall be visible from behind when the engine service doors are opened. Light lenses shall be designed and located to prevent damage when running the vehicle through an automatic bus washer.

DEFAULT

Commercially available LED-type lamps shall be used at all exterior lamp locations.

ALTERNATIVE

Contractor to provide details of exterior lighting system.

DEFAULT**Standard Lamps**

All LED lamps shall be standard installation of the OEM. The entire assembly shall be specifically coated to protect the light from chemical and abrasion degradation.

ALTERNATIVE**Potted Lamps**

LED lamps shall be potted type and designed to last the life of the bus.

DEFAULT**Standard Size**

Size of LED lamps used for tail, brake and turn signal lamps shall be standard installation of OEM.

ALTERNATIVE**Larger Size**

LED lamps used for tail, brake and turn signal lamps shall be a minimum of sq 7 in.

ALTERNATIVE

Front marker (clearance) lights along with lights located on the roof and sides of the bus shall have protective shields or be of the flush mount type to protect the lens against minor impacts.

TS 73.1 Backup Light/Alarm

Visible and audible warnings shall inform following vehicles or pedestrians of reverse operation. Visible reverse operation warning shall conform to SAE J593. Audible reverse operation warning shall conform to SAE J994 Type C or D.

TS 73.2 Doorway Lighting

Lamps at the front and rear passenger doorways (if applicable) shall comply with ADA requirements and shall activate only when the doors open. These lamps shall illuminate the street surface to a level of no less than 1 footcandle (fc) for a distance of 3 ft 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 shall be shielded to protect passengers' eyes from glare.

TS 73.3 Turn Signals**DEFAULT****Standard Turn Signals**

Turn-signal lights shall be provided on the front, rear, curb and street sides of the bus in accordance with federal regulations.

ALTERNATIVE

Wraparound Front Turn Signals

Front turn signals shall be of wraparound design or shall be designed to be visible from the front and the near side of the bus.

TS 73.4 Headlamps

Headlamps shall be designed for ease of replacement.

DEFAULT

Standard Installation

Standard OEM headlamp installation shall be provided in accordance with federal regulations.

ALTERNATIVE

Daytime Running Lights

Headlamps shall incorporate a daytime running light feature.

ALTERNATIVE

LED

Headlamps shall be LED/halogen, sealed beam.

ALTERNATIVE

Specify Design Life

Headlamps' design life to be specified in units of hours by the Agency.

TS 73.5 Brake Lamps

TS 73.5.1 Transit Coach

Brake lamps shall be provided in accordance with federal regulations.

DEFAULT

No High/Center Mount Brake Lamp or Deceleration Warning Lamps

Bus shall not include a high/center mount brake lamp and/or deceleration warning indicator lamps.

ALTERNATIVE

High and Center Mount Red Brake Lamp

Bus shall include red, high and center mount brake lamp(s) along the backside of the bus in addition to the lower brake lamps required under FMVSS. The high and center mount brake lamp(s) shall illuminate steadily with brake application. Agency to specify the size of the high and center mount brake lamp(s).

ALTERNATIVE

High and Center Mount Amber Lamp

Bus shall include amber high and center mount lamp(s) along the backside of the bus that illuminate steadily when the transmission is in forward mode and when the throttle is completely released (0 percent engagement). The amber lamps shall automatically extinguish, regardless of transmission and throttle condition, with brake application. Operation of the amber lamps shall be programmable with the multiplex system. Agency to specify the size of the high and center mount amber lamp(s).

TS 73.5.2 Commuter Coach

Brake lamps shall be provided in accordance with federal regulations.

Bus shall include red, high and center mount brake lamp(s) along the back side of the bus in addition to the lower brake lamps required under FMVSS. The high and center mount brake lamp(s) shall illuminate steadily with brake application.

TS 73.6 Service Area Lighting (Interior and Exterior)

LED lamps shall 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. These service areas shall include, but not be limited to, the engine compartment, the communication box, junction/apparatus panels and passenger door operator compartments. Lighting shall be adequate to light the space of the service areas to levels needed to complete typical emergency repairs and adjustments. The service area lamps shall be suitable for the environment in which they are mounted.

Engine compartment lamps shall be controlled by a switch mounted near the rear start controls or in an approved location. All other service area lamps shall be controlled by switches mounted on or convenient to the lamp assemblies. Power to the service area lighting shall be programmable. Power shall latch on with activation of the switch and shall be automatically discontinued (timed out) after 30 minutes to prevent damage caused by inadvertently leaving the service area lighting switch in the “on” position after repairs are made.

INTERIOR PANELS AND FINISHES

TS 74. General Requirements

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

Interior surfaces more than 10 in. 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. Any components and other electrical components within close proximity to these surfaces shall also be resistant to this cleaning method.

DEFAULT

No requirement for anti-graffiti/vandalism surface treatments.

ALTERNATIVE

Requirements for additional anti-graffiti/vandalism treatments for interior surfaces.

ALTERNATIVE

Internal surfaces, as possible, to be stainless steel or other resistant material.

NOTE: Any additional weight added to a battery bus will reduce vehicle range.

TS 75. Interior Panels

Panels shall be easily replaceable and tamper-resistant. They shall be reinforced, as necessary, to resist vandalism and other rigors of transit bus service. Individual trim panels and parts shall be interchangeable to the extent practicable.

DEFAULT

Interior panel required to meet FMVSS 302.

ALTERNATIVE

Fire Resistance

Materials shall comply with the Recommended Fire Safety Practices defined in FTA Docket 90-A, dated Oct. 20,1993.

ALTERNATIVE

Textured stainless steel.

NOTE: Any additional weight added to a battery bus will reduce vehicle range.

ALTERNATIVE

Anodized or powder-coated aluminum.

ALTERNATIVE

Composite.

ALTERNATIVE

Scratch-resistant plastic.

ALTERNATIVE

Melamine-type material.

ALTERNATIVE

Carpeting or fabric.

TS 75.1 Driver Area Barrier

TS 75.1.1 Transit Coach

A barrier or bulkhead between the driver and the street-side front passenger seat shall be provided. The barrier shall minimize glare and reflections in the windshield directly in front of the barrier from interior lighting during night operation. Location and shape must permit full seat travel and reclining possibilities that can accommodate the shoulders of a 95th-percentile male. The partition shall have a side return and stanchion to prevent passengers from reaching the driver by standing behind the driver's seat. The lower area between the seat and panel must be accessible to the driver. The partition must be strong enough in conjunction with the entire partition assembly for mounting of such equipment as flare kits, fire extinguishers (1.2 kg), microcomputer, public address amplifier, etc. The panel should be properly attached to minimize noise and rattles.

DEFAULT (TRANSIT COACH)

Wheel-Well-to-Ceiling Configuration of Driver's Barrier

The driver's barrier shall extend from the top of the wheel well to the ceiling the level of the seated driver and shall fit close to the bus-side windows and wall to prevent passengers from reaching the driver or the driver's personal effects.

ALTERNATIVE

Full-Height (Floor-to-Ceiling) Configuration of Driver's Barrier

The driver's barrier shall extend continuously from the floor area to the ceiling and from the bus wall to the first stanchion immediately behind the driver to provide security to the driver and to limit passenger conversation.

ALTERNATIVE

Driver enclosure or door.

TS 75.1.2 Commuter Coach

A barrier or bulkhead between the driver and the street-side front passenger seat shall be provided. The barrier shall minimize glare and reflections in the windshield directly in front of the barrier from interior lighting during night operation. Location and shape must permit full seat travel and reclining possibilities that can accommodate the shoulders of a 95th-percentile male. The partition shall have a side return and stanchion to prevent passengers from reaching the driver by standing behind the driver's seat. The lower area between the seat and panel must be accessible to the driver. The partition must be strong enough in conjunction with the entire partition assembly for mounting of such equipment as flare kits, fire extinguishers (1.2 kg), microcomputer, public address amplifier, etc. The panel should be properly attached to minimize noise and rattles.

The driver's barrier shall extend from the floor area to the ceiling and from the bus wall to the first stanchion immediately behind the driver to provide security to the driver and to limit passenger conversation.

TS 75.2 Modesty Panels

Sturdy divider panels constructed of durable, unpainted, corrosion-resistant material complementing the interior shall be provided to act as both a physical and visual barrier for seated passengers.

Design and installation of modesty panels located in front of forward-facing seats shall include a handhold or grab handle along their top edge. These dividers shall be mounted on the sidewall and shall project toward the aisle no farther than passenger knee projection in longitudinal seats or the aisle side of the transverse seats. Modesty panels shall extend from at least the window opening of the side windows, and those forward of transverse seats shall extend downward to 1 and 1½ in. above the floor. Panels forward of longitudinal seats shall extend to below the level of the seat cushion. Dividers positioned at the doorways, where applicable, shall provide no less than a 2½ in. clearance between the modesty panel and a fully open, inward opening door, or the path of a deploying flip-out ramp to protect passengers from being pinched. Modesty panels installed at doorways shall be equipped with grab rails if passenger assists are not provided by other means.

The modesty panel and its mounting shall withstand a static force of 250 lb applied to a 4 × 4 in. area in the center of the panel without permanent visible deformation.

DEFAULT

Modesty panels shall be installed as stated.

ALTERNATIVE

Additional floor clearances for cleaning, toe clearance.

ALTERNATIVE

Clear non-glass panel from above the modesty panel to the top of the daylight opening and attached to the stanchion.

TS 75.3 Front End

The entire front end of the bus shall be sealed to prevent debris accumulation behind the dash and to prevent the driver's feet from kicking or fouling wiring and other equipment. The front end shall be free of protrusions that are hazardous to passengers standing at the front of the standee line area of the bus during rapid decelerations. Paneling across the front of the bus and any trim around the driver's compartment shall be formed metal or composite material. Composite dash panels shall be reinforced as necessary, vandal-resistant and replaceable. All colored, painted and plated parts forward of the driver's barrier shall be finished with a surface that reduces glare. Any mounted equipment must have provision to support the weight of equipment.

TS 75.4 Rear Bulkhead

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

The rear bulkhead paneling shall be contoured to fit the ceiling, sidewalls and seat backs so that any litter or trash will tend to fall to the floor or seating surface when the bus is on a level surface. Any air vents in this

area shall be louvered to reduce airflow noise and to reduce the probability of trash or liter being thrown or drawn through the grille. If it is necessary to remove the panel to service components located on the rear bulkhead, then the panel shall be hinged or shall be able to be easily removed and replaced. Grilles where access to or adjustment of equipment is required shall be heavy duty and designed to minimize damage and limit unauthorized access.

TS 75.5 Headlining

Ceiling panels shall be made of durable, corrosion resistant, easily cleanable material. 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 members. Moldings and trim strips, as required to make the edges tamperproof, shall be stainless steel, aluminum or plastic, colored to complement the ceiling material. Headlining panels covering operational equipment that is mounted above the ceiling shall be on hinges for ease of service but retained to prevent inadvertent opening.

TS 75.6 Fastening

Interior panels shall be attached so that there are no exposed unfinished, rough edges or rough surfaces. Fasteners should be corrosion resistant. Panels and fasteners shall not be easily removable by passengers. Exposed interior fasteners should be minimized, and where required shall be tamper-resistant.

TS 75.7 Insulation

Any insulation material used between the inner and outer panels shall minimize the entry and/or retention of moisture. Insulation properties shall be unimpaired during the service life of the bus. Any insulation material used inside the engine compartment shall not absorb or retain oils or water and shall be designed to prevent casual damage that may occur during maintenance operations.

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

DEFAULT

FTA Docket 90-A

All insulation materials shall comply with the Recommended Fire Safety Practices defined in FTA Docket 90-A, dated Oct. 20, 1993.

ALTERNATIVE

FMVSS 302

Insulation shall meet the requirements of FMVSS 302.

TS 75.8 Floor Covering

The floor covering shall have a nonskid walking surface that remains effective in all weather conditions. The floor covering, as well as transitions of flooring material to the main floor and to the entrance and exit area, shall be smooth and present no tripping hazards. Seams shall be sealed/welded per manufacturer's specifications. The color and pattern shall be consistent throughout the floor covering. The standee line shall

be approximately 2 in. wide and shall extend across the bus aisle and contrast with the rest of the floor covering.

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

The floor shall be easily cleaned and shall be arranged to minimize debris accumulation.

A one-piece center strip shall 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 the center strip shall 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 shall extend from the center strip to the outboard edge of the rear/exit area.

The floor under the seats shall be covered with smooth surface flooring material. The floor covering shall closely fit the sidewall in a fully sealed butt joint or extend to the top of the cove.

TS 75.9 Interior Lighting

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

The lens material shall be translucent polycarbonate. Lenses shall be designed to effectively “mask” the light source. Lenses shall be sealed to inhibit incursion of dust and insects yet be easily removable for service. Access panels shall be provided to allow servicing of components located behind light panels. If necessary, the entire light fixture shall be hinged.

TS 75.10 Passenger Area Lighting

DEFAULT

First Row Lights

The first light on each side (behind the driver and the front door) is normally turned on only when the front door is opened, in “night run” and “night park.” As soon as the door closes, these lights shall go out. These lights shall be turned on at any time if the switch is in the “on” position.

ALTERNATIVE

Dimming Second Row Lights

To help eliminate windshield reflection on suburban roads where street lighting is at a low level, the second light on each side, when “night run” or “night park” is selected, shall be controlled by the switch; off in “off” and on in “normal.” These lights shall be turned on at any time if the switch is in the “on” position.

All interior lighting shall be turned off whenever the vehicle is in reverse and the engine run switch is in the “on” position.

The interior lighting design shall require the approval of the Agency.

DEFAULT

LED lights.

ALTERNATIVE**Fluorescent Lights**

Fluorescent tubes shall be a maximum 6 ft in length, single-pin, T-12 type (with exceptions granted for extinguishing or dimming fixtures, as noted below).

Individual ballast units shall be provided for each light fixture. Ballast shall have a fire-resistant housing, minimum operating frequency of above audible range, reverse polarity protection and integrated circuit breaker/automatic thermal protection.

ALTERNATIVE

Enhanced design ballast that minimizes arcing and carries a type and CC UL935 certification.

DEFAULT**First Light Modules Dim/Extinguish When Front Door Is Closed**

When the master switch is in the “run” or “night/run” mode, the first light module on each side of the coach shall automatically extinguish or dim when the front door is in the closed position and illuminate when the door is opened.

ALTERNATIVE**No Dimming/Extinguishing of First Light Modules When Front Door Is Closed**

No dimming/extinguishing feature of first light modules shall be provided.

TS 75.11 Driver’s Area Lighting

The driver’s area shall have a light to provide general illumination, and it shall illuminate the half of the steering wheel nearest the driver to a level of 5 to 10 fc.

TS 75.12 Seating Area Lighting (Transit Coach)

The interior lighting system shall provide a minimum 15 fc illumination on a 1 sq ft plane at an angle of 45 deg from horizontal, centered 33 in. above the floor and 24 in. in front of the seat back at each seat position. Allowable average light level for the rear bench seats shall be 7 fc.

TS 75.13 Seating Area Lighting (Commuter Coach)

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. 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 in. (432 mm). Interior window post caps shall be ABS, 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 in. (1016 mm) apart. Total capacity shall be a minimum 109 cu ft (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; an exit signal push button, red in color; and individual air distribution outlets. These outlets shall be adjustable from fully closed to fully open position. A minimum of 26 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 using 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.

ALTERNATIVE

Parcel rack air conditioning will be provided.

TS 75.14 Vestibules/Doors Lighting (Transit Coach)

Floor surface in the aisles shall be a minimum of 10 fc, and the vestibule area a minimum of 4 fc with the front doors open and a minimum of 2 fc with the front doors closed. The front entrance area and curb lights shall illuminate when the front door is open and the master run switch is in the “lights” or “night run” position. Rear exit area and curb lights shall illuminate when the rear door is unlocked.

TS 75.15 Vestibules/Doors Lighting (Commuter Coach)

Floor surface in the aisles shall be a minimum of 2 fc, and the vestibule area in accordance with ADA requirements.

TS 75.16 Step Lighting

Step lighting for the intermediate steps between lower and upper floor levels shall be a minimum of 4 fc and shall illuminate in all vehicle run positions. The step lighting shall be low profile to minimize tripping and snagging hazards for passengers and shall be shielded as necessary to protect passengers’ eyes from glare.

TS 75.17 Ramp Lighting (Transit Coach)

Exterior and interior ramp lighting shall comply with federal regulations.

TS 75.18 Turntable Lighting (Articulated Coach)

Lighting in the turntable can be reduced to 7 fc.

TS 75.19 Farebox/Card Reader Lighting

TS 75.19.1 Transit Coach

DEFAULT (TRANSIT COACH)

Farebox Light

A light fixture shall be mounted in the ceiling above the farebox location. The fixture shall 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.

ALTERNATIVE (TRANSIT COACH)

No farebox light.

ALTERNATIVE (TRANSIT COACH)

Card Reader Light

A light fixture shall be mounted in the ceiling above the card reader location. The fixture shall be capable of projecting a concentrated beam of light on the card reader. 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.

ALTERNATIVE (TRANSIT COACH)

Provide a farebox and card reader light.

TS 75.19.2 Commuter Coach

DEFAULT (COMMUTER COACH)

No farebox light.

ALTERNATIVE (COMMUTER COACH)

Farebox Light

A light fixture shall be mounted in the ceiling above the farebox location. The fixture shall 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.

TS 76. Fare Collection

Space and structural provisions shall be made for installation of currently available fare collection devices, which shall be as far forward as practicable. Location of the fare collection device shall not restrict traffic in the vestibule, including wheelchairs if a front door loading device is used, and shall allow the driver to easily reach the farebox controls and to view the fare register. The farebox shall not restrict access to the driver’s area, shall not restrict operation of driver controls, and shall not—either by itself or in combination with stanchions, transfer mounting, cutting and punching equipment, or route destination signs—restrict the driver’s field of view per SAE J1050. The location and mounting of the fare collection device shall allow use, without restriction, by passengers. The farebox location shall permit accessibility to the vault for easy manual removal or attachment of suction devices. Meters and counters on the farebox shall be readable on a daily

basis. The floor under the farebox shall be reinforced as necessary to provide a sturdy mounting platform and to prevent shaking of the farebox.

Contractor shall provide fare collection installation layout to the Agency for approval.

Transfer mounting, cutting and punching equipment shall be located in a position convenient to the driver.

DEFAULT

Agency will install its own farebox/card reader.

ALTERNATIVE

Agency will specify a farebox/card reader for Contractor to install.

TS 77. Interior Access Panels and Doors (Transit Coach)

Access for maintenance and replacement of equipment shall be provided by panels and doors that appear to be an integral part of the interior. Access doors shall be hinged with gas props or overcenter springs, where practical, to hold the doors out of the mechanic's way. Panels shall prevent entry of mechanism lubricant into the bus interior. All fasteners that retain access panels shall be captive in the cover.

DEFAULT

Access Doors That Do Not Require Tools or Keys to Open

Access doors shall be secured with hand screws or latches. All fasteners that retain access panels shall be captive in the cover.

ALTERNATIVE

Access Doors with Locks

Access doors shall be secured with locks. The locks shall be standardized so that only one tool is required to open access doors on the bus.

TS 77.1 Floor Panels

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

The number of special fastener tools required for panel and access door fasteners shall be minimized.

PASSENGER ACCOMMODATIONS

TS 78. Passenger Seating

TS 78.1 Arrangements and Seat Style (Transit Coach)

The passenger seating arrangement in the bus shall be such that seating capacity is maximized and in compliance to the following requirements.

NOTE: The Agency recognizes that ramp location, foot room, hip-to-knee room, doorway type, width, seat construction, floor level type, seat spacing requirements, ramp or lift, number of wheelchair positions, etc. ultimately affect seating capacity and layout.

DEFAULT

Forward-Facing Seat Configuration

Passenger seats shall be arranged in a transverse, forward-facing configuration, except at the wheel housings and turntable, if applicable, 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).

ALTERNATIVE

Reclining seats.

ALTERNATIVE

Perimeter Seating Arrangement

Passenger seats shall be arranged in longitudinal rows facing the centerline of the bus. One row of transverse, forward-facing seats shall be provided at the rear of the bus. Each seat shall have a minimum width of 17 in., not including any armrest. Seating capacity with this arrangement shall be no fewer than [insert number] seated passengers, not including the driver, with the specified seating arrangement.

ALTERNATIVE

Combination Forward-Facing and Perimeter Seating Arrangement

Passenger seats shall be arranged in a transverse, two-position forward-facing configuration at the front section of the bus, and in longitudinal rows facing the centerline of the bus with one row of transverse, forward-facing seats provided at the rear of the bus. Each seat shall have a minimum width of 17 in., not including any armrest. Seating capacity with this arrangement shall be no fewer than [insert number] seated passengers, not including the driver, with the specified seating arrangement.

TS 78.2 Rearward Facing Seats (Transit Coach)

DEFAULT

Rearward facing seats not allowed.

ALTERNATIVE

Allow rearward facing seats.

TS 78.3 Turntable Seating (Articulated Coach)

DEFAULT

Handholds or leaning rail.

ALTERNATIVE

Seats.

TS 78.4 Padded Inserts/Cushioned Seats (Transit Coach)

DEFAULT

Non-Padded Inserts, Unupholstered

The passenger seats shall be equipped with unupholstered inserts throughout the bus.

ALTERNATIVE

Non-Padded Inserts, Upholstered

The seats shall be equipped with upholstered vandal-resistant inserts throughout the bus.

ALTERNATIVE

Padded Inserts

The passenger seats shall be equipped with padded inserts throughout the bus (measure to uncompressed surface).

ALTERNATIVE

Fully Cushioned Seats

The passenger seats shall be fully cushioned throughout the bus (measure to compressed surface, 150-lb person).

ALTERNATIVE

Combination Insert Seating Padded Inserts and Fully Cushioned

The passenger seats in the front section shall be equipped with inserts of choice and those in the rear (aft of the rear/exit door) shall be equipped with inserts of choice.

TS 78.5 Seat Back Configuration

DEFAULT

Back Insert Seat Configuration

The seat back insert thickness shall not exceed 1 in. in the knee room area.

ALTERNATIVE

Cushioned backs

Seating and interior trim shall have features to improve passenger comfort. The seat cushion and back shall be padded with a cellular foam product and be no less than ½ in. thick in areas contacted and loaded by passengers in the normal seated position and shall be covered with vinyl and/or fabric material.

Seats, back cushions and other pads shall be securely attached and shall be detachable by means of a simple release mechanism so that they are easily removable by the maintenance staff but not by passengers. To the extent practicable, seat cushions and pads shall be interchangeable throughout the bus. Materials shall have high resistance to tearing, flexing and wetting.

ALTERNATIVE

Cushioned Seat Configuration

Seating and interior trim shall have features to maximize passenger comfort. The seat cushion shall be supported by springs. The seat cushion and back shall be padded with a cellular foam product and be no less than 2 in. thick in areas contacted and loaded by passengers in the normal seated position and shall be upholstered with vinyl and/or fabric materials.

Seats, back cushions and other pads shall be securely attached and shall be detachable by means of a simple release mechanism so that they are easily removable by maintenance personnel but not by passengers. To the extent practicable, seat cushions and pads shall be interchangeable throughout the bus. Materials shall have high resistance to tearing, flexing and wetting.

ALTERNATIVE

Combination of Inserts

The passenger seats in the front section shall be equipped with [insert type] inserts, and those in the rear (aft of the rear/exit door) shall be equipped with [insert type] inserts.

TS 78.6 Drain Hole in Seats

DEFAULT

No requirements for drain hole provision in seat inserts.

ALTERNATIVE

Requirement for Drain Hole Provision in Seat Inserts

Provision, such as a small grommeted hole, to allow drainage shall be incorporated into seat insert. (Drain through hole, ¼ in. through hole, bottom seat only, one per seat.)

TS 78.7 Arrangements and Seat Style (Commuter Coach)

DEFAULT

Forward-Facing Seat Configuration

Passenger seats shall be arranged in forward-facing configuration with a minimum of 55 reclining and cushioned passenger seats. Contractor to provide seat layout to the Agency once the Agency has provided the seat manufacturer and model number.

ALTERNATIVE

Agency to specify options such as cup holder, head rests, foot rests, etc.

TS 78.8 Hip-to-Knee Room

Hip-to-knee room measured from the center of the seating position, from the front of one seat back horizontally across the highest part of the seat to a vertical surface immediately in front, shall be a minimum of 26 in. At all seating positions in paired transverse seats immediately behind other seating positions, hip-to-knee room shall be no less than 27 in.

TS 78.9 Foot Room

Foot room, measured at the floor forward from a point vertically below the front of the seat cushion, shall be no less than 14 in. Seats immediately behind the wheel housings and modesty panels may have foot room reduced (Agency will approve acceptable dimensions).

TS 78.10 Aisles (Transit Coach)

The aisle between the seats shall be no less than 22 in. wide at seated passenger hip height. Seat backs shall be shaped to increase this dimension to no less than 24 in. at 32 in. above the floor (standing passenger hip height).

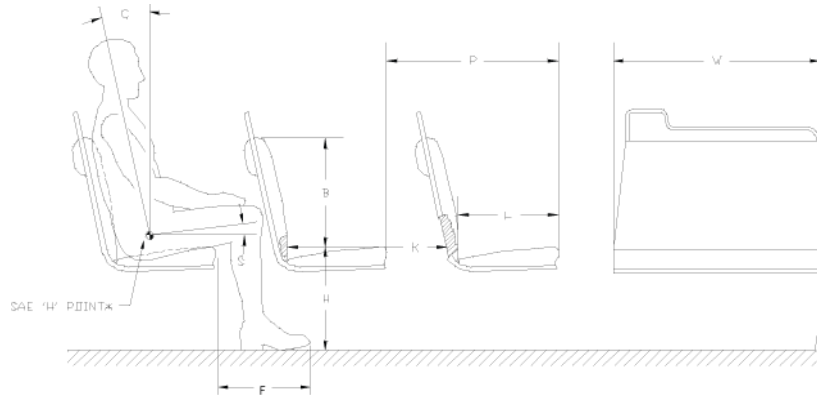
TS 78.11 Aisles (Commuter Coach)

The aisle between the seats shall be no less than 14 in. wide at seated passenger hip height.

TS 78.12 Dimensions (Transit Coach)

FIGURE 6

Seating Dimensions and Standard Configuration



DEFAULT

Seat dimensions for the various seating arrangements shall have the dimensions as follows (refer to **Figure 6**):

- The width, W, of the two-passenger transverse seat shall be a minimum 35 in.
- The length, L, shall be 17 in., ± 1 in.
- The seat back height, B, shall be a minimum of 15 in.
- The seat height, H, shall be 17 in., ± 1 in. For the rear lounge (or settee) and longitudinal seats, and seats located above raised areas for storage of underfloor components, a cushion height of up to 18 in., ± 2 in., will be allowed. This shall also be allowed for limited transverse seats, but only with the express approval of the Agency.
- Foot room = F.
- The seat cushion slope, S, shall be between 5 and 11 deg.
- The seat back slope, C, shall be between 8 and 17 deg.
- Hip to knee room = K.
- The pitch, P, is shown as reference only.

ALTERNATIVE

Agency to specify seat dimensions.

TS 78.13 Structure and Design (Transit Coach)

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

Seats, structures and restraints around the securement area should not infringe into the mobility device envelope or maneuverability.

The transverse seat structure shall be fully cantilevered from the sidewall with sufficient strength for the intended service. The lowest part of the seat assembly that is within 12 in. of the aisle shall be at least 10 in. above the floor.

In locations at which cantilevered installation is precluded by design and/or structure, other seat mounting may be allowed.

All transverse objects—including seat backs, modesty panels and longitudinal seats—in front of forward-facing seats shall not impart a compressive load in excess of 1000 lb onto the femur of passengers ranging in size from a 5th-percentile female to a 95th-percentile male during a 10g deceleration of the bus. This deceleration shall peak at 0.05 to 0.015 seconds from initiation. Permanent deformation of the seat resulting from two 95th-percentile males striking the seat back during this 10g deceleration shall not exceed 2 in., measured at the aisle side of the seat frame at height H. The seat back should not deflect more than 14 in., 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 shall not introduce a laceration hazard.

The seat assembly shall withstand static vertical forces of 500 lb applied to the top of the seat cushion in each seating position with less than ¼ in. permanent deformation in the seat or its mountings. The seat assembly shall withstand static horizontal forces of 500 lb evenly distributed along the top of the seat back with less than ¼ in. permanent deformation in the seat or its mountings. The seat backs at the aisle position and at the window position shall withstand repeated impacts of two 40 lb sandbags without visible deterioration. One sandbag shall strike the front 40,000 times and the other sandbag shall strike the rear 40,000 times. Each sandbag shall be suspended on a 36 in. pendulum and shall strike the seat back 10,000 times each from distances of 6, 8, 10 and 12 in. Seats at both seating positions shall withstand 4000 vertical drops of a 40 lb sandbag without visible deterioration. The sandbag shall be dropped 1000 times each from heights of 6, 8, 10 and 12 in. Seat cushions shall withstand 100,000 randomly positioned 3½ in. drops of a squirming, 150 lb, smooth-surfaced, buttocks-shaped 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 shall incorporate a handhold no less than 7⁄8 in. in diameter for standees and seat access/egress. The handhold shall not be a safety hazard during severe decelerations. The handhold shall extend above the seat back near the aisle so that standees shall have a convenient vertical assist, no less than 4 in. long, that may be grasped with the full hand. This handhold shall not cause a standee using this assist to interfere with a seated 50th-percentile male passenger. The handhold shall 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 shall be padded and/or constructed of energy-absorbing materials. During a 10g deceleration of the bus, the HIC number (as defined by SAE J211a) shall 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 a vertical assist is provided.

Longitudinal seats shall be the same general design as transverse seats but without seat back handholds. Longitudinal seats may be mounted on the wheelhouses. Armrests shall 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 driver's barrier or a modesty panel, when 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 3½ in. of the end of the seat cushion. Armrests shall be located from 7 to 9 in. above the seat cushion surface. The area between the armrest and the seat cushion shall be closed by a barrier or panel. The top and sides of the armrests shall have a minimum width of 1 in. and shall be free from sharp protrusions that form a safety hazard.

Seat back handhold and armrests shall withstand static horizontal and vertical forces of 250 lb applied anywhere along their length with less than ¼ in. permanent deformation. Seat back handhold and armrests shall withstand 25,000 impacts in each direction of a horizontal force of 125 lb with less than ¼ in. permanent deformation and without visible deterioration.

TS 78.14 Structure and Design (Commuter Coach)

Passenger seats shall be arranged in a transverse, forward-facing configuration.

No more than 10 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.

Seats shall be commuter coach reclining seats. Seat frames shall be constructed of high-strength, fatigue-resistant, welded steel with a durable powder-coated, corrosion-resistant colored finish that 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 a minimum of 1 in. to a maximum of 5 in. (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 a minimum of 36 in. and a maximum of 40.50 in. (1029 mm). Aisle shall not be less than 14 in. (356 mm) wide.

TS 78.15 Construction and Materials (Transit Coach)

Selected materials shall minimize damage from vandalism and shall reduce cleaning time. The seats shall be attached to the frame with tamper-resistant fasteners. Coloring shall be consistent throughout the seat material, with no visually exposed portion painted. Any exposed metal touching the sides or the floor of the bus shall be stainless steel. The seat, pads and cushions shall be contoured for individuality, lateral support and maximum comfort and shall fit the framework to reduce exposed edges.

The minimum radius of any part of the seat back, handhold or modesty panel in the head or chest impact zone shall be a nominal ¼ in. The seat back and seat back handhold immediately forward of transverse seats shall be constructed of energy-absorbing materials to provide passenger protection and, in a severe crash, to allow the passenger to deform the seating materials in the impact areas. Complete seat assemblies shall be interchangeable to the extent practicable.

TS 78.16 Construction and Materials (Commuter Coach)

Seat cushions shall be supported by steel serpentine springs. Seat covering shall be high-quality wool fabric or vinyl. Wool fabric shall be tested to a minimum of 60,000 rubs per the Wyzendeek test method.

Seat foam padding shall be polyurethane. Seat upholstery shall be able to be removed with ease for cleaning/replacement purposes.

DEFAULT

Agency to select seat fabric.

ALTERNATIVE

Contractor will select seat fabric on the basis of durability, ease of maintenance and pleasing texture and appearance.

TS 79. Passenger Assists (Transit Coach)

Passenger assists in the form of full grip, vertical stanchions or handholds shall be provided for the safety of standees and for ingress/egress. Passenger assists shall be convenient in location, shape and size for both the 5th-percentile female standee and the 95th-percentile male standee. Starting from the entrance door and moving anywhere in the bus and out the exit door, a vertical assist shall be provided either as the vertical portion of the 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 then the other without losing support. All handholds and stanchions at the front doorway, around the farebox, and at interior steps for bi-level designs shall be powder-coated in a high-contrast yellow color.

ALTERNATIVE

The forward-most vertical stanchions on either side of the aisle immediately behind the driver's area shall be powder-coated black.

ALTERNATIVE

The forward-most vertical stanchions on either side of the aisle immediately behind the driver's area shall be powder-coated yellow.

ALTERNATIVE

The forward-most vertical stanchions on either side of the aisle immediately behind the driver's area shall be a stainless steel finish.

TS 79.1 Assists (Transit Coach)

Excluding those mounted on the seats and doors, the assists shall have a cross-sectional diameter between 1¼ and 1½ in. or shall provide an equivalent gripping surface with no corner radii less than ¼ in. All passenger assists shall permit a full hand grip with no less than 1½ in. of knuckle clearance around the assist. Passenger assists shall be designed to minimize catching or snagging of clothes or personal items and shall be capable of passing the NHTSA Drawstring Test.

Any joints in the assist structure shall be underneath supporting brackets and securely clamped to prevent passengers from moving or twisting the assists. Seat handholds may be of the same construction and finish as the seat frame. Door-mounted passenger assists shall be of anodized aluminum, stainless steel or powder-coated metal. Connecting tees and angles may be powder-coated metal castings. Assists shall withstand a force of 300 lb applied over a 12 in. 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, shall be designed to eliminate pinching, snagging and cutting hazards and shall be free from burrs or rough edges.

TS 79.2 Front Doorway

Front doors, or the entry area, shall be fitted with ADA-compliant assists. Assists shall be as far outward as practicable, but shall be located no farther inboard than 6 in. from the outside edge of the entrance step 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, the vertical assist and the assists on the wheel housing or on the front modesty panel.

TS 79.3 Vestibule (Transit Coach)

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

A horizontal passenger assist shall be located across the front of the bus and shall 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 shall provide support for a boarding passenger from the front door through the fare collection procedure. The assist shall be no less than 36 in. above the floor. The assists at the front of the bus shall 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 driver's barrier, wheel housings or front modesty panel.

TS 79.4 Rear Doorway(s) (Transit Coach)

Vertical assists that are functionally continuous with the overhead assist shall 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 shall be provided on modesty panels that are functionally continuous with the rear door assists. Rear doors, or the exit area, shall be fitted with assists having a cross-sectional diameter between 1¼ and 1½ in. or providing an equivalent gripping surface with no corner radii less than ¼ in., and shall provide at least 1½ in. of knuckle clearance between the assists and their mounting. The assists shall be designed to permit a 5th-percentile female to easily move from one assist to another during the entire exiting process. The assists shall be located no farther inboard than 6 in. from the outside edge of the rear doorway step.

NOTE: For an articulated bus, passenger assists will be provided to aid in the transition between the front and rear sections of the bus.

TS 79.5 Overhead (Transit Coach)

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

DEFAULT

No requirements for overhead grab straps/extensions.

ALTERNATIVE

Grab straps or other extensions as necessary shall be provided for sections where vertical assists are not available and for use by passengers who cannot reach to 70 in.

DEFAULT

Grab straps shall be stainless steel.

ALTERNATIVE

Grab straps shall be fabric.

ALTERNATIVE

Grab straps shall be flip-up/non-flip.

ALTERNATIVE

Grab straps shall be leather.

ALTERNATIVE

Grab straps shall be plastic.

Overhead assists shall simultaneously support 150 lb on any 12 in. length. No more than 5 percent of the full grip feature shall be lost due to assist supports.

TS 79.6 Longitudinal Seat Assists (Transit Coach)

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

TS 79.7 Wheel Housing Barriers/Assists (Transit Coach)

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

TS 80. Passenger Doors

TS 80.1 Transit Coach

Doorways will be provided in locations and styles as follows. Passenger doors and doorways shall comply with ADA requirements.

TS 80.1.1 Front door

DEFAULT

Door shall be forward of the front wheels and under direct observation of the driver.

TS 80.1.2 Rear Door(s)

ALTERNATIVE

Curbside doorway centerline located rearward of the point midway between the front door centerline and the rearmost seat back.

ALTERNATIVE

Curbside doorway located behind the rear axle.

ALTERNATIVE

Street-side rearward of the point midway between the front door centerline and the rearmost seat back.

ALTERNATIVE

Street-side located behind the rear axle.

ALTERNATIVE (ARTICULATED BUS)

Curbside located forward of the rear axle of the trailer section.

ALTERNATIVE (ARTICULATED BUS)

Street-side located forward of the rear axle of the trailer section.

ALTERNATIVE (ARTICULATED BUS)

Curbside, located forward of the center axle.

In cases where street-side and curbside doors are chosen, provisions shall be made for operating the front door, curbside rear door(s) and street-side rear door(s) independently or in the combinations shown in **Table 7** while providing positive tactile feedback to the operator identifying the door control selection.

TABLE 7
Door Operating Combinations

| Front | Curbside Rear | Street-Side Rear |
|--------|---------------|------------------|
| Closed | Closed | Closed |
| Open | Closed | Closed |
| Open | Open | Closed |
| Open | Closed | Open |
| Open | Open | Open |
| Closed | Open | Closed |
| Closed | Closed | Open |
| Closed | Open | Open |

DEFAULT

If air-powered, the door system shall operate per specification at air pressures between 90 and 130 psi.

ALTERNATIVE

Electric-powered doors.

TS 80.2 Commuter Coach

TS 80.2.1 Front door

DEFAULT

Forward of the front wheels and under direct observation of the driver.

TS 80.3 Materials and Construction

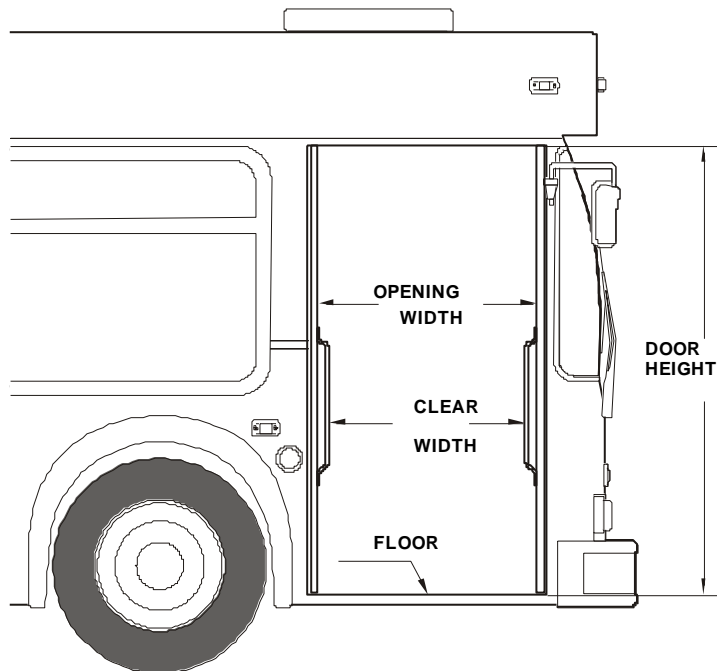
Structure of the doors, their attachments, inside and outside trim panels and any mechanism exposed to the elements shall be corrosion resistant. Door panel construction shall be of corrosion-resistant metal or reinforced non-metallic composite materials. When fully opened, the doors shall provide a firm support and shall not be damaged if used as an assist by passengers during ingress or egress. Door edges shall be sealed to prevent infiltration of exterior moisture, noise, dirt and air elements from entering the passenger compartment, to the maximum extent possible based on door types.

The closing edge of each door panel shall have no less than 2 in. of soft weather stripping. The doors, when closed, shall be effectively sealed, and the hard surfaces of the doors shall be at least 4 in. apart (not applicable to single doors). The combined weather seal and window glazing elements of the front door shall not exceed 10 deg of binocular obstruction of the driver's view through the closed door.

TS 80.4 Dimensions

TS 80.4.1 Transit Coach

FIGURE 7
Transit Bus Minimum Door Opening



When open, the doors shall leave an opening no less than 75 in. in height.

DEFAULT

31¾ in. Minimum Doorway Clear Width

Front door clear width shall be a minimum of 31¾ in. with the doors fully opened. Rear door opening clear width shall be a minimum of 24 in. with the doors fully opened. If a rear door ramp or lift is provided, then the clear door opening width shall be a minimum of 31¾ in. with door fully opened.

ALTERNATIVE

Doorway Clear Width Greater than 31¾ in.

The front door clear width shall be a minimum of [insert number] in. with the doors fully opened. The rear door clear width shall be a minimum of [insert number] in. with the doors fully opened.

If the Agency requires a minimum rear door clear width of 31¾ in. or greater and an outward opening (swing) door is specified, then the maximum outboard excursion of 13 in. may be exceeded.

TS 80.4.2 Commuter Coach

Minimum doorway width per ADA requirements.

TS 80.5 Door Glazing

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

Door glazing shall be easily replaceable.

DEFAULT

Zip type glazing rubber.

ALTERNATIVE

Quick change glazing exterior frame.

ALTERNATIVE

Full exterior glass quick change glazing hidden frame (tempered glass only).

ALTERNATIVE

Bonded or adhesive.

DEFAULT

The front door panel glazing material shall have a nominal ¼ in. thick laminated safety glass conforming with the requirements of ANSI Z26.1 Test Grouping 2 and the recommended practices defined in SAE J673.

ALTERNATIVE

The front door panel glazing material shall have a nominal ¼ in. thick tempered glass conforming with 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 shall be defined by the Agency.

TS 80.6 Door Projection (Transit Coach)

TS 80.6.1 Exterior

The exterior projection of the front doors beyond the side of the bus shall be minimized and shall not block the line of sight of the rear exit door via the curbside mirror when the doors are fully open. The exterior projection of both doors shall be minimized and shall not exceed 14 in. during the opening or closing cycles or when doors are fully opened.

TS 80.6.2 Interior

Projection inside the bus shall not cause an obstruction of the rear door mirror or cause a hazard for standees.

TS 80.7 Door Height Above Pavement

It shall be possible to open and close either passenger door when the bus, loaded to gross vehicle weight rating, is not knelt and parked with the tires touching an 8 in. high curb on a street sloping toward the curb so that the street-side wheels are 5 in. higher than the right-side wheels.

TS 80.8 Closing Force

Closing door edge speed shall not exceed 12 in. per second, and opening door speed shall not exceed 19 in. per second. Power doors shall not slam closed under any circumstance, even if the door is obstructed during the closing cycle. If a door is obstructed during the closing cycle, the pressure exerted on the obstruction shall not increase once initial contact has been made.

Doors closed by a return spring or counterweight-type device shall be equipped with an obstruction-sensing device that, at a minimum, alerts the driver if an obstruction is detected between the closing doors. Doors closed by a return spring or counterweight type device, when unlocked, shall be capable of being pushed to the point where the door starts to open with a force not to exceed 25 lb applied to the center edge of the forward door panel.

Whether or not the obstruction-sensing system is present or functional, it shall be possible to withdraw a 1½ in. diameter cylinder from between the center edges of a closed and locked door with an outward force not greater than 35 lb.

TS 80.8.1 Rear Door Closing Force (Transit Coach)

Power-close rear doors shall be equipped with an obstruction-sensing system such that if an obstruction is within the path of the closing doors, the doors will stop and/or reverse direction prior to imparting a 10 lb force on 1 sq in. of that obstruction. If a contactless obstruction sensing system is employed, then it shall be capable of discriminating between the normal doorway environment and passengers or other obstructions within the doorway, and of altering the zones of detection based upon the operating state of the door system.

TS 80.9 Actuators

Doors shall open or close completely in not more than 3.5 seconds from the time of control actuation and shall be subject to the closing force requirements.

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

Door actuators and associated linkages shall maximize door holding forces in the fully open and fully closed positions to provide firm, non-rattling, non-fluttering door panels while minimizing the force exerted by the doors on an obstruction midway between the fully open and closed positions.

DEFAULT

The rear door actuator(s) shall be under the complete control of the vehicle operator and shall open and close in response to the position of the driver's door control.

ALTERNATIVE

The rear doors shall be passenger-controlled. The vehicle operator shall unlock and enable the opening mechanism, which shall be annunciated by illumination of a green light near the door. After enabling and unlocking, the doors shall be opened by either the passenger manually pushing the door open, or by a powered mechanism actuated by passenger activation of a touch bar or touch switch, or by passenger activation of a contactless sensing system. A switch located within reach of the seated operator shall, when actuated, restore rear door function to complete operator control, as described in the Default.

Doors that employ a “swing” or pantograph geometry and/or are closed by a return spring or counterweight-type device shall be equipped with a positive mechanical holding device that automatically engages and prevents the actuation mechanism from being back-driven from the fully closed position. The holding device shall be overcome only when the driver’s door control is moved to an “Exit Door Enable” position and the vehicle is moving at a speed of less than 2 mph, or in the event of actuation of the emergency door release.

Locked doors shall require a force of more than 300 lb to open manually. When the locked doors are manually forced to open, damage shall be limited to the bending of minor door linkage with no resulting damage to the doors, actuators or complex mechanism.

TS 80.9.1 Actuator (Commuter Coach)

The nominal door opening and closing speed shall be in the 3 to 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.

TS 80.10 Emergency Operation

In the event of an emergency, it shall be possible to manually open doors designated as emergency exits from inside the bus using a force of no more than 25 lb after actuating an unlocking device. The unlocking device shall be clearly marked as an emergency-only device and shall require two distinct actions to actuate. The respective door emergency unlocking device shall be accessible from the doorway area. The unlocking device shall be easily reset by the operator without special tools or opening the door mechanism enclosure. Doors that are required to be classified as “emergency exits” shall meet the requirements of FMVSS 217.

TS 80.11 Door Control

The door control shall be located in the operator’s area within the hand reach envelope described in SAE J287, “Driver Hand Control Reach.” The driver’s door control shall provide tactile feedback to indicate commanded door position and resist inadvertent door actuation.

DEFAULT

Door control located on street side.

ALTERNATIVE

Location as specified by Agency.

DEFAULT

The front door shall remain in commanded state position even if power is removed or lost.

ALTERNATIVE

As specified by Agency.

TS 80.12 Door Controller**TS 80.12.1 Transit Coach****DEFAULT****Five-Position Driver's Door Controller**

The control device shall be protected from moisture. Mounting and location of the door control device handle shall be designed so that it is within comfortable, easy arm's reach of the seated driver. The door control device handle shall be free from interference by other equipment and have adequate clearance so as not to create a pinching hazard.

Position of the door control handle shall result in the following operation of the front and rear doors:

- **Center position:** Front door closed, rear door(s) closed or set to lock.
- **First position forward:** Front door open, rear door(s) closed or set to lock.
- **Second position forward:** Front door open, rear door(s) open or set to open.
- **First position back:** Front door closed, rear door(s) open or set to open.
- **Second position back:** Front door open, rear door(s) open or set to open.

ALTERNATIVE**Push-Button Door Controls**

Doors shall be operated by push-button controls, conveniently located and operable within the driver's reach. The push buttons shall be labeled. There shall be a separate set of push-button controls for the front and rear door(s), as needed.

ALTERNATIVE

Two-position switch for front door only.

TS 80.12.2 Commuter Coach

Doors shall be operated by push-button controls, conveniently located and operable within the driver's reach. The push buttons shall be labeled.

TS 80.13 Door Open/Close**ALTERNATIVE****Operator-Controlled Front and Rear Doors (if Applicable)**

Operation of, and power to, the passenger doors shall be completely controlled by the operator.

ALTERNATIVE (TRANSIT COACH)

Operator-Controlled Front and Passenger-Controlled Rear Doors

Operation of, and power to, the front passenger doors shall be completely controlled by the operator. Power to rear doors shall be controlled by the operator. After enabling, the rear doors shall be opened by the passenger.

ALTERNATIVE (TRANSIT COACH)

Operator-Controlled Front and Passenger-Controlled Rear Doors with Provision for Driver Override

Operation of, and power to, the front passenger doors shall be completely controlled by the operator. Power to rear doors shall be controlled by the operator. After enabling, the rear doors shall be opened by the passenger. A switch shall be provided to enable the driver to obtain full control of the rear doors.

DEFAULT

A control or valve in the operator's compartment shall 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 shall close the rear/center doors (if applicable), deactivate the door control system, release the interlocks and permit only manual operation of the rear/center doors.

ALTERNATIVE

An exterior door control switch shall be installed. An air dump valve shall be accessible from the exterior of the bus.

TS 81. Accessibility Provisions

Space and body structural provisions shall be provided at the front or rear door of the bus to accommodate a wheelchair loading system.

TS 81.1 Loading Systems

There are three options:

- high-floor lift
- low-floor ramp
- platform (boarding bridge plate) level boarding

TS 81.2 Lift/ramp

The wheelchair lift control system must be capable of receiving multiplex commands from vehicle interlocks.

An automatically controlled, power-operated wheelchair lift system compliant to requirements defined in 49 CFR 571.403 (FMVSS 403) shall 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.

DEFAULT

Wheelchair lift or ramp mounted in front step well.

ALTERNATIVE

Wheelchair lift or ramp mounted in rear center door location.

ALTERNATIVE**Folding Ramp**

When the system is not in use, the passageway shall appear normal. In the stored position of the ramp, no tripping hazards shall be present, and any resulting gaps shall be minimized. The controls shall be simple to operate with no complex phasing operations required, and the loading system operation shall be under the surveillance and complete control of the driver. If the loading system and controls are at the rear doors, then a keyed switch shall be provided in the driver's area to disable the loading system. The bus shall be prevented from moving during the loading or unloading cycle by a throttle and brake interlock system. The loading system shall be inhibited from stowing/deploying when a passenger is on the ramp/platform. A passenger departing or boarding via the ramp shall be able to easily obtain support by grasping the passenger assist located on the doors or other assists provided for this purpose. The platform shall be designed to protect the ramp from damage and people on the sidewalk from injury during the extension/retraction or lowering/raising phases of operation.

The loading platform shall be covered with a replaceable or renewable nonskid material and shall be fitted with devices to prevent the wheelchair from rolling off the sides during loading or unloading.

Deployment or storage of the ramp shall require no more than 15 seconds. The device shall function without failure or adjustment for 500 cycles or 5000 miles in all weather conditions on the design operating profile when activated once during the idle phase. A manual override system shall permit unloading a wheelchair and storing the device in the event of a primary power failure. The manual operation of the ramp shall not require more than 35 lb of force.

ALTERNATIVE**Heavy-Duty Ramp System**

Power units must meet other spec requirements (hydraulic or electric).

TS 81.3 Loading System for 30 to 60 ft Low-Floor Bus

An automatically controlled, power-operated ramp system compliant to requirements defined in 49 CFR Part 38, Subpart B, §38.23c shall 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.

DEFAULT**Front Door Location of Loading System, Flip-Out Design Ramp with 6:1 Slope**

The wheelchair loading system shall be located at the front door, with the ramp being of a simple hinged, flip-out type design being capable of deploying to the ground at a maximum 6:1 slope.

ALTERNATIVE

Rear/Center Door Location of Loading System, Flip-Out Design Ramp with 4:1 Slope

The wheelchair loading system shall be located at the rear/center door, with the ramp being of a simple hinged, flip-out type design being capable of deploying to the ground at a maximum 4:1 slope.

ALTERNATIVE

Front Door Location of Loading System, Flip-Out Design Ramp with 6:1 Slope

The wheelchair loading system shall be located at the rear door, with the ramp being a flip-out type design being capable of deploying to the ground at a maximum 6:1 slope.

ALTERNATIVE

Rear/Center Door Location of Loading System, Flip-Out Design Ramp with 6:1 Slope

The wheelchair loading system shall be located at the rear/center door, with the ramp being a flip-out type design being capable of deploying to the ground at a maximum 6:1 slope.

TS 81.4 Loading System for Level Boarding on a 45 to 60 ft Low-Floor BRT

For level-entry boarding in applications such as BRT, where the vertical transition from the vehicle floor and the boarding and alighting surface is no more than 3 in., a bridge plate shall be used. Bridge plates 30 in. or longer shall support a load of 600 lb, placed at the centroid of the ramp or bridge plate distributed over an area of 26 × 26 in., with a safety factor of at least 3, based on the ultimate strength of the material. Bridge plates shorter than 30 in. shall support a load of 300 lb. When deployed to boarding and alighting surface, the slope of the bridge plate shall not exceed 6:1.

DEFAULT

Front Door Location of Bridge Plate Loading System

The bridge plate loading system shall be located at the front door.

ALTERNATIVE

Rear Door Location of Bridge Plate Loading System

The bridge plate loading system shall be located at the rear/center door.

TS 81.5 Wheelchair Accommodations

All passenger securement devices must be stowed off the floor and out of the way when not in use.

NOTE: Agency will approve acceptable securement system.

DEFAULT

Two Forward-Facing Wheelchair Securement Locations

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

ALTERNATIVE

Additional (Beyond Two) Number of Wheelchair Securement Locations

[insert number] forward-facing location(s), as close to the wheelchair loading system as practical, shall provide parking space and securement system compliant with ADA requirements for a passenger in a wheelchair.

ALTERNATIVE

Non-Forward Facing

All passenger securement devices must be stowed off the floor and out of the way when not in use.

TS 81.6 Interior Circulation

Maneuvering room inside the bus shall be compliant with 49 CFR Part 38, Subpart B, §38.29 and accommodate easy travel for a passenger in a wheelchair from the loading device and from the designated securement area. It shall be designed so that no portion of the wheelchair protrudes into the aisle of the bus when parked in the designated parking space(s). When the positions are fully utilized, an aisle space of no less than 22 in. shall be maintained. As a guide, no width dimension should be less than 34 in. Areas requiring 90 deg turns of wheelchairs should have a clearance arc dimension no less than 45 in., and in the parking area where 180 deg turns are expected, space should be clear in a full 60 in. diameter circle. A vertical clearance of 12 in. above the floor surface should be provided on the outside of turning areas for wheelchair footrests.

TS 82. Wheelchair Lifts (Commuter Coach)

TS 82.1 Lift

A travel lift and two forward-facing mobility device securement areas 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 to 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/propulsion system 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 handheld pendant.

The lift shall include a hinged platform to bridge the coach floor to the lift platform. The bridge shall be hinged and locked in an upward position to act as a barrier when the lift is in use. The bridge shall also allow lift passenger 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 ensure 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 push-button switch on the controller to immediately stop 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 luggage bay door. The handle shall be stored adjacent to the pump to allow immediate usage.

TS 82.2 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 vehicle 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 vehicle 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.

The lift storage door shall not block the visual observation to the lift assembly while using 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 luggage door is a preferred design.

TS 82.3 Lift Width

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 an 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 wheelchair securement positions.

Each coach shall have adequate information decals installed that detail the proper lift operation in both the normal and manual modes of operation.

TS 82.4 Lighting Requirements

Lighting for the lift areas shall be designed to meet Title 13 and 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 6 candlepower a distance of 3 ft beyond the external dimensions of the lift platform once deployed and lowered. Additional lighting shall be provided to ensure illumination of the instruction placard and the manual override pump when it is in use.

TS 82.5 Securement System

The vehicle interior shall permit the securement of two forward-facing wheelchair passengers in which the primary position shall be on the street side of the coach directly across from the lift. Securement areas shall be a minimum 30 × 48 in. as required by the ADA.

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. A minimum 10.5 in. high barrier shall also be provided at the rear of the lift area for additional passenger protection.

TS 82.6 Roof Ventilation/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.

ALTERNATIVE

A rear egress window can replace a rooftop escape hatch.

ALTERNATIVE

A single rooftop escape hatch.

SIGNAGE AND COMMUNICATION

TS 83. Destination Signs

DEFAULT

A destination sign system shall be furnished on the front, on the right side near the front door.

ALTERNATIVE

Route sign on the rear of the vehicle.

ALTERNATIVE

Street and Curbside Route Sign

The sign located near the front door shall not block the driver's critical horizontal line of sight. Display areas of destination signs shall be clearly visible in direct sunlight and/or at night. Parts shall be commercially available.

All signs shall be controlled via a single human-machine interface (HMI). In the absence of a single mobile data terminal (MDT), the HMI shall be conveniently located for the bus driver within reach of the seated driver.

DEFAULT

The driver shall be able to access the sign while seated.

ALTERNATIVE

The sign shall not be located within reach of the seated driver.

DEFAULT

The destination sign compartments shall meet the following minimum requirements:

- Compartments shall be designed to prevent condensation and entry of moisture and dirt.
- Compartments shall be designed to prevent fogging of both compartment window and glazing on the unit itself.
- Access shall be provided to allow cleaning of inside compartment window and unit glazing.
- The front window shall have an exterior display area of no less than 8.5 in. high by 56 in. wide.

ALTERNATIVE

No active defogging required.

ALTERNATIVE

Run number sign shall be installed.

TS 84. Passenger Information and Advertising (Transit Coach)

TS 84.1 Interior Displays

Provisions shall be made on the rear of the driver's barrier or equipment box located on the wheel well for a frame to retain information such as routes and schedules.

Advertising media 11 in. high and 0.09 in. thick shall be retained near the juncture of the bus ceiling and sidewall. The retainers may be concave and shall support the media without adhesives. The media shall be illuminated by the interior light system.

TS 84.2 Exterior Displays

Provisions shall be made to integrate advertising into the exterior design of the bus. Advertising media, frames or supporting structures shall not detract from the readability of destination signs and signal lights, and shall not compromise passenger visibility. Advertising provisions shall not cause pedestrian hazards or foul automatic bus washing equipment, and shall not cover or interfere with doors, air passages, vehicle fittings or in any other manner restrict the operation or serviceability of the bus.

TS 85. Passenger Stop Request/Exit Signal

TS 85.1 Transit Coach

DEFAULT

Touch Tape Passenger Signal

A passenger “stop requested” signal system that complies with applicable ADA requirements defined in 49 CFR, Part 38.37, shall be provided. The system shall consist of a touch tape, chime and interior sign message. The touch tape shall be accessible to all seated passengers, with provisions for standees. It shall be easily accessible to all passengers, seated or standing. Vertical touch tape shall be provided at each window mullion and adjacent to each wheelchair parking position and in priority seating positions.

ALTERNATIVE

Pull Cord Passenger Signal

A passenger “stop requested” signal system that complies with applicable ADA requirements defined in 49 CFR, Part 38.37, shall be provided. The system shall consist of a heavy-duty pull cable, chime and interior sign message. The pull cable shall 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, then the height of the pull cable shall approximate this transom level and shall be no greater than 63 in. as measured from the floor surface. It shall be easily accessible to all passengers, seated or standing. Pull cable(s) shall activate one or more solid state or magnetic proximity switches. At each wheelchair passenger position and at priority seating positions, additional provisions shall be included to allow a passenger in a mobility aid to easily activate the “stop requested” signal.

An auxiliary passenger “stop requested” signal shall be installed at the rear door to provide passengers standing in the rear door/exit area a convenient means of activating the signal system. The signal shall be a heavy-duty push button type located in the rear door vicinity. Button shall be clearly identified as “passenger signal.”

DEFAULT

No requirements for additional “stop request” button on rear door stanchion.

ALTERNATIVE

Additional “Stop Request” Button on Rear Door Stanchion

A heavy-duty “stop request” signal button shall be installed on the modesty panel stanchion immediately forward of the rear door and clearly identified as “STOP.”

ALTERNATIVE

“Stop request” signal buttons shall be available at intervals to be determined by the Agency.

TS 85.2 Commuter Coach

A heavy-duty “stop request” signal button shall be installed at every seat location except the rear cross seat.

TS 85.3 Signal Chime

DEFAULT (TRANSIT COACH)

A single “stop requested” chime shall sound when the system is first activated. A double chime shall sound anytime the system is activated from wheelchair passenger areas.

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

ALTERNATIVE (TRANSIT COACH)

Passenger signal system shall be arranged with push-button switches accessible by each seated passenger and on stanchions and at rear door locations for standees.

DEFAULT (COMMUTER COACH)

A single “stop requested” chime shall sound when the system is first activated. A double chime shall sound anytime the system is activated from wheelchair passenger areas.

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

ALTERNATIVE (COMMUTER COACH)

Agency to specify the stop request system for wheelchair seating area

TS 86. Communications

TS 86.1 Camera Surveillance System

DEFAULT

No surveillance system provisions required.

ALTERNATIVE

Provide all wiring and mounting locations for a multi-camera surveillance system for the later provision of and installation of cameras, recorder, microphone, etc. Agency to specify the camera system cable to be installed, the locations for pre-wiring and the quantity.

ALTERNATIVE

Provide all wiring and mounting locations for a multi-camera surveillance system, including the installation of cameras, recorder, microphone, etc.

TS 86.2 Public Address System

A public address system shall be provided on each bus for facilitating radio system and driver-originated announcements to passengers.

TS 86.2.1 Speakers

DEFAULT

[insert number] interior loudspeakers shall be provided, semi-flush mounted, on alternate sides of the bus passenger compartment, installed with proper phasing. Total impedance seen at the input connecting end shall be 8 ohms. Mounting shall be accomplished with riv-nuts and machine screws.

ALTERNATIVE

The speaker cable shall terminate at the instrument panel area on the curb side with a minimum of 3 ft of extra speaker cable. An end connector shall be supplied so a lead can be connected from the radio control head in order to make announcements directly from the transit control center to passengers through the PA system.

TS 86.3 Automatic Passenger Counter (APC)

DEFAULT

No APC system shall be installed.

ALTERNATIVE

An infrared APC system shall be installed. Agency to provide details of APC system, including installation locations and number of buses to be equipped.

TS 86.4 Radio Handset and Control System

TS 86.4.1 Driver's Speaker

Each bus shall have a recessed speaker in the ceiling panel above the driver. This speaker shall be the same component used for the speakers in the passenger compartment. It shall have 8 ohms of impedance.

TS 86.4.2 Handset

Contractor will install a handset for driver use.

TS 86.4.3 Driver Display Unit (DDU)

Contractor shall install a driver display unit as close to the driver's instrument panel as possible.

TS 86.4.4 Emergency Alarm

Contractor shall install an emergency alarm that is accessible to the driver but hidden from view.

TS 87. Event Data Recorder (EDR)

DEFAULT

No EDR shall be installed.

ALTERNATIVE

EDRs shall be installed on the bus, one at the front and the other at the rear. These units are to be installed as low as possible. The EDRs shall be able to communicate over the J1939 CAN line and shall each be equipped with three-axis accelerometers. Settings are to be finalized with the Agency during pre-production. EDRs shall broadcast via the J1939 data communication link severe impact events to the vehicle monitoring system and also trigger an event in the camera system. The EDR shall also tag an event from a signal received over the J1939 CAN line from the silent alarm switch signal and the camera event button and in turn broadcast these events to the vehicle monitoring system. The EDR shall also record the following operational data: headlights on or off, turn signals and hazard lights on or off, ignition on or off, low air pressure warning, whether moving in forward or reverse or idling, and whether parking brake is on or off.

TS 88. Approved Equals

Table 8 lists products that have been approved for the bus procurement. The list contains products that are of interest to the Agency and is not intended to be a comprehensive listing of every product required for the manufacture of the subject buses. Product categories not listed are left to the discretion of the Contractor so long as the product complies with the specifications. Product specification information is for reference only and may not reflect the latest or future improvements by manufacturers. Any change, revision or substitution of specified products requires approval of the agency. To add to or revise this list, Contractor must submit a written request per the Specification by the due date found in the RFP for approved equals.

NOTE: Transit agencies are encouraged to list as many suppliers as possible.

TABLE 8
Approved Equals Products

| Product | Manufacturer | Product Specification |
|---------|--------------|-----------------------|
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SECTION 7: WARRANTY REQUIREMENTS

WR 1. Basic Provisions

WR 1.1 Warranty Requirements

WR 1.1.1 Contractor Warranty

Warranties in this document are in addition to any statutory remedies or warranties imposed on the Contractor. Consistent with this requirement, the Contractor warrants and guarantees to the original Agency each complete bus and specific subsystems and components as follows. Performance requirements based on design criteria shall not be deemed a warranty item.

WR 1.1.2 Complete Bus (Diesel, CNG, Hybrid)

The complete bus, propulsion system, components, major subsystems and body and chassis structure are warranted to be free from Defects and Related Defects for one year or 50,000 miles, whichever comes first, beginning on the date of revenue service but not longer than 15 days after acceptance under “Inspection, Testing and Acceptance.” The warranty is based on regular operation of the bus under the operating conditions prevailing in the Agency’s locale.

WR 1.1.3 Complete Bus (All Electric)

DEFAULT

The complete bus, propulsion system, components, major subsystems and body and chassis structure are warranted to be free from Defects and Related Defects for one year or 50,000 miles, whichever comes first, beginning on the date of revenue service but not longer than 15 days after acceptance under “Inspection, Testing and Acceptance.” The warranty is based on regular operation of the bus under the operating conditions prevailing in the Agency’s locale.

ALTERNATIVE

The complete bus, propulsion system, components, major subsystems and body and chassis structure are warranted to be free from Defects and Related Defects for two years or 100,000 miles, whichever comes first, beginning on the date of revenue service but not longer than 15 days after acceptance under “Inspection, Testing and Acceptance.” The warranty is based on regular operation of the bus under the operating conditions prevailing in the Agency’s locale.

WR 1.1.4 Body and Chassis Structure

Body, body structure, structural elements of the suspension and engine cradle are warranted to be free from Defects and Related Defects for three years or 150,000 miles, whichever comes first.

Primary load-carrying members of the bus structure, including structural elements of the suspension, are warranted against corrosion failure and/or Fatigue Failure sufficient to cause a Class 1 or Class 2 Failure for a period of 12 years or 500,000 miles, whichever comes first.

WR 1.1.5 Propulsion System (Diesel, CNG, Hybrid)

Propulsion system components, including the engine, transmission or drive motors, and generators (for hybrid technology) and drive and non-drive axles shall be warranted to be free from Defects and Related Defects for the standard two years or 100,000 miles, whichever comes first. An Extended Warranty to a maximum of five

years or 300,000 miles, whichever comes first, may be purchased at an additional cost. The propulsion system manufacturer's standard warranty, delineating items excluded from the Extended Warranty, should be submitted in accordance with the Request for Pre-Offer Change or Approved Equal or with the Form for Proposal Deviation.

WR 1.1.6 Propulsion System (All Electric)

ALTERNATIVE

Propulsion system components, including the traction motor(s), traction motor controller(s), transmission, drive motors, drive and non-drive axles, and any other propulsion system-related line replacement components, shall be warranted to be free from Defects and Related Defects for the standard 12 years or 500,000 miles, whichever comes first. The propulsion system manufacturer's standard warranty, delineating items excluded from the Extended Warranty, should be submitted in accordance with the Request for Pre-Offer Change or Approved Equal or with the Form for Proposal Deviation.

ALTERNATIVE

Propulsion system components, including the traction motor(s), traction motor controller(s), transmission, drive motors, drive and non-drive axles, and any other propulsion system-related line replacement components, shall be warranted to be free from Defects and Related Defects for the standard six years or 300,000 miles, whichever comes first. An optional Extended Warranty of 12 years or 500,000 miles, whichever comes first, shall be submitted with the proposal. The propulsion system manufacturer's standard warranty, delineating items excluded from the Extended Warranty, should be submitted in accordance with the Request for Pre-Offer Change or Approved Equal or with the Form for Proposal Deviation.

ALTERNATIVE

OEM shall provide information on standard warranties and available extended warranty options

WR 1.1.7 Energy Storage System (All Electric or Hybrid)

ALTERNATIVE

The energy storage system (ESS), including the traction battery, battery management system and any other ESS-related line replacement component, shall be warranted to be free from Defects and Related Defects for 12 years or 500,000 miles, whichever comes first, beginning on the date of bus acceptance under "Inspection, Testing and Acceptance," per this RFP. The ESS shall also be warranted for 12 years or 500,000 miles, whichever comes first, to remain within warrantable end of life. The ESS original specified energy storage capacity and Warrantable End of Life (see definition of Warrantable End of Life in section TS.2), as a percentage of the original specified energy capacity, shall be clearly defined by the Proposer. Acceptable methods for measuring or obtaining ESS storage capacity with respect to its original specified capacity shall be clearly identified by the Manufacturer. The Manufacturer will propose the test method and certify that the results are true and accurate. The test will be performed according to a documented test procedure. The Agency is allowed to engage third parties for capacity testing. If applicable, the proposal shall include a comprehensive statement of any additional warranty terms relating to the ESS, including explanation of all disclaimers within the warranty.

ALTERNATIVE

The energy storage system (ESS), including the traction battery, battery management system and any other ESS-related line replacement component, shall be warranted to be free from Defects and Related Defects for six years or 300,000 miles, whichever comes first, beginning on the date of bus acceptance under “Inspection, Testing and Acceptance,” per this RFP. The ESS shall also be warranted for six years or 300,000 miles, whichever comes first, to remain within warrantable end of life. An optional Extended Warranty of 12 years or 500,000 miles shall be submitted with the proposal. The ESS original specified energy storage capacity and Warrantable End of Life (see definition of Warrantable End of Life in section TS.2), as a percentage of the original specified energy capacity, shall be clearly defined by the Proposer. Acceptable methods for measuring or obtaining ESS storage capacity with respect to its original specified capacity shall be clearly identified by the Manufacturer. The Manufacturer will propose the test method and certify that the results are true and accurate. The test will be performed according to a documented test procedure. The Agency is allowed to engage third parties for capacity testing. If applicable, the proposal shall include a comprehensive statement of any additional warranty terms relating to the ESS, including explanation of all disclaimers within the warranty.

ALTERNATIVE

The Energy Storage System (ESS) shall be leased. The Energy Storage System (ESS), including the traction battery, Battery Management System, and any other ESS-related line replacement component, shall be warranted to be free from Defects and Related Defects for the term of the ESS lease. The ESS shall also be warranted for the term of the lease to remain within Warrantable End Of Life (see definition of Warrantable End of Life in section TS.2). The ESS original specified energy storage capacity and Warrantable End of Life, as a percentage of the original specified energy capacity, shall be clearly defined by the Proposer. Acceptable methods for measuring or obtaining ESS storage capacity with respect to its original specified capacity shall be clearly identified by the manufacturer. The manufacturer will propose the test method, and certify the results are true and accurate. The test will be performed according to a documented test procedure. The Agency is allowed to engage third-parties for capacity testing. If applicable, the proposal shall include a comprehensive statement of any additional warranty terms relating to the ESS, including explanation of all disclaimers within the warranty.

WR 1.1.8 Emission Control System (ECS)

The Contractor warrants the emission control system for five years or 100,000 miles, whichever comes first. The ECS shall include, but is not limited to, the following components:

- complete exhaust system, including catalytic converter (if required)
- after treatment device
- components identified as emission control devices

WR 1.1.9 Subsystems

The following subsystems shall be warranted to be free from Defects and Related Defects for two years or 100,000 miles, whichever comes first:

- Brake system: Foundation brake components, including advancing mechanisms, as supplied with the axles, excluding friction surfaces

- Destination signs: All destination sign equipment for the front, side and rear signs, power modules and operator control
- Heating, ventilating: Roof and/or rear main unit only, excluding floor heaters and front defroster
- AC unit and compressor: Roof and/or rear main unit only, excluding floor heaters and front defroster
- Door systems: Door operating actuators and linkages
- Air compressor
- Air dryer
- Wheelchair lift and ramp system: Lift and/or ramp parts and mechanical only
- Starter
- Alternator: Alternator only; does not include the drive system.
- Charge air cooler: Charge air cooler including core, tanks and including related surrounding framework and fittings
- Fire suppression: Fire suppression system including tank and extinguishing agent dispensing system
- Hydraulic systems: Including radiator fan drive and power steering as applicable
- Propulsion system cooling systems: Radiator including core, tanks and related framework, including surge tank and transmission cooler
- Power electronics: DC/DC converters, inverters, if supplied
- Passenger seating excluding upholstery
- Fuel storage and delivery system
- Surveillance system including cameras and video recorders

The following subsystems shall be warranted to be free from Defects and Related Defects for 12 years or 500,000 miles, whichever comes first:

- Low-voltage and high-voltage electrical wiring and harnesses (12 years)

WR 1.1.10 Extended Warranty

The Agency requires the following additional subsystems to be warranted to be free from Defects and Related Defects for two years or 100,000 miles, whichever comes first.

[Insert as appropriate]

WR 1.1.11 Serial Numbers

Upon delivery of each bus, the Contractor shall provide a complete electronic list of serialized units installed on each bus to facilitate warranty tracking. If supplied with the bus, the list shall include but is not limited to the following:

- Engine or traction motor(s)
- Propulsion system controller/inverter(s)
- Energy storage pack(s) or module(s)
- Power electronics: DC/DC converters, inverters
- Transmission
- Alternator
- Starter
- HVAC system and major components
- Drive axle
- Power steering unit
- Fuel cylinders (if applicable)

- Air compressor
- Wheelchair ramp (if applicable)

The Contractor shall provide updated serial numbers resulting from warranty campaigns. The format of the list shall be approved by the Agency prior to delivery of the first production bus.

WR 1.1.12 Extension of Warranty

If, during the warranty period, repairs or modifications on any bus are made necessary by defective design, materials or workmanship but are not completed due to lack of material or inability to provide the proper repair for thirty (30) calendar days, then the applicable warranty period shall be extended by the number of days equal to the delay period.

WR 1.2 Voiding of Warranty

The warranty shall not apply to the failure of any part or component of the bus that directly results from misuse, negligence, accident or repairs not conducted in accordance with the Contractor-provided maintenance manuals and with workmanship performed by adequately trained personnel in accordance with recognized standards of the industry. The warranty also shall be void if the Agency fails to conduct normal inspections and scheduled preventive maintenance procedures as recommended in the Contractor's maintenance manuals and if that omission caused the part or component failure. The Agency shall maintain documentation, auditable by the Contractor, verifying service activities in conformance with the Contractor's maintenance manuals.

WR 1.3 Exceptions and Additions to Warranty

The warranty shall not apply to the following items:

- scheduled maintenance items
- normal wear-out items
- items furnished by the Agency

Should the Agency require the use of a specific product and has rejected the Contractor's request for an alternate product, then the standard Supplier warranty for that product shall be the only warranty provided to the Agency. This product will not be eligible under "Fleet Defects," below.

The Contractor shall not be required to provide warranty information for any warranty that is less than or equal to the warranty periods listed.

WR 1.3.1 Pass-Through Warranty

Should the Contractor elect to not administer warranty claims on certain components and wish to transfer this responsibility to the sub-suppliers, or to others, the Contractor shall request this waiver.

Contractor shall state in writing that the Agency's warranty reimbursements will not be impacted. The Contractor also shall state in writing any exceptions and reimbursement including all costs incurred in transport of vehicles and/or components. At any time during the warranty period, the Contractor may request approval from the Agency to assign its warranty obligations to others, but only on a case-by-case basis approved in writing by the Agency. Otherwise, the Contractor shall be solely responsible for the administration of the warranty as specified. Warranty administration by others does not eliminate the warranty liability and responsibility of the Contractor.

WR 1.3.2 Superior Warranty

The Contractor shall pass on to the Agency any warranty offered by a component Supplier that is superior to that required herein. The Contractor shall provide a list to the Agency noting the conditions and limitations of the Superior Warranty not later than the start of production. The Superior Warranty shall not be administered by the Contractor.

WR 1.4 Fleet Defects

WR 1.4.1 Occurrence and Remedy

A Fleet Defect is defined as cumulative failures of twenty-five (25) percent of the same components in the same or similar application in a minimum fleet size of twelve (12) or more buses where such items are covered by warranty. A Fleet Defect shall apply only to the base warranty period in sections entitled "Complete Bus," "Propulsion System" and "Major Subsystems." When a Fleet Defect is declared, the remaining warranty on that item/component stops. The warranty period does not restart until the Fleet Defect is corrected.

For the purpose of Fleet Defects, each option order shall be treated as a separate bus fleet. In addition, should there be a change in a major component within either the base order or an option order, the buses containing the new major component shall become a separate bus fleet for the purposes of Fleet Defects.

The Contractor shall correct a Fleet Defect under the warranty provisions defined in "Repair Procedures." After correcting the Defect, the Agency and the Contractor shall mutually agree to and the Contractor shall promptly undertake and complete a work program reasonably designed to prevent the occurrence of the same Defect in all other buses and spare parts purchased under this Contract. Where the specific Defect can be solely attributed to particular identifiable part(s), the work program shall include redesign and/or replacement of only the defectively designed and/or manufactured part(s). In all other cases, the work program shall include inspection and/or correction of all the buses in the fleet via a mutually agreed-to arrangement. The Contractor shall update, as necessary, technical support information (parts, service and operator's manuals) due to changes resulting from warranty repairs. The Agency may immediately declare a Defect in design resulting in a safety hazard to be a Fleet Defect. The Contractor shall be responsible to furnish, install and replace all defective units.

WR 1.4.2 Exceptions to Fleet Defect Provisions

The Fleet Defect warranty provisions shall not apply to Agency-supplied items, such as radios, fare collection equipment, communication systems and tires. In addition, Fleet Defects shall not apply to interior and exterior finishes, hoses, fittings and fabric.

WR 2. Repair Procedures

WR 2.1 Repair Performance

The Contractor is responsible for all warranty-covered repair Work. To the extent practicable, the Agency will allow the Contractor or its designated representative to perform such Work. At its discretion, the Agency may perform such Work if it determines it needs to do so based on transit service or other requirements. Such Work shall be reimbursed by the Contractor.

WR 2.2 Repairs by the Contractor

If the Agency detects a Defect within the warranty periods defined in this section, it shall, within thirty (30) days, notify the Contractor's designated representative. The Contractor or its designated representative shall,

if requested, begin Work on warranty-covered repairs within five calendar days after receiving notification of a Defect from the Agency. The Agency shall make the bus available to complete repairs timely with the Contractor's repair schedule.

The Contractor shall provide at its own expense all spare parts, tools and space required to complete repairs. At the Agency's option, the Contractor may be required to remove the bus from the Agency's property while repairs are being effected. If the bus is removed from the Agency's property, then repair procedures must be diligently pursued by the Contractor's representative.

WR 2.3 Repairs by the Agency

WR 2.3.1 Parts Used

If the Agency performs the warranty-covered repairs, then it shall correct or repair the Defect and any Related Defects utilizing parts supplied by the Contractor specifically for this repair. At its discretion, the Agency may use Contractor-specified parts available from its own stock if deemed in its best interests.

WR 2.3.2 Contractor-Supplied Parts

The Agency may require that the Contractor supply parts for warranty-covered repairs being performed by the Agency. Those parts may be remanufactured but shall have the same form, fit and function, and warranty. The parts shall be shipped prepaid to the Agency from any source selected by the Contractor within fourteen (14) days of receipt of the request for said parts and shall not be subject to an Agency handling charge.

WR 2.3.3 Defective Component Return

The Contractor may request that parts covered by the warranty be returned to the manufacturing plant. The freight costs for this action shall be paid by the Contractor. Materials should be returned in accordance with the procedures outlined in "Warranty Processing Procedures."

WR 2.3.4 Failure Analysis

The Contractor shall, upon specific request of the Agency, provide a failure analysis of Fleet Defect or safety-related parts, or major components, removed from buses under the terms of the warranty that could affect fleet operation. Such reports shall be delivered within 60 days of the receipt of failed parts.

WR 2.3.5 Reimbursement for Labor and Other Related Costs

The Agency shall be reimbursed by the Contractor for labor. The amount shall be determined by the Agency for a qualified mechanic at a straight time wage rate of [insert wage] per hour, which includes fringe benefits and overhead adjusted for the Agency's most recently published rate in effect at the time the Work is performed, plus the cost of towing the bus if such action was necessary and if the bus was in the normal service area. These wage and fringe benefit rates shall not exceed the rates in effect in the Agency's service garage at the time the Defect correction is made.

WR 2.3.6 Reimbursement for Parts

The Agency shall be reimbursed by the Contractor for defective parts and for parts that must be replaced to correct the Defect. The reimbursement shall be at the current price at the time of repair and shall include taxes where applicable, plus 15 percent handling costs. Handling costs shall not be paid if parts are supplied by the Contractor and shipped to the Agency.

WR 2.3.7 Reimbursement Requirements

The Contractor shall respond to the warranty claim with an accept/reject decision including necessary failure analysis no later than sixty (60) days after the Agency submits the claim and defective part(s), when requested. Reimbursement for all accepted claims shall occur no later than sixty (60) days from the date of acceptance of a valid claim. The Agency may dispute rejected claims or claims for which the Contractor did not reimburse the full amount. The parties agree to review disputed warranty claims during the following quarter to reach an equitable decision to permit the disputed claim to be resolved and closed. The parties also agree to review all claims at least once per quarter throughout the entire warranty period to ensure that open claims are being tracked and properly dispositioned.

WR 2.4 Warranty after Replacement/Repairs

If any component, unit or subsystem is repaired, rebuilt or replaced by the Contractor or by the Agency with the concurrence of the Contractor, then the component, unit or subsystem shall have the unexpired warranty period of the original. Repairs shall not be warranted if Contractor-provided or authorized parts are not used for the repair, unless the Contractor has failed to respond within five days, in accordance with “Repairs by the Contractor.”

If an item is declared to be a Fleet Defect, then the warranty stops with the declaration of the Fleet Defect. Once the Fleet Defect is corrected, the item(s) shall have three (3) months or remaining time and/or miles of the original warranty, whichever is greater. This remaining warranty period shall begin on the repair/replacement date for corrected items on each bus if the repairs are completed by the Contractor or on the date the Contractor provides all parts to the Agency.

WR 2.4.1 Warranty Processing Procedures

The following list represents requirements by the Contractor to the Agency for processing warranty claims. One failure per bus per claim is allowed.

- bus number and VIN
- total vehicle life mileage at time of repair
- date of failure/repair
- acceptance/in-service date
- Contractor part number and description
- component serial number
- description of failure
- all costs associated with each failure/repair (invoices may be required for third-party costs):
 - towing
 - road calls
 - labor
 - materials
 - parts
 - handling
 - troubleshooting time

WR 2.5 Forms

The Agency’s forms will be accepted by the Contractor if all of the above information is included. Electronic submittal may be used if available between the Contractor and the Agency.

WR 2.6 Return of Parts

When returning defective parts to the Contractor, the Agency shall tag each part with the following:

- bus number and VIN
- claim number
- part number
- serial number (if available)

WR 2.7 Timeframe

Each claim must be submitted no more than thirty (30) days from the date of failure and/or repair, whichever is later. All defective parts must be returned to the Contractor, when requested, no more than forty-five (45) days from the date of repair.

WR 2.8 Reimbursements

Reimbursements are to be transmitted to the following address:

[Insert address]



COMMONWEALTH of VIRGINIA

Department of General Services
Division of Purchases and Supply

J. Peter Stamps, CPPO, VCM, VCO
Director

Kelly J. Langley, CPPO, CPPB, VCM, VCO
Deputy Director

P. O. Box 1199
Richmond, VA 23218-1199
Voice: (804) 786-3842

September 13, 2022

ADDENDUM NO. 1 TO ALL BIDDERS:

| | |
|----------------------------------|---|
| Reference – Invitation for Bids: | IFB 6447 |
| Commodity: | 55610 & 55620 |
| Dated: | September 2, 2022 |
| For Delivery To: | Department of General Services, Division of Purchases and Supply, on behalf of the Virginia Department of Rail and Public Transportation (DRPT) |
| Bid Due: | September 14, 2022 |
| Public Bid Opening: | September 15, 2022 |

The above is hereby changed to read:

- Reference Closing Date and Time: The bid due date is hereby changed to September 29, 2022 at 1:00 p.m. (ET).
- Reference Public Opening Date and Time: Bid Opening date is hereby changed to September 30, 2022 at 10:00 a.m. (ET).

Note: A signed acknowledgment of this addendum must be received at the location indicated on the IFB either prior to the bid due date and hour or attached to your bid.

Very truly yours,

Pamela Copeland

Pamela Copeland, VCO
Statewide Sourcing & Contracting Officer

Name of Firm

Signature/Title

Date

Solicitation Print

[Return to Solicitation](#) [Send to Printer](#)

Solicitation 6447

| | |
|--|-------------------------------|
| Procurement Folder: 98694 | High-Risk: Yes |
| Solicitation: 6447 | Status: Open |
| Solicitation Type: Invitation for Bids (IFB) | Issued Date: 8/2/2022 |
| Short Description: Vehicle: Transit Bus | |
| Description: Vehicle: Low Floor Transit Buses, Commuter Coach Buses, and Trolleys Heavy Duty, 12 Year (29 ft. – 60 ft. sizes) | |
| External Solicitation ID: | |
| External Solicitation Version: | |
| External Solicitation Type: | |
| Closing Date: 9/14/2022 | Closing Time: 1:00 PM |
| Requestor Office: E194 | Phone: (804) 786-4068 |
| Preparer Office: E194 | Phone: (804) 786-4068 |
| Work Location: Virginia - Statewide | |
| Created By: pcopelan5 | Modified By: pcopelan5 |
| Created On: 1/28/2022 | Modified On: 8/2/2022 |

Attachments

| | |
|---|--|
| Attachment Name: IFB 6447 adv r.pdf | Description: IFB 6447 |
| Attachment Name: Attachment H, Pricing Schedule 12-Year Transit - Commuter Coach DRAFT1.xlsx | Description: Attachment H Pricing Schedule IFB 6447 |

Contact Information

| | |
|--|------------------------------|
| Pamela Copeland | Phone: (804) 786-4068 |
| Email: pamela.copeland@dgs.virginia.gov | Fax: |

Other Events

Information not provided

Commodity Information

Lot 1: Lot 1

| | | |
|--|--------------------------|-----------|
| Lot 1, Line 1 | Line Type: Good | |
| Commodity: 55610 Coach, Transit (Articulated) | Quantity: 1 | |
| Specifications: | Unit: each | |
| Description: Vehicle: Transit Bus Low Floor HD 12 yr. Diesel, CNG, Hybrid, Battery Electric | Requested Delivery Date: | |
| Manufacturer: | Drawing: | |
| Part Number: | Piece: | |
| Product/Category: | Color: | |
| Serial Number: | Size: | |
| Specification: | Model: | |
| | Detailed Instructions: | Warranty: |

Ship To
 eVA-Shipping Exception
 SEE COMMENTS
 eVA,VA 99999-9999
 US
 Shipping Method:
 MSDS Required?: **No**
 Hazardous Materials:
 Handling Instructions:
 Packing Instructions:
 Additional Instructions:
 Shipping Instructions:

Bill To
 eVA-Billing Exception
 Same as Ship To Address
 eVA,VA 99999-9999
 US
 Billing Instructions:

| | |
|----------------------|-----------------------|
| External Lot Number: | External Line Number: |
|----------------------|-----------------------|

| | | |
|---|--------------------------|-----------|
| Lot 1, Line 2 | Line Type: Good | |
| Commodity: 55620 Coach, Transit (Electric) | Quantity: 1 | |
| Specifications: | Unit: each | |
| Description: Vehicle: Transit Bus Low Floor HD 12 yr. Diesel, CNG Hybrid, Battery Electric | Requested Delivery Date: | |
| Manufacturer: | Drawing: | |
| Part Number: | Piece: | |
| Product/Category: | Color: | |
| Serial Number: | Size: | |
| Specification: | Model: | |
| | Detailed Instructions: | Warranty: |
| Ship To | Bill To | |

eVA-Shipping Exception
 SEE COMMENTS
 eVA,VA 99999-9999
 US
 Shipping Method:
 MSDS Required?: No
 Hazardous Materials:
 Handling Instructions:
 Packing Instructions:
 Additional Instructions:
 Shipping Instructions:

eVA-Billing Exception
 Same as Ship To Address
 eVA,VA 99999-9999
 US
 Billing Instructions:

External Lot Number:

External Line Number:

Build Commodity List

| Line | Commodity | Description |
|------|-----------|------------------------------|
| 2 | 55610 | Coach, Transit (Articulated) |
| 3 | 55620 | Coach, Transit (Electric) |

Terms And Conditions**Section GEN****NOTE**

This public body does not discriminate against faith-based organizations in accordance with the Code of Virginia, § 2.2-4343.1 or against a bidder because of race, religion, color, sex, national origin, age, disability, sexual orientation, gender identity, political affiliation, or veteran status or any other basis prohibited by state law relating to discrimination in employment. Faith-based organizations may request that the issuing agency not include subparagraph 1.f in General Terms and Condition C. Such a request shall be in writing and explain why an exception should be made in that invitation for bid.

VENDORS MANUAL

This solicitation is subject to the provisions of the Commonwealth of Virginia Vendors Manual and any changes or revisions thereto, which are hereby incorporated into this contract in their entirety. The process for filing a complaint about this solicitation is in section 7.13 of the Vendors Manual. (Note section 7.13 does not apply to protests of awards or formal contractual claims.) The procedure for filing contractual claims is in section 7.19 of the Vendors Manual. A copy of the manual is normally available for review at the purchasing office and is accessible on the Internet at www.eva.virginia.gov under "I Sell To Virginia".

APPLICABLE LAWS AND COURTS

This solicitation and any resulting contract shall be governed in all respects by the laws of the Commonwealth of Virginia, without regard to its choice of law provisions, and any litigation with respect thereto shall be brought in the circuit courts of the Commonwealth. The agency and the contractor are encouraged to resolve any issues in controversy arising from the award of the contract or any contractual dispute using Alternative Dispute Resolution (ADR) procedures (Code of Virginia, § 2.2-4366). ADR procedures are described in Chapter 9 of the Vendors Manual. The contractor shall comply with all applicable federal, state and local laws, rules and regulations.

ANTI-DISCRIMINATION

By submitting their bids, bidders certify to the Commonwealth that they will conform to the provisions of the Federal Civil Rights Act of 1964, as amended, as well as the Virginia Fair Employment Contracting Act of 1975, as amended, where applicable, the Virginians With Disabilities Act, the Americans With Disabilities Act and § 2.2-4311 of the Virginia Public Procurement Act (VPPA). If the award is made to a faith-based organization, the organization shall not discriminate against any recipient of goods, services, or disbursements made pursuant to the contract on the basis of the recipient's religion, religious belief, refusal to participate in a religious practice, or on the basis of race, age, color, gender sexual orientation, gender identity, or national origin and shall be subject to the same rules as other organizations that contract with public bodies to account for the use of the funds provided; however, if the faith-based organization segregates public funds into separate accounts, only the accounts and programs funded with public funds shall be subject to audit by the public body. (Code of Virginia, § 2.2-4343.1E). In every contract over \$10,000 the provisions in 1. and 2. below apply: 1. During the performance of this contract, the contractor agrees as follows: a. The contractor will not discriminate against any employee or applicant for employment because of race, religion, color, sex, sexual orientation, gender identity, national origin, age, disability, or any other basis prohibited by state law relating to discrimination in employment, except where there is a bona fide occupational qualification reasonably necessary to the normal operation of the contractor. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause. b. The contractor, in all solicitations or advertisements for employees placed by or on behalf of the contractor, will state that such contractor is an equal opportunity employer. c. Notices, advertisements and solicitations placed in accordance with federal law, rule or regulation shall be deemed sufficient for the purpose of meeting the requirements of this section. d. If the contractor employs more than five employees, the contractor shall (i) provide annual training on the contractor's sexual harassment policy to all supervisors and employees providing services in the Commonwealth, except such supervisors or employees that are required to complete sexual harassment training provided by the Department of Human Resource Management, and (ii) post the contractor's sexual harassment policy in (a) a conspicuous public place in each building located in the Commonwealth that the contractor owns or leases for business purposes and (b) the contractor's employee handbook. e. The requirements of these provisions 1. and 2. are a material part of the contract. If the Contractor violates one of these provisions, the Commonwealth may terminate the affected part of this contract for breach, or at its option, the whole contract. Violation of one of these provisions may also result in debarment from State contracting regardless of whether the specific contract is terminated. f. In accordance with Executive Order 61 (2017), a prohibition on discrimination by the contractor, in its employment practices, subcontracting practices, and delivery of goods or services, on the basis of race, sex, color, national origin, religion, sexual orientation, gender identity, age, political affiliation, disability, or veteran status, is hereby incorporated in this contract. 2. The contractor will include the provisions of 1. above in every subcontract or purchase order over \$10,000, so that the provisions will be binding upon each subcontractor or vendor.

ETHICS IN PUBLIC CONTRACTING

By submitting their bids, bidders certify that their bids are made without collusion or fraud and that they have not offered or received any kickbacks or inducements from any other bidder, supplier, manufacturer or subcontractor in connection with their bid, and that they have not conferred on any public employee having official responsibility for this procurement transaction any payment, loan, subscription, advance, deposit of money, services or anything of more than nominal value, present or promised, unless consideration of substantially equal or greater value was exchanged.

IMMIGRATION REFORM

Applicable for all contracts over \$10,000: By entering into a written contract with the Commonwealth of Virginia, the Contractor certifies that the Contractor does not, and shall not during the performance of the contract for goods and services in the Commonwealth, knowingly employ an unauthorized alien as defined in the federal Immigration Reform and Control Act of 1986.

DEBARMENT STATUS

By participating in this procurement, the vendor certifies that they are not currently debarred by the Commonwealth of Virginia from submitting a response for the type of goods and/or services covered by this solicitation. Vendor further certifies that they are not debarred from filling any order or

accepting any resulting order, or that they are an agent of any person or entity that is currently debarred by the Commonwealth of Virginia. If a vendor is created or used for the purpose of circumventing a debarment decision against another vendor, the non-debarred vendor will be debarred for the same time period as the debarred vendor.

ANTITRUST

By entering into a contract, the contractor conveys, sells, assigns, and transfers to the Commonwealth of Virginia all rights, title and interest in and to all causes of action it may now have or hereafter acquire under the antitrust laws of the United States and the Commonwealth of Virginia, relating to the particular goods or services purchased or acquired by the Commonwealth of Virginia under said contract.

MANDATORY USE OF STATE FORM

Failure to submit a bid on the official state form provided for that purpose shall be a cause for rejection of the bid. Modification of or additions to any portion of the Invitation for Bids may be cause for rejection of the bid; however, the Commonwealth reserves the right to decide, on a case by case basis, in its sole discretion, whether to reject such a bid as nonresponsive. As a precondition to its acceptance, the Commonwealth may, in its sole discretion, request that the bidder withdraw or modify nonresponsive portions of a bid which do not affect quality, quantity, price, or delivery. No modification of or addition to the provisions of the contract shall be effective unless reduced to writing and signed by the parties.

CLARIFICATION OF TERMS

If any prospective bidder has questions about the specifications or other solicitation documents, the prospective bidder should contact the buyer whose name appears on the face of the solicitation no later than five working days before the due date. Any revisions to the solicitation will be made only by addendum issued by the buyer.

PAYMENT

1. To Prime Contractor: a. Invoices for items ordered, delivered and accepted shall be submitted by the contractor directly to the payment address shown on the purchase order/contract. All invoices shall show the state contract number and/or purchase order number; social security number (for individual contractors) or the federal employer identification number (for proprietorships, partnerships, and corporations). b. Any payment terms requiring payment in less than 30 days will be regarded as requiring payment 30 days after invoice or delivery, whichever occurs last. This shall not affect offers of discounts for payment in less than 30 days, however. c. All goods or services provided under this contract or purchase order, that are to be paid for with public funds, shall be billed by the contractor at the contract price, regardless of which public agency is being billed. d. The following shall be deemed to be the date of payment: the date of postmark in all cases where payment is made by mail, or when offset proceedings have been instituted as authorized under the Virginia Debt Collection Act. e. Unreasonable Charges. Under certain emergency procurements and for most time and material purchases, final job costs cannot be accurately determined at the time orders are placed. In such cases, contractors should be put on notice that final payment in full is contingent on a determination of reasonableness with respect to all invoiced charges. Charges which appear to be unreasonable will be resolved in accordance with Code of Virginia, § 2.2-4363 and -4364. Upon determining that invoiced charges are not reasonable, the Commonwealth shall notify the contractor of defects or improprieties in invoices within fifteen (15) days as required in Code of Virginia, § 2.2-4351... The provisions of this section do not relieve an agency of its prompt payment obligations with respect to those charges which are not in dispute (Code of Virginia, § 2.2-4363). 2. To Subcontractors: a. Within seven (7) days of the contractor's receipt of payment from the Commonwealth, a contractor awarded a contract under this solicitation is hereby obligated: (1) To pay the subcontractor(s) for the proportionate share of the payment received for work performed by the subcontractor(s) under the contract; or (2) To notify the agency and the subcontractor(s), in writing, of the contractor's intention to withhold payment and the reason. b. The contractor is obligated to pay the subcontractor(s) interest at the rate of one percent per month (unless otherwise provided under the terms of the contract) on all amounts owed by the contractor that remain unpaid seven (7) days following receipt of payment from the Commonwealth, except for amounts withheld as stated in (2) above. The date of mailing of any payment by U. S. Mail is deemed to be payment to the addressee. These provisions apply to each sub-tier contractor performing under the primary contract. A contractor's obligation to pay an interest charge to a subcontractor may not be construed to be an obligation of the Commonwealth. 3. Each prime contractor who wins an award in which provision of a SWaM procurement plan is a condition to the award, shall deliver to the contracting agency or institution, on or before request for final payment, evidence and certification of compliance (subject only to insubstantial shortfalls and to shortfalls arising from subcontractor default) with the SWaM procurement plan. Final payment under the contract in question may be withheld until such certification is delivered and, if necessary, confirmed by the agency or institution, or other appropriate penalties may be assessed in lieu of withholding such payment. 4. The Commonwealth of Virginia encourages contractors and subcontractors to accept electronic and credit card payments.

PRECEDENCE OF TERMS

The following General Terms and Conditions VENDORS MANUAL, APPLICABLE LAWS AND COURTS, ANTI-DISCRIMINATION, ETHICS IN PUBLIC CONTRACTING, IMMIGRATION REFORM AND CONTROL ACT OF 1986, DEBARMENT STATUS, ANTITRUST, MANDATORY USE OF STATE FORM AND TERMS AND CONDITIONS, CLARIFICATION OF TERMS, PAYMENT shall apply in all instances. In the event there is a conflict between any of the other General Terms and Conditions and any Special Terms and Conditions in this solicitation, the Special Terms and Conditions shall apply.

QUALIFICATIONS OF BIDDERS

The Commonwealth may make such reasonable investigations as deemed proper and necessary to determine the ability of the bidder to perform the services/furnish the goods and the bidder shall furnish to the Commonwealth all such information and data for this purpose as may be requested. The Commonwealth reserves the right to inspect bidder's physical facilities prior to award to satisfy questions regarding the bidder's capabilities. The Commonwealth further reserves the right to reject any bid if the evidence submitted by, or investigations of, such bidder fails to satisfy the Commonwealth that such bidder is properly qualified to carry out the obligations of the contract and to provide the services and/or furnish the goods contemplated therein.

TESTING AND INSPECTION

The Commonwealth reserves the right to conduct any test/inspection it may deem advisable to assure goods and services conform to the specifications.

ASSIGNMENT OF CONTRACT

A contract shall not be assignable by the contractor in whole or in part without the written consent of the Commonwealth.

CHANGES TO THE CONTRACT

Changes can be made to the contract in any of the following ways: 1. The parties may agree in writing to modify the terms, conditions, or scope of the contract. Any additional goods or services to be provided shall be of a sort that is ancillary to the contract goods or services, or within the same broad product or service categories as were included in the contract award. Any increase or decrease in the price of the contract resulting from such modification shall be agreed to by the parties as a part of their written agreement to modify the scope of the contract. 2. The Purchasing Agency may order changes within the general scope of the contract at any time by written notice to the contractor. Changes within the scope of the contract include, but are not limited to, things such as services to be performed, the method of packing or shipment, and the place of delivery or installation. The contractor shall comply with the notice upon receipt, unless the contractor intends to claim an adjustment to compensation, schedule, or other contractual impact that would be caused by complying with such notice, in which case the contractor shall, in writing, promptly notify the Purchasing Agency of the adjustment to be sought, and before proceeding to comply with the notice, shall await the Purchasing Agency's written decision affirming, modifying, or revoking the prior written notice. If the Purchasing Agency decides to issue a notice that requires an adjustment to compensation, the contractor shall be compensated for any additional costs incurred as the result of such order and shall give the Purchasing Agency a credit for any savings. Said compensation shall be determined by one of the following methods: a. By mutual agreement between the parties in writing; or b. By agreeing upon a unit price or using a unit price set forth in the contract, if the work to be done can be expressed in units, and the contractor accounts for the number of units of work performed, subject to the Purchasing Agency's right to audit the contractor's records and/or to determine the correct number of units independently; or c. By ordering the contractor to proceed with the work and keep a record of all costs incurred and savings realized. A markup for overhead and profit may be allowed if provided by the contract. The same markup shall be used for determining a decrease in price as the result of savings realized. The contractor shall present the Purchasing Agency with all vouchers and records of expenses

incurred and savings realized. The Purchasing Agency shall have the right to audit the records of the contractor as it deems necessary to determine costs or savings. Any claim for an adjustment in price under this provision must be asserted by written notice to the Purchasing Agency within thirty (30) days from the date of receipt of the written order from the Purchasing Agency. If the parties fail to agree on an amount of adjustment, the question of an increase or decrease in the contract price or time for performance shall be resolved in accordance with the procedures for resolving disputes provided by the Disputes Clause of this contract or, if there is none, in accordance with the disputes provisions of the Commonwealth of Virginia Vendors Manual. Neither the existence of a claim nor a dispute resolution process, litigation or any other provision of this contract shall excuse the contractor from promptly complying with the changes ordered by the Purchasing Agency or with the performance of the contract generally.

DEFAULT

In case of failure to deliver goods or services in accordance with the contract terms and conditions, the Commonwealth, after due oral or written notice, may procure them from other sources and hold the contractor responsible for any resulting additional purchase and administrative costs. This remedy shall be in addition to any other remedies which the Commonwealth may have.

TAXES

Sales to the Commonwealth of Virginia are normally exempt from State sales tax. State sales and use tax certificates of exemption, Form ST-12, will be issued upon request. Deliveries against this contract shall usually be free of Federal excise and transportation taxes. The Commonwealth's excise tax exemption registration number is 54-73-0076K. If sales or deliveries against the contract are not exempt, the contractor shall be responsible for the payment of such taxes unless the tax law specifically imposes the tax upon the buying entity and prohibits the contractor from offering a tax-included price.

USE OF BRAND NAMES

Unless otherwise provided in this solicitation, the name of a certain brand, make or manufacturer does not restrict bidders to the specific brand, make or manufacturer named, but conveys the general style, type, character, and quality of the article desired. Any article which the public body, in its sole discretion, determines to be the equivalent of that specified, considering quality, workmanship, economy of operation, and suitability for the purpose intended, shall be accepted. The bidder is responsible to clearly and specifically identify the product being offered and to provide sufficient descriptive literature, catalog cuts and technical detail to enable the Commonwealth to determine if the product offered meets the requirements of the solicitation. This is required even if offering the exact brand, make or manufacturer specified. Normally in competitive sealed bidding only the information furnished with the bid will be considered in the evaluation. Failure to furnish adequate data for evaluation purposes may result in declaring a bid nonresponsive. Unless the bidder clearly indicates in its bid that the product offered is an equivalent product, such bid will be considered to offer the brand name product referenced in the solicitation.

TRANSPORTATION AND PACKAGING

By submitting their bids, all bidders certify and warrant that the price offered for FOB destination includes only the actual freight rate costs at the lowest and best rate and is based upon the actual weight of the goods to be shipped. Except as otherwise specified herein, standard commercial packaging, packing and shipping containers shall be used. All shipping containers shall be legibly marked or labeled on the outside with purchase order number, commodity description, and quantity.

INSURANCE

By signing and submitting a bid under this solicitation, the bidder certifies that if awarded the contract, it will have the following insurance coverage at the time the contract is awarded. For construction contracts, if any subcontractors are involved, the subcontractor will have workers' compensation insurance in accordance with §§ 2.2-4332 and 65.2-800 et seq. of the Code of Virginia. The bidder further certifies that the contractor and any subcontractors will maintain these insurance coverages during the entire term of the contract and that all coverage will be provided by companies authorized to sell insurance in Virginia by the Virginia State Corporation Commission. **MINIMUM INSURANCE COVERAGES AND LIMITS:** 1. Workers' Compensation - Statutory requirements and benefits. Coverage is compulsory for employers of three or more employees, to include the employer. Contractors who fail to notify the Commonwealth of increases in the number of employees that change their workers' compensation requirements under the Code of Virginia during the course of the contract shall be in noncompliance with the contract. 2. Employer's Liability - \$100,000. 3. Commercial General Liability - \$1,000,000 per occurrence and \$2,000,000 in the aggregate. Commercial General Liability is to include bodily injury and property damage, personal injury and advertising injury, products and completed operations coverage. The Commonwealth of Virginia shall be added as an additional insured to the policy by an endorsement. 4. Automobile Liability - \$1,000,000 combined single limit. (Required only if a motor vehicle not owned by the Commonwealth is to be used in the contract. Contractor must assure that the required coverage is maintained by the Contractor (or third party owner of such motor vehicle.) Profession/Service Limits Accounting \$1,000,000 per occurrence, \$3,000,000 aggregate Architecture \$2,000,000 per occurrence, \$6,000,000 aggregate Asbestos Design, Inspection or Abatement Contractors \$1,000,000 per occurrence, \$3,000,000 aggregate Health Care Practitioner (to include Dentists, Licensed Dental Hygienists, Optometrists, Registered or Licensed Practical Nurses, Pharmacists, Physicians, Podiatrists, Chiropractors, Physical Therapists, Physical Therapist Assistants, Clinical Psychologists, Clinical Social Workers, Professional Counselors, Hospitals, or Health Maintenance Organizations.) Code of Virginia § 8.01-581.15 <https://law.lis.virginia.gov/vacode/title8.01/chapter21.1/section8.01-581.15/> Insurance/Risk Management \$1,000,000 per occurrence, \$3,000,000 aggregate Landscape/Architecture \$1,000,000 per occurrence, \$1,000,000 aggregate Legal \$1,000,000 per occurrence, \$5,000,000 aggregate Professional Engineer \$2,000,000 per occurrence, \$6,000,000 aggregate Surveying \$1,000,000 per occurrence, \$1,000,000 aggregate

ANNOUNCEMENT OF AWARD

Upon the award or the announcement of the decision to award a contract as a result of this solicitation, the purchasing agency will publicly post such notice in eVA (www.eva.virginia.gov) for a minimum of 10 days.

DRUG-FREE WORKPLACE

Applicable for all contracts over \$10,000: During the performance of this contract, the contractor agrees to (i) provide a drug-free workplace for the contractor's employees; (ii) post in conspicuous places, available to employees and applicants for employment, a statement notifying employees that the unlawful manufacture, sale, distribution, dispensation, possession, or use of a controlled substance or marijuana is prohibited in the contractor's workplace and specifying the actions that will be taken against employees for violations of such prohibition; (iii) state in all solicitations or advertisements for employees placed by or on behalf of the contractor that the contractor maintains a drug-free workplace; and (iv) include the provisions of the foregoing clauses in every subcontract or purchase order of over \$10,000, so that the provisions will be binding upon each subcontractor or vendor. For the purposes of this section, "drug-free workplace" means a site for the performance of work done in connection with a specific contract awarded to a contractor, the employees of whom are prohibited from engaging in the unlawful manufacture, sale, distribution, dispensation, possession or use of any controlled substance or marijuana during the performance of the contract.

NONDISCRIMINATION

A bidder or contractor shall not be discriminated against in the solicitation or award of this contract because of race, religion, color, sex, sexual orientation, gender identity, national origin, age, disability, faith-based organizational status, any other basis prohibited by state law relating to discrimination in employment or because the bidder employs ex-offenders unless the state agency, department or institution has made a written determination that employing ex-offenders on the specific contract is not in its best interest. If the award of this contract is made to a faith-based organization and an individual, who applies for or receives goods, services, or disbursements provided pursuant to this contract objects to the religious character of the faith-based organization from which the individual receives or would receive the goods, services, or disbursements, the public body shall offer the individual, within a reasonable period of time after the date of his objection, access to equivalent goods, services, or disbursements from an alternative provider.

eVA VENDOR REGISTRATION

The eVA Internet electronic procurement solution, web site portal www.eVA.virginia.gov, streamlines and automates government purchasing activities in the Commonwealth. The eVA portal is the gateway for vendors to conduct business with state agencies and public bodies. All vendors desiring to provide goods and/or services to the Commonwealth shall participate in the eVA Internet e-procurement solution by completing the free eVA Vendor Registration. All bidders must register in eVA and pay the Vendor Transaction Fees specified below; failure to register will result in the bid being

rejected. Vendor transaction fees are determined by the date the original purchase order is issued and the current fees are as follows: a. For orders issued July 1, 2014, and after, the Vendor Transaction Fee is: (i) DSBSD-certified Small Businesses: 1%, capped at \$500 per order. (ii) Businesses that are not DSBSD-certified Small Businesses: 1%, capped at \$1,500 per order. b. Refer to Special Term and Condition "eVA Orders and Contracts" to identify the number of purchase orders that will be issued as a result of this solicitation with the eVA transaction fee specified above assessed for each order. For orders issued prior to July 1, 2014, the vendor transaction fees can be found at www.eVA.virginia.gov. The specified vendor transaction fee will be invoiced, by the Commonwealth of Virginia Department of General Services, typically within 60 days of the order issue date. Any adjustments (increases/decreases) will be handled through purchase order changes.

AVAILABILITY OF FUNDS

It is understood and agreed between the parties herein that the agency shall be bound hereunder only to the extent that the legislature has appropriated funds that are legally available or may hereafter become legally available for the purpose of this agreement.

SET-ASIDES AWARD PRIORITY

This solicitation is set-aside for award priority to DSBSD-certified micro businesses or small businesses when designated as "Micro Business Set-Aside Award Priority" or "Small Business Set-Aside Award Priority" accordingly in the solicitation. DSBSD-certified micro businesses or small businesses also includes DSBSD-certified women-owned and minority-owned businesses when they have received the DSBSD small business certification. For purposes of award, bidders shall be deemed micro businesses or small businesses if and only if they are certified as such by DSBSD on the due date for receipt of bids.

BID PRICE CURRENCY

Unless stated otherwise in the solicitation, bidders shall state bid prices in US dollars.

AUTHORIZATION TO CONDUCT BUS.

A contractor organized as a stock or nonstock corporation, limited liability company, business trust, or limited partnership or registered as a registered limited liability partnership shall be authorized to transact business in the Commonwealth as a domestic or foreign business entity if so required by Title 13.1 or Title 50 of the Code of Virginia or as otherwise required by law. Any business entity described above that enters into a contract with a public body pursuant to the Virginia Public Procurement Act shall not allow its existence to lapse or its certificate of authority or registration to transact business in the Commonwealth, if so required under Title 13.1 or Title 50, to be revoked or cancelled at any time during the term of the contract. A public body may void any contract with a business entity if the business entity fails to remain in compliance with the provisions of this section.

CIVILITY IN STATE WORKPLACES

The contractor shall take all reasonable steps to ensure that no individual, while performing work on behalf of the contractor or any subcontractor in connection with this agreement (each, a "Contract Worker"), shall engage in 1) harassment (including sexual harassment), bullying, cyber-bullying, or threatening or violent conduct, or 2) discriminatory behavior on the basis of race, sex, color, national origin, religious belief, sexual orientation, gender identity or expression, age, political affiliation, veteran status, or disability. The contractor shall provide each Contract Worker with a copy of this Section and will require Contract Workers to participate in agency training on civility in the State workplace if contractor's (and any subcontractor's) regular mandatory training programs do not already encompass equivalent or greater expectations. Upon request, the contractor shall provide documentation that each Contract Worker has received such training. For purposes of this Section, "State workplace" includes any location, permanent or temporary, where a Commonwealth employee performs any work-related duty or is representing his or her agency, as well as surrounding perimeters, parking lots, outside meeting locations, and means of travel to and from these locations. Communications are deemed to occur in a State workplace if the Contract Worker reasonably should know that the phone number, email, or other method of communication is associated with a State workplace or is associated with a person who is a State employee. The Commonwealth of Virginia may require, at its sole discretion, the removal and replacement of any Contract Worker who the Commonwealth reasonably believes to have violated this Section. This Section creates obligations solely on the part of the contractor. Employees or other third parties may benefit incidentally from this Section and from training materials or other communications distributed on this topic, but the Parties to this agreement intend this Section to be enforceable solely by the Commonwealth and not by employees or other third parties.

Reminders

Information not provided

Vendor List

Information not provided

Free Form Vendor

Information not provided

Publishing Options

Pre-Bid Conference Type: Pre-Bid Conference

Category: Equipment - Non-Technology

Pre-Bid Conference Date: 8/15/2022

Publish Date: 8/2/2022

Close Date: 9/14/2022

Open Responses Date: 9/15/2022

Pre-Bid Conference Time: 10:00 AM

Publish Time: 1:10 PM

Close Time: 1:00 PM

Open Responses Time: 10:00 AM

IFB# 6447

**Vehicle: Low Floor Transit Buses, Commuter Coach Buses, and Trolleys
Heavy Duty, 12 Year (29 ft. – 60 ft. sizes)**

I. PURPOSE:

The purpose of this Invitation for Bids (IFB) is to solicit sealed bids to establish a contract with one or more qualified suppliers to provide Low Floor Transit Buses, Commuter Coach Buses, and Trolleys, heavy duty, 12 year, 29 ft. to 60 ft. sizes. Authorized Users shall be defined as any local authority or non-profit provider within the Commonwealth of Virginia whose purpose is the provision of public transportation as defined in 49 U.S.C. § 5302.

Any contract that may result from this solicitation will be an optional-use term contract for use by Commonwealth of Virginia executive branch agencies and optional-use for other public bodies and authorized users. Any contract that may result from this solicitation will be established and managed by the Commonwealth of Virginia, Department of General Services (DGS), Division of Purchases and Supplies (DPS).

All Authorized Users shall place orders through eVA for any contract that may result from this solicitation.

II. PERIOD OF CONTRACT:

The initial period of the contract will be from date of award through two (2) years, with three (3) optional one (1) year renewal periods.

III. BACKGROUND AND/OR HISTORICAL SALES DATA:

- The Commonwealth requires one or more Transit bus contracts to address and consolidate all Low Floor Transit Buses and Commuter Coach Buses, Heavy Duty, 12 year (29 ft. – 60 ft. sizes).
- The Commonwealth reserves the right to make awards for any goods and/or services depending upon the capabilities and the benefits described in a Bidder's bid and as the Commonwealth deems in its best interest. Such decision shall be based upon the Commonwealth's sole and exclusive judgement.
- Previous Transit Bus Contract(s) E194-75548 and E194-81688; the Commonwealth has processed orders for an approximate total spend, as follows:

Contract# E194-75548 \$9,190,990

Contract# E194-81688 \$5,741,562

IV. SPECIFICATIONS:

A. Department of General Service/Division of Purchases and Supply (DGS/DPS) is issuing this IFB on behalf of and in cooperation with the Virginia Department of Rail and Public Transportation ("DRPT"). The minimum specifications for Low Floor Heavy Duty Transit Buses, Commuter Coach Buses, and Trolleys are intended to define the minimum level of quality and performance, as follows:

All vehicles offered by any prospective contractor must meet the requirements and as delineated herein and the following:

- 1) All DRPT-required specifications and requirements
- 2) U.S. Federal Transit Administration (FTA) current requirements ([ref. Attachment J](#))
- 3) All provisions of the Americans with Disabilities Act Final Rule as stated in the Federal Register Vol. 56, No. 173 of September 6, 1991, Subpart B-Buses, Vans and Systems, pages 45756 through 45761, as applicable.
- 4) The bidder shall submit with bid, documentation certifying that the offered vehicle meets all applicable Federal Motor Vehicle Safety Standard (FMVSS) Regulations. Vehicle must comply with all applicable FMVSS for Low Floor Transit Buses, Commuter Coach Buses, and Trolleys.
- 5) International Organization for Standardization (ISO); ISO 9000 family – Quality Management (2019); published Date: February 27, 2020.

(Ref. ISO website) <https://www.transit.dot.gov/funding/grant-programs/capital-investments/quality-management-system-guidelines>

- 6) Compliance with Section 7613 of the National Defense Authorization Act for Fiscal Year 2020 (NDAA 2020), subsection 49 U.S.C. § 5323 (u). Bidder shall complete/sign and return **Attachment F**.
- 7) American Public Transportation Association (APTA) current *Standard Bus Procurement Guidelines RFP* (rev. 2.1 published 6/8/2021) (ref, **Attachment G**), as follows:
Only the sections listed below:
 - SECTION 6: TECHNICAL SPECIFICATIONS
 - SECTION 7: WARRANTY REQUIREMENTS

(Ref APTA Website)

<https://www.apta.com/research-technical-resources/standards/procurement/apta-bts-bpg-gl-001-13/>

The terms and conditions posted to eVA for this solicitation are mandatory and are the only terms and conditions that will govern any contract awarded as a result of this solicitation. Any modification, clarification, or change to the mandatory terms and conditions by the Bidder shall cause the bid to be rejected.

If the Bidder includes any additional terms and conditions, regardless of form, they will not be reviewed by DPS and will have no consequence to any resulting contract.

The Commonwealth reserves the right to obtain technical data and to request clarification when deemed necessary. Failure on the part of the Bidder to provide all requested documentation may be cause to deem the bid non-responsive.

- B. The Contractor shall furnish and deliver vehicle(s) with the standard and optional equipment specifically advertised and installed by the manufacturer for the vehicle which the Bidder proposes to furnish. The requirements below are for the base vehicle. All components, unless otherwise required by these specifications, shall be the standard or optional equipment specifically advertised and installed by the manufacturer for the vehicle, which the bidder proposes to furnish. The only source of information in determining whether or not the equipment is specifically advertised for the vehicle being offered, shall be the manufacturer's published vehicle literature.

Any equipment called for in these specifications which is not listed by the manufacturer as standard or optional for the model being offered is subject to buyer approval.

C. Requirements

1. **Geographic:** The Contractor shall provide transit buses and related products and services under this contract to any Authorized User, as described herein. Bidders with any geographic restrictions should specify the geographic areas that they are not able to provide products and/or services. Regardless of any contracted service areas, and to any extent that they may overlap, Authorized Users shall have the opportunity to use any contract, based on their own business direction and/or operational needs.
2. **Products and/or Services:** Any Contractors shall be able to provide the broadest possible spectrum of all available transit/coach/trolley bus categories. The Commonwealth recognizes that dealers or manufacturers may not carry all or exactly the same range of products or lines. However, all products and product lines carried either in the dealers or manufacturers available inventory, catalog, price list, or special order shall be covered in the bid.
3. **Delivery:** Delivery shall be FOB Destination (freight included in base bus contract price). Prices for all items shall include all standard freight costs. Delivery price is a single line item in the price section and shall be included as a flat fee with "*Total Bid Price*" (ref. **Attachment H, Pricing Schedule**). Delivery charges for **Virginia customers (only)** is included in **Attachment H, Pricing Schedule**. Third Party participants, outside Virginia: Single Unit/Net Price is the base bus price (Third party participants delivery cost will be as mutually agreed upon by the customer and contractor).

Bidder entering of a bus delivery price in **Attachment H** constitutes the bidder's representation and warranty that the stated delivery price does not exceed the bidder's actual out-of-pocket cost of delivering the bus by the most economical method with no mark-up. For all sales of buses to Authorized Users in Virginia, the delivery charge for mileage shall be the amount based on a destination to Richmond, Virginia 23219 – regardless of where the Authorized User in Virginia is actually located.

For sales to third party authorized users outside of Virginia, shipping cost may not exceed the contractor's actual out-of-pocket cost of shipping to that authorized user's actual location by the most economical method with no mark-up and will be quoted to and agreed to by the authorized user at the time of order.

The Authorized User shall assume risk of loss of vehicles and related equipment upon delivery. Prior to delivery the Contractor shall assume risk of loss of vehicle(s) and related equipment. This shall include any damages sustained during the delivery regardless of the status of title or any payments related to the bus/equipment. Bus and/or equipment that is released back to the Contractor for any reason; the Contractor shall assume risk of loss upon such release.

4. **Delivery Location and Time:** Buses shall be delivered to various state agencies, cities, counties, towns and political subdivisions throughout the State as required and indicated in the purchase order. Normal hours for delivery shall be between the hours of 8:00 AM and 5:00 PM, except on official state holidays and periods of shut down, unless otherwise instructed by the Authorized User. The Contractor shall clarify and coordinate deliveries with the Authorized User. **Failure to coordinate delivery with the Authorized user may result in refusal of delivery.**

5. **Delivery Lead Time:** Bidders shall provide a delivery lead-time, after receipt of order (ARO), in the “Delivery” section IX. Special Terms and Conditions, [paragraph 15](#) of the solicitation. This lead-time shall be for orders placed prior to the build out date. Any orders placed from the Contractor’s in-stock inventory, in the “Build Out/Factory Order Cut-off Date” section IX. Special Terms and Conditions shall be delivered within 60 calendar days or less.

6. **Delivery Inspection:** Each Vehicle delivered will be checked for compliance with the purchase order. **If any deviations from the specifications, damage, or improper Contractor preparation exist (ref. Section IX. #30; New Vehicle Preparation – e.g. missing state inspection), the invoice will not be approved for payment until the Contractor corrects all defects.**

7. **Product Additions:** The Commonwealth recognizes that products and product line additions to the Contractor’s standard bid during the life of the contract are likely to occur. The Commonwealth considers these additions as enhancements. Additions will be considered as follows:
 - a) Any and all new transit buses will be categorized with similar products or product lines into existing market categories previously defined and agreed to by the Commonwealth and with respect to discount structure, net price or grand total of product.

 - b) In the event the Contractor adds a new transit bus product line that represents product(s) that are consistent with the scope, type, and class of transit buses covered under the contract, then the Commonwealth and the Contractor may agree to add to contract as considered with respect to contract discount structure, net price or grand total of product(s).

 - c) New transit bus product line additions must be with the DPS Statewide Sourcing and Contracting Officer prior to order placement by any Authorized User.

8. WARRANTY/MAINTENANCE (Buses)

Upon Acceptance of Buses by and Authorized User, and to ensure the maximum safety, protection and satisfaction to any Authorized User, and to their passengers, Contractor agrees that any new Bus shall be provided with a minimum twelve (12) month/50,000-mile (whichever comes first) bumper-to-bumper new vehicle warranty ("Warranty"), as follows: Warranty is to include all Buses and integral and peripheral components, materials, parts, assemblies and subassemblies e.g., body, chassis, engine, transmission, cooling, drive train, suspension, electrical and manual controls, steering, starter and alternator, safety equipment, heater and air conditioning, electric vehicle battery, etc. necessary to keep Bus in good operating condition and preserve its operating efficiency in accordance with all OEM technical specifications and operating standards. The rights and remedies provided herein are in addition to and do not limit those available to any Authorized User by and other Contractual provision, or as provided in law.

Warranty/Maintenance repairs shall be made onsite at the Authorized User's location. Normal warranty work (other than that work required to be performed by the sub-suppliers) will be performed by the Authorized User's maintenance department and reimbursed by the manufacturer at an agreed upon warranty labor rate by both parties.

Warranty/Maintenance excludes the following normal wear items: tires. Filter, and wiper blades, light bulbs (including headlamp assemblies), seals and gaskets, oil filters, air filters, fuel filters, bushings, belts, brake linings, and brake drums. Selected optional component equipment e.g., cameras, radios, GPS, etc., may be provided with a separate Warranty/maintenance provision, but such Warranty/maintenance shall be provided solely in accordance with the pricing schedule, attached hereto.

Warranty/Maintenance of Buses shall not include any work that is external to the Bus, the furnishing of supplies, or adding or removing accessories, attachments, or other equipment that is not provided under the Contract. Maintenance of Bus also shall not include repair of damage that is the direct result from the operational use by the Authorized User or from accident, unless the accident is caused by negligent or intentional acts or omissions of Contractor or its agents.

Contractor shall not be responsible for the cost of any Warranty/Maintenance repair due to the direct result of an Authorized User's intentional failure to properly use, maintain, and care for the Products as outlines in the documentation of manuals provided by the Contractor. Authorized Users are advised to maintain copies of all maintenance records and receipts for review by the Contractor.

All Warranty/Maintenance services to be performed on Buses shall be performed by qualified OEM-certified technicians to perform such services. Normal warranty work (other than that work required to be performed by sub-suppliers) will be performed by the Authorized User's maintenance department and reimbursed by the Manufacturer at an agreed upon warranty labor rate by both parties. The Commonwealth or any Authorized User reserves the right to require proof of certification prior to placing an order or performance of services and at any time during the term of the Warranty/Maintenance period, and any subsequent renewal period thereafter.

During the Bus pre-production meeting, the Contractor shall offer Authorized User the option to purchase additional warranties, in accordance with all contractual provisions herein, and in accordance with pricing as delineated herein, on **Attachment H, "Pricing Schedule."** This can only be purchased at the pre-production meeting.

In those instances where it is necessary for the Contractor to return a Bus for depot maintenance repair and support, the Contractor shall be responsible for towing costs. Only new standard part or parts equal in performance to new parts, and certified as OEM-acceptable replacement parts shall be used in effecting repairs. Parts which have been replaced shall become the property of the Contractor. Replacement parts installed shall become the property of the Authorized User. If the Equipment is out of service for more than seven (7) consecutive calendar days. Contractor would then assist the Authorized User by specifically calling the vendors directly to get them better focused on resolving the Authorized User's issues to ensure the Bus is repaired and returned in good working order as soon as possible.

Nothing herein shall be construed to waive or limit any rights or remedies otherwise available to the Commonwealth of Virginia or Authorized User under any other provisions herein, or in Code.

All Warranty/Maintenance services to be performed on Equipment shall be performed by qualified OEM-certified technicians to perform such services. The Commonwealth or any Authorized User reserves the right to require proof of certification prior to placing an order or performance of Services and at any time during the term of the Warranty/Maintenance period, and any subsequent renewal period thereafter.

9. **Maintenance Support:** Bidder shall include provisions with pricing (hourly labor rate and parts discount on **Attachment H (Pricing Schedule)** for post-warranty repair/maintenance support, to include, but not limited to; all labor, equipment, materials, supplies, travel time, and any other operating costs necessary to furnish and deliver OEM parts and accessories ordered to repair, service, and provide maintenance and options with appropriate service levels to 12-Year Transit Buses that any "Authorized User" may deem best to meet their specific mission requirements and service expectations e.g.:
 - a. Contractor's Services shall minimally include, but not be limited to, the following flexible maintenance support categorization options, as deemed appropriate by "Authorized Users", and in cooperation with the Contractor:
 - b. The vendor shall have personnel available to answer warranty, parts, and service inquiries Monday Through Friday, 8 A.M. to 5 P.M., except during holidays recognized by the Commonwealth of Virginia. The vendor shall respond to warranty, parts, and service inquiries and offer a reasonable initial plan to address such inquiries within 24 hours of call receipt or the next business day, whichever is later, via phone or email.
 - c. Service Types; onsite, offsite, telephonic, remote, or return to depot, and; In such event that Contractor's products must be returned to depot, manufacturer, or licensed facility

authorized to perform maintenance services, then Contractor shall communicate estimated bus “downtime” to the Authorized User.

- d. Contractor shall include a document identifying the cost of all parts on any order, e.g. parts order only and service/maintenance and repair orders. Bidder shall provide discount percentage off the list price for parts. The parts percentage discount shall remain firm over the life of the contract.
 - e. Contractor shall hold hourly labor rate pricing firm for a period of one year from the start of the contract. After the first year, labor rates may be adjusted according to the Price Escalation/De-Escalation paragraph in [Section IX., paragraph 18.](#)
 - f. In such event, that Contractor’s products must be returned to depot, manufacturer, or licensed facility authorized to perform maintenance services, then Contractor shall communicate estimated bus “downtime” to the Authorized User.
10. **Sales and Support Service:** The Contractor shall have a full time sales representative assigned to the Commonwealth to make regular calls to assist Authorized Users, address problems, e-procurement concerns and other matters. The Contractor shall apprise the Commonwealth of any quality issues including recalls, upgrades, and product warnings that may affect product performance and safety. All sales representatives must have on-line access to information to provide immediate response to inquiries concerning the status of orders, delivery information, back-order information, statewide contract pricing, and general product information. Sales representatives shall be available by phone, fax or email. Such contact information shall be provided to the Commonwealth and any Authorized User.
11. **Training:** The Contractor shall include with the bid and base bus bid price the training plan for new bus(es)/equipment operation, service/maintenance and basic repair to include, but not be limited to, the Contractor’s role in training and/or how training by a third party may occur.
12. **Pricing Schedule:** Bidders shall complete and submit all applicable fields of the pricing schedule for each transit bus make, length/size, to include optional equipment, accessories, and extended warranties, for example; charging infrastructure (equipment only) required for battery electric transit buses bid on [Attachment H, Pricing Schedule.](#)
- **Virginia entities:** Single Unit / Net Price + Delivery Price (flat fee) = Total Bid Price
 - **Third Party participants, outside Virginia:** Single Unit / Net Price = Base Bus Price (Third party participants delivery cost will be as mutually agreed upon by the customer and contractor).

Failure on the part of the bidder to provide all requested documentation may be cause to reject the bid, as non-responsive.

13. **Bidders shall submit a base floor plan (for each make/model and length/size)** and technical data for each vehicle offered on [Attachment H, Pricing Schedule](#). The Commonwealth reserves the right to obtain technical data and to request clarification when deemed necessary. **Failure on the part of the bidder to provide all requested documentation may be cause to reject the bid, as non-responsive.**
14. **Transit Bus Options:** Bidder should provide available options with description, option code, MSRP/list price and Commonwealth contract price for each make, length/size on [Attachment H](#). Bidder shall provide a percentage discount off MSRP/Catalog price on [Attachment H](#) for unlisted options. **(Ref. IX. Paragraph 24)**
15. **Ordering:** The parties agree that all orders issued under the contract by Authorized Users (Commonwealth of Virginia/COV) shall be processed through eVA. Orders against the contract which are not processed through eVA are not in compliance with the terms and conditions of the contract and Contractors receiving such non-eVA orders shall request the Authorized User (COV) to resubmit the order through eVA. If the Contractor accepts an order under the contract, where the order has not been processed through eVA, the Contractor will be in breach of contract. If an Authorized User (COV) issues an order which is not processed through eVA, but purports to be authorized by the contract, the agency may be found in violation of Section 2.2-4376 of the Code of Virginia. Section 2.2-4376 prohibits public employees from knowingly making false statements or misrepresentations, and from using documents known to contain false statements or misrepresentations.
16. **New Equipment:** The Vehicles bid in response to this solicitation and delivered under the contract shall be new and unused models of the Vehicle. No prototype or demonstrator Vehicle will be accepted, and bidding of such a Vehicle will be cause for bid rejection.
17. **Safety Notices and Recalls:** All safety notices and recalls shall be mailed to the entity's address on the purchase order for the destination of goods or other contact noted on the purchase order.
18. **Additional Specifications:** The Low Floor Transit Buses, Commuter Coach Buses, and Trolleys, heavy duty, 12 year, 29 ft. to 60 ft. sizes shall conform to the additional specifications on [Attachment H, Pricing Schedule](#). Bidders shall indicate that their vehicle conforms to those specifications by filling out the checkbox and any comments on [Attachment H, Pricing Schedule](#).
19. **Minimum Order:** There shall be no minimum order requirement.

V. PRE-BID CONFERENCE:

OPTIONAL PRE-BID CONFERENCE: An optional pre-bid conference will be held Virtually on [August 15, 2022 at 10:00 AM](#) (virtual information provided at the end of this section). The purpose of this conference is to allow potential Bidders an opportunity to present questions and obtain clarification relative to any facet of this solicitation.

While attendance at this conference will not be a prerequisite to submitting a bid, Bidders who intend to submit a bid are encouraged to attend. **No vendors will be admitted after 10:10 AM.** If admittance is required after the conference has begun, there is no guarantee that the Statewide Sourcing and Contracting Officer will be able to admit attendees.

Copies of the solicitation will not be distributed so bring a copy with you. Any changes resulting from this conference will be issued in a written addendum to the solicitation.

Teleconference participants must use the instructions provided below and are advised to start dialing-in no later than **9:50 AM** to ensure a telephone connection at the start of the teleconference. There will be no technical assistance available if a connection cannot be made. Bidder should notify the DPS Contracting Officer noted in the solicitation by email, no later than **August 11, 2022** if intending to participate by teleconference. If Bidder dials in late, information may not be repeated and Bidder may have to wait for the addendum to be issued.

Google Meet information:

Meeting ID: meet.google.com/jce-mprw-dew

Phone Number: (US) +1 256-502-4844

Phone Pin Number: **518 224 509#**

VI. SOLICITATION CLARIFICATIONS:

Questions regarding the solicitation **must be submitted in writing only** to Pamela Copeland via e-mail at pamela.copeland@dgs.virginia.gov no later than **4:00 p.m. on August 30, 2022**. Bidder should identify the email by noting the solicitation number **IFB# 6447** in the subject line. Responses to clarifications may be posted in eVA's Virginia Business Opportunities (VBO). The identity of Bidder's will not be published with the response. Formal changes to the solicitation, including but not limited to, contractual terms and procurement requirements will only be changed by formal written addendum to the solicitation.

There shall be no communication of any type on any aspect of this solicitation, written or otherwise, by any prospective Bidder, including any sub-bidder, Bidder's agent or other type of Bidder representative, with any employee or agency of the Commonwealth of Virginia, with the exception of the DPS Contracting Officer noted in the solicitation, unless a Bidder is instructed otherwise by the DPS Contracting Officer. Failure to comply with this requirement may disqualify a Bidder from participation in this opportunity.

As used in this IFB, the terms "must", "shall", "should" and "may" identify the criticality of requirements. "Must" and "shall" identify requirements whose absence will have a major negative impact on the suitability of the bid. Items labeled as "should" or "may" are highly desirable, although their absence will not have a large impact and would be useful, but are not necessary.

VII. REPORTING REQUIREMENTS:

A. CONTRACTOR'S QUARTERLY REPORT OF SALES: (Ref. Attachment I)

Contractor shall provide electronic reports in Microsoft Excel format on a quarterly basis showing total invoiced sales data, which means all invoices issued within the reporting period. Reports shall be provided no later the 15th of the next month following the end of the calendar quarter, reporting total invoiced sales and return transactions that took place in the immediately preceding quarter. Reports shall be sent to the DPS Contracting Officer. Failure to submit required information in a timely manner may result in cancellation of the Contract.

B. REPORTING SCHEDULES:

| <u>Quarterly Report Period</u> | <u>Sales Months</u> | <u>Report Due</u> |
|--------------------------------|---------------------|-------------------|
| 1st Quarter | Jan, Feb, Mar | April 15th |
| 2nd Quarter | Apr, May, June | July 15th |
| 3rd Quarter | July, Aug, Sept | October 15th |
| 4th Quarter | Oct, Nov, Dec | January 15th |

C. Contractor shall:

1. Meet or conference call at least quarterly with the DPS Contracting Officer to review performance, usage under the Contract, and discuss opportunities for improvements.
2. Provide any documentation or reports as requested by the DPS Contracting Officer.
3. Notify the DPS Contracting Officer, in writing, of any unresolved disputes or problems that have been outstanding for more than thirty (30) days.

VIII. INVOICES AND PAYMENT:

A. INVOICES:

Contractor shall submit the invoice(s) to the address designated on the purchase order following acceptance by the Authorized User of goods and services rendered. No invoice may include any cost other than those identified in the purchase order referencing the Contract. Invoice(s) shall provide at a minimum:

1. Name of Authorized User (the ordering entity)
2. Authorized User point of contact and phone/email
3. Description of the goods and/or services provided
4. Contract number
5. Purchase order number
6. Invoice number
7. Invoice date
8. Invoice amount

B. PAYMENT:

Payment will be made in accordance with the Virginia Prompt Payment Act. State Agencies will pay per §2.2-4350 of the Virginia Prompt Payment Act. Localities will pay per §2.2-4352 of the Virginia Prompt Payment Act. Payments will only be remitted after the receipt of valid invoice and verification of satisfactory goods received and/or completion of work. Payment may be made via a small purchase charge card (SPCC) (refer to the Mandatory Acceptance of Small Purchase Charge Card (SPCC) term and condition), check or EDI depending on how the Contractor is registered with the Department of Accounts. Utilization of the SPCC for payment shall not result in any additional fees (transaction fee, service charge etc.).

IX. SPECIAL TERMS & CONDITIONS:

1. **AUDIT:** The contractor shall retain all books, records, and other documents relative to this contract for five (5) years after final payment, or until audited by the Commonwealth of Virginia, whichever is sooner. The agency, its authorized agents, and/or state auditors shall have full access to and the right to examine any of said materials during said period.
2. **AWARD TO MULTIPLE BIDDERS:** The Commonwealth, at its sole discretion, reserves the right to make multiple awards as a result of this solicitation. The award(s) will be made to the lowest responsive and responsible bidder(s) meeting the requirements of the solicitation. The Commonwealth will make award(s) after evaluations of the **"Base Price"** and discounts offered for manufacturer's brand(s) and lengths. Due consideration will be given to price, discounts, completed information submitted on all pricing sheets ([ref. Attachment H, Pricing Schedule](#)). The Commonwealth reserves the right to conduct any tests it may deem advisable and to make all evaluations. The Commonwealth also reserves the right to reject any or all bids, in whole or in part, to waive informalities and to delete items prior to making the award, whenever it is deemed in the sole opinion of the procuring public body to be in its best interest.
3. **CANCELLATION OF CONTRACT:** The purchasing agency reserves the right to cancel and terminate any resulting contract, in part or in whole, without penalty, upon 60 days written notice to the contractor. In the event the initial contract period is for more than 12 months, the resulting contract may also be terminated by the contractor, without penalty, after the initial 12 months of the contract period upon 60 days written notice to the other party. Any contract cancellation notice shall not relieve the contractor of the obligation to deliver and/or perform on all outstanding orders issued prior to the effective date of cancellation.
4. **eVA ORDERS AND CONTRACTS:** It is anticipated that the contract will result in multiple purchase orders (i.e., one for each delivery requirement) with the applicable eVA transaction fee assessed for each order.

Vendors desiring to provide goods and/or services to the Commonwealth shall participate in the eVA Internet e-procurement solution and agree to comply with the following: If this solicitation is for a term contract, failure to provide an electronic catalog (price list) or index page catalog for items awarded will be just cause for the Commonwealth to reject your bid or terminate this contract for default. The format of this electronic catalog shall conform to the eVA Catalog Interchange Format (CIF) Specification that can be accessed and downloaded from

www.eVA.virginia.gov. Contractors should email Catalog or Index Page information to eVA-catalog-manager@dgs.virginia.gov.

5. **RENEWAL OF CONTRACT:** This contract may be renewed by the Commonwealth upon written agreement of both parties for **three (3)** successive **one (1) year** periods, under the terms of the current contract, and at a reasonable time (approximately 90 days) prior to the expiration.
6. **BID ACCEPTANCE PERIOD:** Any bid in response to this solicitation shall be valid for sixty (60) days. At the end of the sixty (60) days the bid may be withdrawn at the written request of the bidder. If the bid is not withdrawn at that time it remains in effect until an award is made or the solicitation is canceled.
7. **LOBBYING AND INTEGRITY:** Bidders are cautioned that communications with individuals other than the DPS Contracting Officer may result in incorrect and/or insufficient information being provided. In addition, the Bidder shall not, in connection with this or any other agreement with the Commonwealth of Virginia, directly or indirectly (1) offer, confer, or agree to confer any pecuniary benefit on anyone as consideration for any state officer or employee's decision, opinion, recommendation, vote, other exercise of discretion, or violation of a known legal duty, or (2) offer, give, or agree to give anyone any gratuity for the benefit of or at the direction or request of any state officer or employee.

Upon request of the Commonwealth of Virginia's, Department of General Services, the Bidder shall provide any type of information deemed relevant.

8. **FINANCIAL WARRANTY:** Contractor shall ensure that the prices, discounts, incentives, and other financial terms (collectively, the "financial deal") applicable to purchases under this Contract are always at least as favorable to the purchaser as the financial deal that the Contractor or its affiliates make available to any public body in Virginia for the same good(s)/service(s) outside this Contract. Throughout the term of this Contract, if Contractor (or any affiliate) makes a better financial deal available to a public body in Virginia for any good(s)/service(s) available under this Contract, Contractor shall immediately notify DGS of the details and, at DGS's option, sign an amendment to this Contract, so that an equivalent financial deal for the affected good(s)/service(s) is also available as an option under this Contract. Contractor may request exemption if the better financial deal was for a spot purchase, and DGS shall grant such request if DGS in good faith finds that the spot purchase involved special circumstances affecting cost that would make it unfair to apply an equivalent financial deal outside of that spot purchase. Upon DGS's request (and annually on August 1), Contractor shall submit to DGS an affidavit certifying full compliance with this Section. The Contractor (and any affiliate) shall waive any contractual or other right that inhibits any public body in Virginia from disclosing to DGS or others the financial terms made available to the public body, and upon request from DGS, Contractor shall ensure that a signed confirmation of the waiver is provided to the public body and DGS. As used in this Section, an affiliate is any entity that controls, is controlled by, or is under common control with, the contractor.
9. **ORDERS:** Authorized Users must order goods and/or services available from the Contract by issuing an eVA purchase order through the Commonwealth's electronic procurement website portal <http://www.eva.virginia.gov>.

- 10. PERIOD FOR PERFORMANCE OF PURCHASE ORDERS:** To be valid, a purchase order issued under this Contract must be issued during the term of the Contract. The period specified for performance of the purchase order may extend past the term of the Contract. If a notice terminating this Contract is issued, the notice shall be construed as applying only to the Contract and not to any existing purchase order, unless the notice expressly states the intent to terminate the purchase order.
- 11. EXCLUSIVITY OF TERMS AND CONDITIONS:** No employee or agent of the Commonwealth or Authorized User shall be required to sign or execute any additional contract, license or other agreement containing contractual terms and conditions. No contractor shall be required to sign, from any employee or agent of the Commonwealth or Authorized Users, any additional agreements, contracts, or other documents that were not part of the original contract. Any documents signed by persons other than the Director of DPS or their authorized designee shall have no validity or effect upon the Contract.
- 12. CONTRACTUAL DISPUTES:** In accordance with Code of Virginia § 2.2-4363, contractual claims, whether for money or other relief, shall be submitted in writing to the Authorized User no later than sixty (60) days after final payment; however, written notice of the Contractor's intention to file such claim must be given to the Authorized User at the time of the occurrence or beginning of the work upon which the claim is based. Pendency of claims shall not delay payment of amounts agreed due in the final payment. The Authorized User shall render a final decision in writing within thirty (30) days after its receipt of the Contractor's written claim.
- a. The Contractor may not invoke any available administrative procedure under Code of Virginia § 2.2-4365 nor institute legal action prior to receipt of the Commonwealth's decision on the claim, unless the Commonwealth fails to render its decision within thirty (30) days. The decision of the Commonwealth shall be final and conclusive unless the Contractor, within six (6) months of the date of the final decision on the claim, invokes appropriate action under Code of Virginia § 2.2-4364 or the administrative procedure authorized by Code of Virginia § 2.2-4365.
 - b. The Commonwealth or any Authorized User, and their officers, agents and employees, including without limitation, the contracting and Ordering Officers, are executing this Agreement and any Orders issued hereunder, solely in its or their statutory and regulatory capacities as agent of the Commonwealth agency or Authorized User that is purchasing and receiving the goods or services in question and need not be joined as a party to any dispute that may arise there under.
 - c. In the event of any breach by the Commonwealth or any Authorized User, Contractor's remedies shall be limited to claims for damages and Prompt Payment Act interest and, if available and warranted, equitable relief, all such claims to be processed pursuant to this Section. In no event shall Contractor' remedies include the right to terminate any services hereunder.
- 13. AUTHORIZED DEALER:** By submission of this bid, the bidder certifies that it is a manufacturer-authorized dealer for all goods and services it proposes to furnish under any resulting contract. If requested by the Commonwealth, the bidder shall provide supporting evidence from the manufacturer.

14. **ADDITIONAL USERS:** This procurement is being conducted as a “Joint and Cooperative Procurement”, as defined by *Code of Virginia § 2.2-4304*. Public bodies outside of the Commonwealth of Virginia may enter into mutual agreements with the Contractor(s) upon written consent from the Contractor(s) for the goods or services awarded against this solicitation and the resulting contract. Approval from the Commonwealth of Virginia is not required for public bodies outside of the Commonwealth of Virginia to utilize this contract. Should a public body require approval or acknowledgement from the Commonwealth of Virginia, the public body shall contact the Contract Officer responsible for managing the solicitation and subsequent contract.

15. **DELIVERY: Bidders shall fill out one of the two delivery clauses:**

a. **For Dealers:** Bidders shall be held to the time it takes for them to deliver the vehicle to the customer fully titled or with a completed Certificate of Origin after they receive it from the manufacturer (turn time). Whether the vehicle is required to be fully titled or only delivered with a Certificate of Origin will be at the discretion of the Authorized User. Authorized Users will communicate which is required and establish the process with the Dealer prior to the delivery of the vehicle(s). Bidders shall also indicate how long it takes for the vehicle to be delivered to the dealer after an order has been placed with the manufacturer (lead-time).

1. **TURN TIME PER VEHICLE ORDERED: _____ DAYS AFTER RECEIPT FROM MANUFACTURER**

2. **MANUFACTURER'S LEAD TIME PER VEHICLE: _____ DAYS ARO**

Throughout the life of the contract, the Commonwealth understands that issues may arise during the model year and delay the vehicle lead-time. If the manufacturer communicates a manufacturing delay, contractor shall notify the DPS Statewide Sourcing and Contracting Officer, as well as the authorized users who are impacted.

\$100 dollars per day shall be deducted from the final price on vehicles that are not delivered within the Turn Time Per Vehicle Ordered. This deduction is not to be considered a factor when calculating whether the financial deal offered to another public body in Virginia is better than that offered to DGS pursuant to the Financial Warranty clause. This deduction shall not apply to delivery delays initiated, authorized, or requested by the Authorized User. Failure to deliver in a timely manner may result in the termination of the contract. This deduction shall only apply to contractors acting as dealers.

b. **For Manufacturer Direct Sales:** Delivery of goods or performance of services shall be within the number of calendar days stated below after receipt of order (ARO) by the bidder. Bidders shall indicate their current expected delivery time below:

BIDDER'S CURRENT EXPECTED DELIVERY TIME: ____ CALENDAR DAYS ARO

If during the life of the contract there are any delays in production of the vehicles, the contractor shall notify both the Statewide Sourcing and Contracting Officer and the impacted authorized users. If the contractor's delivery is delayed due to an event beyond the contractor's control including, but not limited to, natural disaster, fire, an act of war or terrorism, or a labor strike

then the time for delivery of the vehicles shall be extended by the Commonwealth for thirty (30) days unless negotiated after such event has ended. The Commonwealth shall evaluate these situations on a case-by-case basis.

Any deliveries that are not impacted by such an event and are delivered outside the expected time shall have a \$100 dollars per day fee deducted from the final price. This deduction is not to be considered a factor when calculating whether the financial deal offered to another public body in Virginia is better than that offered to DGS pursuant to the Financial Warranty clause. This deduction shall not apply to delivery delays initiated, authorized, or requested by the Authorized User. Failure to deliver in a timely matter may result in the termination of the contract. This deduction shall only apply to contractors who are the manufacturers of the vehicle.

16. DELIVERY NOTIFICATION: The ordering Agency shall be notified five (5) business days prior to delivery so that personnel may be available to inspect and receive vehicle(s) being delivered. Notification shall be made to the individual indicated on the purchase order. The vehicle shall be in acceptable condition upon delivery and will be accepted only by an authorized person designated by the agency.

17. SUBMISSION OF SMALL BUSINESS SUBCONTRACTING PLAN, EVIDENCE OF COMPLIANCE WITH SMALL BUSINESS SUBCONTRACTING PLAN, AND SUBCONTRACTOR REPORTING:

- A. Submission of Small Business Subcontracting Plan: It is the statewide goal of the Commonwealth that 42% of its purchases be made from small businesses certified by DSBSD. This includes discretionary spending in prime contracts and subcontracts. All bidders are required to submit a Small Business Subcontracting Plan. The contractor is encouraged to offer such subcontracting opportunities to DSBSD-certified small businesses. This shall include DSBSD-certified women-owned and minority-owned businesses and businesses with DSBSD service disabled veteran-owned status when they have also received DSBSD small business certification. Where it is not practicable for any portion of the goods/services to be subcontracted to other suppliers, the bidder shall note such on the Small Business Subcontracting Plan. No bidder or subcontractor shall be considered a small business unless certified as such by the Department of Small Business and Supplier Diversity (DSBSD) by the due date for receipt of bids or proposals.
- B. Evidence of Compliance with Small Business Subcontracting Plan: Each prime contractor who wins an award in which provision of a small business subcontracting plan is a condition of the award, shall deliver to the contracting agency or institution monthly reports substantiating compliance in accordance with the small business subcontracting plan. If a variance exists, the contractor shall provide a written explanation. A subcontractor shall be considered a Small Business for purposes of a contract if and only if the subcontractor holds a certification as such by the DSBSD. Payment(s) may be withheld until the purchasing agency confirms that the contractor has certified compliance with the contractor's submitted Small Business Subcontracting Plan or is in receipt of a written explanation of the variance. The agency or institution reserves the right to pursue other appropriate remedies for non-compliance to include, but not be limited to, termination for default.
- C. Prime Contractor Subcontractor Reporting:

1. Each prime contractor who wins an award greater than \$100,000, shall deliver to the contracting agency or institution on a monthly basis, all applicable information for each subcontractor listed on the Small Business Subcontracting Plan that are DSBSD-certified businesses or Employment Services Organizations (ESOs). The contractor shall furnish the applicable information to the purchasing office via the Subcontractor Payment Reporting tool accessible within the contractor's eVA account.
2. In addition each prime contractor who wins an award greater than \$200,000 shall deliver to the contracting agency or institution on a monthly basis, all applicable information on use of subcontractors that are **not** DSBSD-certified businesses or Employment Services Organizations. The contractor shall furnish the all applicable information to the purchasing office via the Subcontractor Payment Reporting tool accessible within the contractor's eVA account.

18. **PRICE ESCALATION/DE-ESCALATION:** Price adjustments may be permitted for changes in the contractor's cost of providing goods and services. The PRODUCER PRICE INDEX/INDICES: 1413-02, Complete vehicles on purchased chassis and other relevant market conditions as determined appropriate and approved by DPS, will be used as guides to evaluate requested price changes. No price increases will be authorized for the current Model Year after the effective date of the contract. Price adjustments may only be allowed at the introduction of new model year to the satisfaction of the purchasing office. However, "across the board" price decreases are subject to implementation at any time and shall be immediately conveyed to the Commonwealth.

Contractor shall request approval in advance for any price increase by notifying the purchasing office. Any approved price changes shall be effective on the agreed upon effective date of the pricing change. In order to receive approval, the contractor shall document the amount and proposed effective date of any general change in the price of materials. Documentation shall be supplied with the contractor's request for increase which will: (1) verify that the requested price increase is general in scope and not applicable just to the Commonwealth of Virginia; and (2) verify the amount or percentage of increase which is being passed on to the contractor by the contractor's suppliers.

This IFB is for the 2022 model year or newer version of the vehicles listed. If pricing from the manufacturer has not been issued to dealers then the dealers shall submit pricing based on the most recent model year at a rate at which the vehicles would have been sold to the Commonwealth, based on the details of this solicitation. If the manufacturer increases the price after the contract is awarded, the contractor shall be allowed to request an increase to the contract price in line with the rest of this term and condition.

DPS will update the publicly posted contract and eVA catalog with the new pricing on the effective date. However, the contractor shall fill all purchase orders received prior to the effective date of the price adjustment at the old contract prices. The contractor is further advised that decreases which affect the cost of materials are required to be communicated immediately to the purchasing office.

19. **PRODUCT INFORMATION:** The bidder shall clearly and specifically identify the product being offered and enclose complete and detailed descriptive literature, catalog cuts and specifications with the bid to enable the Commonwealth to determine if the product offered meets the requirements of the solicitation. Failure to do so may cause the bid to be considered nonresponsive.

20. **QUANTITIES:** Quantities set forth in this solicitation are estimates only, and the contractor shall supply at bid prices actual quantities as ordered, regardless of whether such total quantities are more or less than those shown.

21. **WARRANTY (VEHICLE):** The contractor agrees that the goods or services furnished under any award resulting from this solicitation shall be covered by the most favorable commercial warranties the contractor gives any customer for such goods or services and that the rights and remedies provided therein are in addition to and do not limit those available to the Commonwealth by any other clause of this solicitation and rights and remedies permitted under applicable law. A copy of this warranty should be furnished with the bid.

During the life of the contract, the contractor shall provide all warranty service and shall have their own repair facilities (unless the vehicle manufacturer requires the work performed by them or another party) with sufficient parts and labor to support the vehicles sold under this contract. Contractor shall track all vehicles that receive warranty work under this contract and may be asked to produce that report during the life of the contract. If available, contractor shall furnish operating manuals and schematic design for all vehicles.

In such event that Contractor's products must be returned to depot, manufacturer, or licensed facility authorized to perform maintenance services, then Contractor shall communicate estimated bus "downtime" to the Authorized User.

22. **STATE CORPORATION COMMISSION IDENTIFICATION NUMBER:** Pursuant to Code of Virginia, §2.2-4311.2 subsection B, a bidder organized or authorized to transact business in the Commonwealth pursuant to Title 13.1 or Title 50 is required to include in its bid the identification number issued to it by the State Corporation Commission (SCC). Any bidder that is not required to be authorized to transact business in the Commonwealth as a foreign business entity under Title 13.1 or Title 50 or as otherwise required by law is required to include in its bid a statement describing why the bidder is not required to be so authorized. Indicate the above information on the SCC Form provided. Contractor agrees that the process by which compliance with Titles 13.1 and 50 is checked during the solicitation stage (including without limitation the SCC Form provided) is streamlined and not definitive, and the Commonwealth's use and acceptance of such form, or its acceptance of Contractor's statement describing why the bidder was not legally required to be authorized to transact business in the Commonwealth, shall not be conclusive of the issue and shall not be relied upon by the Contractor as demonstrating compliance.

23. **PAST MODEL YEARS AND STOCK VEHICLES:** Contractors are allowed to keep additional new unused vehicles as stock. Should the contractor keep new stock vehicles on this contract to cover immediate demand by the Commonwealth or localities the following shall apply:

- a. Only vehicles and specific model years that were explicitly incorporated into the contract can be sold as stock.
- b. Only new and unused vehicles shall be sold as stock vehicles.

- c. Stock vehicle prices cannot exceed the pricing for their specific model year but can be sold at a reduced rate with approval from the Statewide Sourcing and Contracting Officer. For example, model year 2022 vehicles shall always be sold at the agreed upon price for the 2022 model year or less and cannot be sold at a higher rate. If a lower price is offered by the contractor on a stock vehicle, a justification shall be sent to and approved by the Statewide Sourcing and Contracting Officer before that price can be applied to the vehicle.
- d. Vehicles shall not be sold after the expiration of the contract. The Commonwealth is not responsible for unsold stock at any time during or after the contract.

24. **OPTIONS (Add-ons & Deletes):** Bidders shall, for options not listed on the pricing schedule, provide a blanket discount off of the Manufacturer Suggested Retail Price (MSRP). After award of contract and/or upon request by authorized user(s) the contractor shall provide list of all options available for each vehicle on contract. For options that were not priced specifically in the bid, this list shall include a percentage off the Manufacturer Suggested Retail Price (MSRP), the MSRP for each listed option, and the final price with discount applied ([ref. Attachment H – Pricing Schedule](#)). The following shall also apply:

- a. The price listed is the full price of that option. There shall be no additional charges, shipping, delivery, installation, etc. added to any option.
- b. Unless an option is specifically identified in the bid as a dealer installed option, all options shall be factory installed by the manufacturer.
- c. If the base vehicle contains options which the Authorized User can and elects to delete, the price of those options shall be credited towards the purchase price of the vehicle.
- d. The Commonwealth reserves the sole right to determine what options are allowed to be sold on the contract and how they are categorized. The “categories” may include Options that will be available for purchase by restricted agencies, all authorized users, or by local government only.
- e. Options that have not been explicitly incorporated into the contract by a contract modification may be purchased as long as the approval from the Statewide Sourcing and Contracting Officer is granted to the Authorized User and the option is priced according to the blanket discount.

25. **ACCEPTANCE OF BUSES:** Within fifteen (15) calendar days after delivery of a bus to the Commonwealth, the Commonwealth or End User will conduct acceptance tests with qualified contractor personnel on the bus before acceptance. Acceptance tests shall be conducted using the criteria and standards, as previously agreed upon by the Commonwealth and the contractor, prior to the contractor building the vehicle. If any delivered bus passes these tests or if the Commonwealth does not notify the contractor of non-acceptance within fifteen (15) calendar days after delivery of the bus, acceptance of bus by the Commonwealth shall be deemed to have occurred the fifteenth (15) day after delivery. Acceptance shall occur earlier if the Commonwealth notifies the contractor of early acceptance or places the ordered bus into service. After the ordered bus have been put into service, qualified contractor personnel shall provide training to the Authorized User.

If any buses do not pass these tests, the Authorized User shall notify the contractor in writing of non-acceptance no later than fifteen (15) calendar days after delivery.

26. **BUILD OUT/FACTORY ORDER CUT-OFF DATE:** The build out, also referred to as the factory order cut-off date, is the date set by the manufacturer and is the latest date where dealers and customers can place an order with the vehicle manufacturer. The following shall apply during the life of the contract:
- a. **Contractors who are authorized dealers:** Contractor shall state the manufacturers build out date for each model and must fill all orders with the manufacturer that are placed by authorized users prior to the build out date. The Commonwealth understands build out date is subject to change and the contractor shall update the Statewide Sourcing and Contracting Officer of any changes. Contractors will not be expected to fulfill orders after build out date.
 - b. **Contractors who are manufacturers:** Contractor shall state their build out date for each model and must fill all orders that are placed by authorized users prior to the build out date. The Commonwealth understands build out date is subject to change and the contractor shall update the Statewide Sourcing and Contracting Officer of any changes. Contractors will not be expected to fulfill orders after build out date unless they possess the ability to produce additional vehicles of that model year.

27. **SALES AND SUPPORT SERVICE:** The contractor shall have a full time sales representative assigned to the Commonwealth to regularly assist authorized users, address problems, e-procurement concerns, and other matters. The contractor shall apprise the Commonwealth of any quality issues including recalls, upgrades, and product warnings that may affect product performance and safety. All service representatives, who are assigned to work the contract, shall have on-line access to information to provide immediate response to inquiries concerning the status of orders, delivery information, back-order information, statewide contract pricing, and general product information. Representatives shall be available by phone, fax or email. Such contact information shall be provided to the Commonwealth and any ordering entities.

Contractor shall send authorized users an email confirmation of receipt of any purchase order they place against the contract. This confirmation shall include the options, color choices, etc. being placed. This requirement shall apply to all orders issued against this contract. Confirmation shall be sent within 10 days after receipt of an order and shall indicate the date the order was placed with the manufacturer. Confirmations shall be emailed to the authorized user's address shown on the purchase order and to anyone else the authorized user has requested the confirmation to go to.

28. **TECHNICAL SERVICE SUPPORT:** The bidder shall provide information on their ability to furnish Lowtechnical assistance, including training and demonstration of operating procedures, for new equipment purchased under this contract. During the life of the contract, the contractor shall provide technical service on technical applications; furnish operating manuals and schematic design, when available, for all equipment. Contractor is responsible for ensuring repair facilities have sufficient spare parts and labor to support all stated manufacturer's equipment sold to the Commonwealth. As an authorized distributor, a contractor shall guarantee and extend all

manufacturers and/or dealer warranties. Contractor shall be able to track historical service requests, maintenance, and repairs.

29. **NEW VEHICLE PREPARATION:** Vehicles shall be delivered clean and complete and ready for service including a current State Inspection (as applicable) and in accordance with Federal and State Requirements. New vehicle service preparation must be performed by the dealer according to the manufacturer's specifications. Vehicles delivered without proper manufacturer/dealer preparation must be picked up, serviced, and re-delivered by the manufacturer/6477dealer at no additional cost to the ordering agency.

The contractor shall deliver the vehicles ready to for use with all parts working correctly. Additionally the following shall apply.

- a. **Temporary License:** A paper 30 Day license tag, unless a different format (e.g. electronic) is requested in writing by the "authorized user", shall be furnished with each vehicle unless Authorized Users waive, in writing, the 30 Day tag. (Ref. Attachment H: Pricing Schedule)
- b. **Title Papers:** All papers for titling purposes shall be delivered with each vehicle, unless a different format (e.g. electronic) is requested in writing by the "authorized user".
- c. **State Inspection Stickers and Decals:** In the event that the vehicles) are acquired from a Virginia manufacturer and/or authorized dealer then the vehicle(s) furnished shall conform to all applicable Federal and Motor Vehicle Safety Standards and all equipment shall conform to Title 46.2, Chapter 10, of the Code of Virginia.
 - Vehicle(s) shall include a valid State Inspection Sticker (as applicable).
 - No dealer identifications such as sticker, decal, metal emblem and so forth will be accepted on vehicle(s) furnished under this contract.
- d. **Taxes:** No Federal Taxes are to be included in the contract price at any time, including on tires. The Authorized Users as described herein shall furnish their Tax Exemption Registration number upon request.
- e. **Vehicle Publications, Forms and Documents:** The contractor shall furnish one (1) paper copy each of the following per vehicle, unless a different format (e.g. electronic) is requested in writing by the "authorized user":
 - i. New Vehicle Warranty Information Manual
 - ii. New Vehicle Owner's Manual
 - iii. Manufacturer's Statement of Origin (MSO)
 - iv. Delayed Warranty Start Form, and any other such documents as necessary for delivery
 - v. Emissions Certifications: Stating the vehicle meets U.S. Government Standards for sale in the Commonwealth of Virginia.
- f. In addition to all other remedies available to the Commonwealth, should the Contractor fail to meet any requirement set forth in this [Section 30](#) with respect to any delivered vehicle, one (1) per cent of that vehicle's cost, not to exceed \$2,000, will be deducted from the applicable invoice in order to compensate the Commonwealth for the resulting inconvenience

and business interruption.

30. **Artwork/Graphics:** All artwork, graphics, including film, camera ready copy, die, or any other artwork needed or created to complete lettering, graphics, wraps, and/or logo required or created to meet the requirements is the property of the "Authorized User" and must be returned to the "Authorized User" upon completion of contract.
31. **ONBOARD OPERATIONAL DATA ACCESS:** The Commonwealth grants the Contractor the right to inspect, examine, download, and otherwise obtain any information or data available from components provided by the Contractor, including, but not limited to, any electronic control modules or other data-collection devices ("subject data"), to the extent necessary to enable the Contractor to perform reliability maintenance analysis, corrective action and/or other engineering-type work for the vehicle.
32. **LICENSE TO USE SUBJECT DATA:** All "subject data", including specifications, technical data, records and reports, engineering drawings (including shop drawings and working drawings), manuals and instruction materials and computer or microprocessor software that is delivered or specified to be delivered under the contract shall remain the property of the Contractor; provided however, the Commonwealth shall have a royalty-free, non-exclusive, non-transferable and irrevocable license to use such subject data only for the purposes of operating and maintaining the vehicle(s).
33. **FEDERALLY IMPOSED TARIFFS:** In the event that the President of the United States, the United States Congress, Customs and Border Protection, or any other federal entity authorized by law, imposes an import duty or tariff (a "tariff"), on an imported good that results in an increase in contractor's costs to a level that renders performance under the Agreement impracticable, the Commonwealth may agree to an increase to the purchase price for the affected good. No increase in purchase price may exceed 25% of the additional tariff imposed on the goods imported or purchased by the contractor that are provided to the Commonwealth under this Agreement.
Prior to the Commonwealth agreeing to a price increase pursuant to this Section, the contractor must provide to the Commonwealth, the following documentation, all of which must be satisfactory to the Commonwealth:
- a. evidence demonstrating: (i) the unit price paid by contractor as of the date of award for the good or raw material used to furnish the goods to the Commonwealth under this Agreement, (ii) the applicability of the tariff to the specific good or raw material, and (iii) contractor's payment of the increased import duty or tariff (either directly or through an increase to the cost paid for the good or raw material). The evidence submitted shall be sufficient in detail and content to allow the Commonwealth to verify that the tariff is the cause of the price change.
 - b. a certification signed by contractor that it has made all reasonable efforts to obtain the good or the raw materials comprising the good procured by the Commonwealth at a lower cost from a different source located outside of the country against which the tariff has been imposed.

- c. a certification signed by contractor that the documentation, statements, and any other evidence it submits in support of its request for a price increase under this Section are true and correct, and that the contractor would otherwise be unable to perform under this Agreement without such price increase.
- d. as requested by the Commonwealth, written instructions authorizing the Commonwealth to request additional documentation from individuals or entities that provide the good or the raw materials to verify the information submitted by contractor.

If the Commonwealth agrees to a price increase pursuant to this Section, the parties further agree to add the following terms to this Agreement:

- a. During the Term and for five (5) years after the termination of this Agreement, contractor shall retain, and the Commonwealth and its authorized representatives shall have the right to audit, examine, and make copies of, all of contractor's books, accounts, and other records related to this Agreement and contractor's costs for providing goods to the Commonwealth, including, but not limited to those kept by the contractor's agents, assigns, successors, and subcontractors.
- b. Notwithstanding anything to the contrary in this Agreement, the Commonwealth shall have the right to terminate this Agreement for the Commonwealth's convenience upon 15 days' written notice to contractor.

In the event the import duty or tariff is repealed or reduced prior to termination of this Agreement, the increase in the Commonwealth's contract price shall be reduced by the same amount and adjusted accordingly.

Any material misrepresentation of fact by contractor relating in any way to the Commonwealth's payment of additional sums due to tariffs shall be fraud against the taxpayer's of the Commonwealth and subject contractor to treble damages pursuant to the Virginia Fraud Against Taxpayers Act.

IFB SUBMISSION INSTRUCTIONS

A. BID SUBMISSION REQUIREMENTS:

IFB #6447 is an invitation for an electronic sealed bid; therefore, bids submitted outside of the eVA system, such as via e-mail, mail, or fax WILL NOT be accepted. Electronic sealed bids will be received until the closing date and time provided in the solicitation. Any bid received after the closing date and time specified in the solicitation will not be considered and will be date and time stamped, marked “late” and retained unopened in the procurement file.

Prior to the due date, Bidders should:

- Check the status of the solicitation on eVA at www.eva.virginia.gov by clicking on Business Opportunities and then click on Virginia Business Opportunities (VBO) for any updates, changes, amendments, cancellations, etc.;
- Check the “Reminders” section in VBO for all attachments and documents to be completed and submitted; and
- Complete all attachments, amendments, exhibits, product information, etc. and attach electronically to the Bidder’s electronic submission.

Bidders are solely responsible for reviewing, complying, and returning a complete and responsive bid. Failure to submit any of the required information may result in the bid being declared non-responsive. Changes to the solicitation’s forms or formats are prohibited except where clearly instructed and permitted.

Bid Submission:

Electronic bid submission with required documents attached is required. Bidder must be registered in eVA in order to submit an electronic bid. Bidders must submit one (1) complete copy of the bid and attachments.

The following are instructions for submitting an electronic bid:

- a. Go to www.eva.virginia.gov;
- b. Click on “I Sell To Virginia”;
- c. Click on “eVA Vendor Training”; and
- d. Click on “Respond to IFBs - RFPs and more”.

If a Bidder need assistance submitting an electronic response, the Bidder must contact eVA Customer Care at 866-289-7367 or email eVACustomerCare@dgs.virginia.gov.

Bid Opening:

A public bid opening will be held at **10:00 a.m. (EST) on September 15, 2022** via Google Hangouts:

Link: meet.google.com/xwy-teka-ivp

Number: [\(US\)+1 319-343-8424](tel:(US)+13193438424)

Pin #: [212 406 571#](tel:212406571#)

VENDOR DATA SHEET

The following information is required as part of the Bidder's response to this solicitation. Failure to complete and provide this sheet may result in bid being declared nonresponsive. (In the case of a Combined Two-Step IFB, it may cause the Technical Proposal to be determined to be not acceptable.)

1. Qualification: The Bidder must have the capability and capacity in all respects to satisfy fully all of the contractual requirements.
2. Bidder's Primary Contact:
 Name: _____ Phone: _____ Email: _____
3. Years in Business: Indicate the length of time Bidder has been in business providing this type of good or service:
 _____ Years _____ Months
4. eVA Vendor ID or DUNS Number: _____
5. Indicate below a listing of at least four (4) current or recent accounts, either commercial or governmental, that the Bidder is servicing, has serviced, or has provided similar goods/services. Include the length of service and the name, address, and telephone number of the point of contact.
 - A. Company: _____ Contact: _____
 Phone:(_____) _____ Email: _____

 Dates of Service: _____ \$ Value: _____
 - B. Company _____ Contact: _____
 Phone:(_____) _____ Email: _____
 Dates of Service: _____ \$ Value: _____
 - C. Company: _____ Contact: _____
 Phone:(_____) _____ Email: _____
 Dates of Service: _____ \$ Value: _____
 - D. Company: _____ Contact: _____
 Phone:(_____) _____ Email: _____

 Dates of Service: _____ \$ Value: _____

I certify the accuracy of this information.

Signed: _____ Title: _____ Date: _____

SMALL BUSINESS SUBCONTRACTING PLAN

It is the goal of the Commonwealth that over 42% of its purchases be made from small businesses. All potential bidders are required to submit the subcontractor plan by one of the following methods in order to be considered responsive:

- A. Complete the subcontractor plan as specified in the electronic response; or
- B. Download the "paper response" form, complete the subcontractor plan section, and submit as an attachment with the bid response.

Small Business: "Small business (including micro)" means a business which holds a certification as such by the Virginia Department of Small Business and Supplier Diversity (DSBSD) on the due date for proposals. This shall also include DSBSD-certified women- owned and minority-owned businesses and businesses with DSBSD service disabled veteran owned status when they also hold a DSBSD certification as a small business on the proposal due date. Currently, DSBSD offers small business certification and micro business designation to firms that qualify.

Certification applications are available through DSBSD online at www.SBSD.virginia.gov (Customer Service).

STATE CORPORATION COMMISSION FORM

The following information is required as part of the Bidder's response to this solicitation. Failure to complete and provide this form may result in bid being declared nonresponsive. (In the case of a Combined Two-Step IFB, it may cause the Technical Proposal to be determined to be not acceptable.)

Virginia State Corporation Commission ("SCC") registration information: The Bidder:

is a corporation or other business entity with the following SCC identification number:

-OR-

is not a corporation, limited liability company, limited partnership, registered limited liability partnership, or business trust

-OR-

is an out-of-state business entity that does not regularly and continuously maintain as part of its ordinary and customary business any employees, agents, offices, facilities, or inventories in Virginia (not counting any employees or agents in Virginia who merely solicit orders that require acceptance outside Virginia before they become contracts, and not counting any incidental presence of the Bidder in Virginia that is needed in order to assemble, maintain, and repair goods in accordance with the contracts by which such goods were sold and shipped into Virginia from Bidder's out-of-state location)

-OR-

is an out-of-state business entity that is including with this bid an opinion of legal counsel which accurately and completely discloses the undersigned Bidder's current contacts with Virginia and describes why those contacts do not constitute the transaction of business in Virginia within the meaning of § 13.1-757 or other similar provisions in Titles 13.1 or 50 of the Code of Virginia.

****NOTE**** >> Check the following box if you have not completed any of the foregoing options but currently have pending before the SCC an application for authority to transact business in the Commonwealth of Virginia and wish to be considered for a waiver to allow you to submit the SCC identification number after the due date for bids (the Commonwealth reserves the right to determine in its sole discretion whether to allow such waiver):

Signature: _____ Date: _____

Name: _____

Print

Title: _____

Name of Firm: _____

NDA 2020 Section 7613 Compliance Form

Regarding compliance with Section 7613 of the National Defense Authorization Act for Fiscal Year 2020 (NDA 2020), subsection 49 U.S.C. § 5323 (u), the undersigned Bidder:

IS COMPLIANT with the provisions of this subsection and certifies the manufacturer is not “owned or controlled by, is a subsidiary of, or is otherwise related legally or financially to a corporation based in” certain foreign countries covered by the restrictions outlined.

IS NOT COMPLIANT with the provisions of this subsection and certifies the manufacturer is “owned or controlled by, is a subsidiary of, or is otherwise related legally or financially to a corporation based in” certain foreign countries covered by the restrictions outlined.

For more information regarding the restriction criteria and the provisions of subsection 49 U.S.C. § 5323 (u), visit the FTA Frequently-Asked-Questions for Section 7613 at the following link: <https://www.transit.dot.gov/funding/procurement/frequently-asked-questions-regarding-section-7613-national-defense>

PLEASE NOTE: Failure to provide this information, may result in your bid being declared non-responsive

Signature: _____ **Date:** _____

Name: _____
Print

Title: _____

Name of Firm: _____

IFB #6447, Attachment G
REFERENCE: SECTION 6 & 7 (only) for IFB 6447

STANDARD BUS PROCUREMENT GUIDELINES



A standardized request for
proposal contract form for
the transit industry





American Public Transportation Association
1300 I Street NW, Suite 1200 East, Washington, DC, 20005
December 2020

Standard Bus Procurement Guidelines RFP

Abstract: This document outlines a request for proposals for a negotiated bus procurement contract. A request for proposals is generally used when the scope of work or specification is less well-defined. In addition, this type of procurement may be used in cases where the vehicle involves “emerging” technology or there is a requirement to discuss warranty provisions or design considerations. This document was developed using a cross-section of representatives from the public and private sectors of the public transit industry for use by transit agencies.

Keywords: bus, request for proposals (RFP)

Overview: Many industries have standard forms of contracts for the acquisition of goods and services. Buyers and sellers in those industries become familiar and comfortable with those forms. The goal of creating a common method of contracting enables participants to focus, when necessary, on negotiating only those issues for which a departure from the accepted norm is necessary or desirable. This approach will save considerable time and effort for the parties to a particular transaction. It also permits new provisions or evolving best practices to be incorporated into the standard contract for that industry efficiently and in a manner designed to benefit the entire industry. Finally, standardization leads to a consistency of interpretation that presumably should reduce the number of contract disputes and result in better prices for both the public and private sectors.

How This Document Is Organized

The outline has been created to facilitate the development of a bus package that is consistent throughout the industry, providing a uniform format for numbering and organizing such documents. The use of standard formats for commonly used procurement contracts will improve the ability of industry participants to prepare contracts that contain all necessary provisions and that facilitate the incorporation of best available practices.

This format for a bus Contract RFP is organized as follows:

- The Notice of Request for Proposals (RFP) (**Section 1**) contains general information to prospective Proposers regarding the RFP package and can also be used as notification of the RFP to the public or an advertisement of the procurement opportunity.
- The Instructions to Proposers (**Section 2**) provides detailed requirements that Proposers must follow in submitting their Proposals. This section also includes evaluation criteria and information of interest to Proposers regarding Agency Contract award procedures.
- The General Conditions (**Section 3**), once customized by each Agency, should contain the standard terms and conditions and should be modified only by language added in the Special Provisions section.
- The Special Provisions (**Section 4**) should be customized to meet the Agency's specific requirements for each individual project or Contract, as well as local and state requirements. The Special Provisions are intended to amend and supplement the General Conditions to meet the individual requirements of each project.
- The Federal Requirements (**Section 5**) should be removed when the project is not funded with federal funds.
- The Technical Specifications (**Section 6**) can be detached as a standalone document.
- The Warranty Requirements (**Section 7**) include requirements to warrant the operation of the bus.
- Quality Assurance (**Section 8**) covers manufacturing, inspection and acceptance procedures.
- Forms and Certifications (**Section 9**) are submitted with the Proposal, or the Proposal may be considered nonresponsive.
- Contract (**Section 10**) will incorporate the surviving terms of the RFP, as well as the Contractor's Proposal in a binding document to be executed by the Agency and successful Proposer within a designated time period following award.
- Appendixes (**Section 11**).

It is understood that transit agencies will need to modify this document to reflect local and state rules, regulations and laws, and that they will insert the standard contract language that they have developed in the appropriate places in the document. However, modifications to the standard format should be made in a manner that will maintain the structural integrity of the document. The numbering of unused articles should be maintained and accompanied by the notations "Not used" or "Reserved."

How to Use This Document

This document has been designed to be a “living” document and will be reviewed biannually to stay current with new or updated regulations, policies and technologies.

Items noted in brackets [example] are areas indicating Agency input and should be filled in accordingly. As this is a living document, references to other sections in the document are noted by title only. All section titles are listed in the Table of Contents.

The Technical Specifications section is designed for multiple bus lengths and propulsion types. By selecting “Default,” a basic bus technical specification will be developed. In areas where there are alternatives to the default, the Agency may select “Alternative” instead.

NOTE: Selection of certain alternatives may present a conflict with other selections and should be carefully considered.

Request for Proposal

[insert Agency name]

[insert Agency logo]

[insert title of procurement]

[insert Proposal number]

[insert date of solicitation]

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SECTION 1: NOTICE OF REQUEST FOR PROPOSALS

NR 1. Description of the Work to be Done

The Agency requests Proposals for the manufacture and delivery of [insert title of procurement] in accordance with the terms and conditions set forth in RFP [insert Proposal number]. The Contract shall be a firm-fixed-price Contract.

Specifically, the Agency is requesting the following types of buses: [insert everything that is being procured in this solicitation].

NR 2. Obtaining Proposal Documents

Proposal documents may be obtained from [insert name of person from whom documents are obtained], in person at [insert location to obtain proposal documents] or electronically, if available, at [insert electronic address]. Documents requested by mail will be packaged and sent postage paid.

NR 3. Proposal Due Date and Submittal Requirements

Proposals must be received by [insert local time, day and date].

1. Sealed Proposals shall be submitted to either of the following addresses:
 - a. For courier delivery or hand delivery: [insert Agency contact, room and address]
 - b. By U.S. mail: [insert Agency contact, room and address, if different from above]
2. Envelopes or boxes containing Proposals shall be sealed and clearly labeled with the Agency's Proposal number and the solicitation title: [insert Proposal number] [insert title of procurement]
3. Proposers are requested to submit to the Agency one hard copy marked "Original," two additional printed copies, and three CDs, each containing an electronic PDF copy of the Proposal. In case of any discrepancies, the hard copy will be considered by the Agency in evaluating the Proposal, and the electronic version is provided for the Agency's administrative convenience only. A Proposal is deemed to be late if it is received by the Agency after the deadline stated above. Proposals received after the submission deadline may be rejected.

NR 4. Validity of Proposals

Proposals and subsequent offers shall be valid for a period of [specify time period, typically not fewer than 90 and not more than 180 days].

NR 5. Pre-Proposal Meeting Information (Optional)

A Pre-Proposal Meeting will be held on [insert day and date]. The meeting will convene at [insert time] in the Agency's [insert meeting room name], located at [insert address of location]. Proposers may also participate via conference call. The call-in number and instructions are as follows: [insert conference call information]

Prospective Proposers are requested to submit written questions to the Contract administrator, identified below, in advance of the Pre-Proposal Meeting. In addition, questions may be submitted up to the date specified in "Proposed Schedule for the Procurement." Responses will be shared with all prospective

Request for Proposal
[insert date of solicitation]
[insert Proposal number]

Proposers. Prospective Proposers are reminded that any changes to the RFP will be by written addenda only, and that nothing stated at the Pre-Proposal Meeting shall change or qualify in any way any of the provisions in the RFP and shall not be binding on the Agency.

Contracting Officer's Contact Information:

Name: [insert name of Contracting Officer]
Title: [insert title of Contracting Officer]
Address: [insert address of Contracting Officer]
Phone number: [insert phone number of Contracting Officer]
Email: [insert email address of Contracting Officer]
Fax number: [insert fax number of Contracting Officer]
Additional contact: [insert additional contacts if applicable]

Identification of Source of Funding

Financial support of this project is provided through financial assistance grants from the Federal Transit Administration (FTA), State of [insert state] and [insert Agency name] and [any other funding sources].

NOTE: Insert any other locally required notice provisions, including how to obtain the solicitation documents.

Signed and Dated for Posting

Signature/Title

Date

SECTION 2: INSTRUCTIONS TO PROPOSERS

IP 1. Quantities

The Work under these Contract documents consists of the manufacture and delivery of a base order of [insert number and bus types] and [insert associated goods and services such as spare parts, training materials and manual].

There will be [insert number of optional vehicles] options for [insert bus types] and [insert associated goods and services].

IP 2. Proposed Schedule for the Procurement

The following is the solicitation schedule for Proposers:

- Pre-Proposal Meeting/teleconference: [insert date and time].
- Proposer communications and requests: [insert date and time]

NOTE: Due date should be at least 20 business days before Proposal Due Date.

- Responses to Proposer's communications and/or Agency addenda: [insert date and time]

NOTE: Due date should be at least 10 business days before Proposal Due Date.

- Proposal Due Date: [insert date and time]

NOTE: The above are recommended dates based upon industry review.

IP 3. Obtaining Proposal Documents

Proposal documents may be obtained from [insert name], in person at [insert location] or electronically at [insert electronic address]. Documents requested by mail will be packaged and sent postage paid. Documents requested by courier will be packaged and sent only at the Proposers' expense.

IP 4. Proposal Security Requirements (Reserved)

[insert as needed]

NOTE: Reserved provision. Common industry practice is not to require a Proposal bond for RFPs.

IP 5. Pre-Proposal Meeting/Information for Proposers

A Pre-Proposal Meeting will be held on [insert date and time]. The meeting will convene at [insert time] in the Agency's [insert room name], located at [insert address]. Proposers can also participate via conference call. The call-in number and instructions are as follows: [insert conference call information]. Prospective Proposers are urged to make every effort to attend this meeting.

NOTE: A universal call-in number (either for North American or international participants, as appropriate) should be used so that Proposers outside the United States can participate in the conference call.

Prospective Proposers are requested to submit written questions to the Contracting Officer, identified above, in advance of the Pre-Proposal Meeting. In addition, questions may be submitted up to the date specified in “Proposed Schedule for the Procurement.” Responses will be shared with all prospective Proposers. Prospective Proposers are reminded that any changes to the RFP will be by written addenda only, and nothing stated at the Pre-Proposal Meeting shall change or qualify in any way any of the provisions in the RFP and shall not be binding on the Agency.

IP 6. Questions, Clarifications and Omissions

All correspondence, communication and contact in regard to any aspect of this solicitation or offers shall be only with the Contracting Officer identified above, [insert designated representative if applicable]. Unless otherwise instructed by the Contracting Officer, Proposers and their representatives shall not make any contact with or communicate with any member of the Agency, or its employees and consultants, other than the designated Contracting Officer, in regard to any aspect of this solicitation or offers.

At any time during this procurement up to the time specified in “Proposed Schedule for the Procurement,” Proposers may request, in writing, a clarification or interpretation of any aspect, a change to any requirement of the RFP, or any addenda to the RFP. Requests may include suggested substitutes for specified items and for any brand names, which whenever used in this solicitation shall mean the brand name or approved equal. Such written requests shall be made to the Contracting Officer. The Proposer making the request shall be responsible for its proper delivery to the Agency as identified on the form Request for Pre-Offer Change or Approved Equal. Any request for a change to any requirement of the Contract documents must be fully supported with technical data, test results or other pertinent information showing evidence that the exception will result in a condition equal to or better than that required by the RFP, without a substantial increase in cost or time requirements.

All responses to Request for Pre-Offer Change or Approved Equal shall be provided to all Proposers. Any response that is not confirmed by a written addendum shall not be official or binding on the Agency.

NOTE: It is recommended that an Agency issue a separate addendum incorporating all approved changes that result from the Request for Pre-Offer Change or Approved Equal process in order to avoid conflicting documents. Furthermore, the Agency should answer all questions in a timely manner.

If it should appear to a prospective Proposer that the performance of the Work under the Contract, or any of the matters relating thereto, is not sufficiently described or explained in the RFP or Contract documents, or that any conflict or discrepancy exists between different parts of the Contract or with any federal, state, local or Agency law, ordinance, rule, regulation, or other standard or requirement, then the Proposer shall submit a written request for clarification to the Agency within the time period specified above.

IP 7. Addenda to RFP

The Agency reserves the right to amend the RFP at any time in accordance with “Proposed Schedule for the Procurement.” Any amendments to the RFP shall be described in written addenda. Notification of or the addenda also will be distributed to all such prospective Proposers officially known to have received the RFP. Failure of any prospective Proposer to receive the notification or addenda shall not relieve the Proposer from any obligation under the RFP therein. All addenda issued shall become part of the RFP. Prospective Proposers shall acknowledge the receipt of each individual addendum in their Proposals on the form Acknowledgement of Addenda. Failure to acknowledge in the Proposal receipt of addenda may at the Agency’s sole option disqualify the Proposal.

If the Agency determines that the addenda may require significant changes in the preparation of Proposals, the deadline for submitting the Proposals may be postponed no fewer than ten (10) days from the date of issuance of addenda or by the number of days that the Agency determines will allow Proposers sufficient time to revise their Proposals. Any new Due Date shall be included in the addenda.

IP 8. DBE Requirements for Transit Vehicle Manufacturers

NOTE: Retain title and add “Reserved” if the procurement is not federally funded.

Pursuant to Title 49, Code of Federal Regulations, Part 26.49, a Proposer, as a condition of being authorized to respond to this solicitation, must certify by completing the form DBE Approval Certification that it has on file with the Federal Transit Administration (FTA) an approved or not disapproved annual disadvantaged business enterprise (DBE) subcontracting participation goal.

IP 9. Buy America Certification

NOTE: The following language should be used in those instances when federal funds are used in the Contract. If non-federal funds are used, then the Agency should insert any appropriate language. If neither applies, then keep the clause title and add the term “Reserved.”

This Contract is subject to the “Buy America” requirements of 49 United States Code (USC) §5323(j) and 49 Code of Federal Regulations (CFR) Part 661, as may be amended from time to time, and applicable federal regulations. Prospective Proposers’ attention is directed to 49 CFR §661.11, “Rolling Stock Procurements.” Prospective Proposers have the responsibility to comply with the cited and any governing statutes and regulations, including official interpretations.

A Proposer shall submit to the Agency the appropriate Buy America certification, included in this document, with all offers on FTA-funded contracts. Proposals that are not accompanied by a properly completed Buy America certification are subject to the provisions of 49 CFR 661.13 and will be rejected as nonresponsive.

The two signature blocks on the Buy America certificate are mutually exclusive. Proposers shall sign only one signature block on the certificate. Signing both signature blocks will make the Proposal nonresponsive. A false certification is a criminal act in violation of 18 USC §1001.

A Proposer who has submitted an incomplete Buy America certificate or an incorrect certificate of noncompliance through inadvertent or clerical error (but not including failure to sign the certificate, submission of certificates of both compliance and noncompliance, or failure to submit any certification), may submit to the FTA Chief Counsel within ten (10) days of Proposal opening a written explanation of the circumstances surrounding the submission of the incomplete or incorrect certification in accordance with 28 USC §1746, sworn under penalty of perjury, stating that the submission resulted from inadvertent or clerical error. The Proposer will also submit evidence of intent, such as information about the origin of the product, invoices, or other working documents. The Proposer will simultaneously send a copy of this information to the Agency.

The FTA Chief Counsel may request additional information from the Proposer, if necessary. The Agency may not make Contract award until the FTA Chief Counsel issues his or her determination, except as provided in 49 CFR Part 661.15(m).

Certification based on ignorance of proper application of the Buy America requirements is not an inadvertent or clerical error.

A waiver from the Buy America provisions will be sought by the Agency from the FTA for the proposed awardee, if the grounds for a waiver exist. All Proposers seeking a waiver must submit to the Agency a timely request in writing, which shall include the facts and justification to support the granting of the waiver. Such waiver from the Buy America provisions may be granted if the FTA determines the following:

1. Their application would be inconsistent with the public interest;
2. Materials are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or
3. Inclusion of domestic material will increase the cost of the overall Contract by more than 25 percent.

Any party may petition the FTA to investigate a successful Proposer's compliance with the Buy America certification. The procedures are set out in 49 CFR Part 661.15. If the FTA determines that the evidence indicates noncompliance, the FTA will require the Agency to initiate an investigation. The successful Proposer has the burden of proof to establish compliance with its certification. If the successful Proposer fails to so demonstrate compliance, then the successful Proposer will be required to substitute sufficient domestic materials without revision of the original Contract terms. Failure to do so will be a breach of the Contract and may lead to the initiation of debarment proceedings under 49 CFR Part 29.

IP 10. Conditions, Exceptions, Reservations or Understandings

Proposers are cautioned to limit exceptions, conditions and limitations to the provisions of this RFP, as they may be determined to be so fundamental as to cause rejection of the Proposal for not responding to the requirements of the RFP.

Any and all Deviations must be explicitly, fully and separately stated in the Proposal by completing the Form for Proposal Deviation, setting forth at a minimum the specific reasons for each Deviation so that it can be fully considered and, if appropriate, evaluated by the Agency. All Deviations shall be evaluated in accordance with the appropriate evaluation criteria and procedures and may result in the Proposer receiving a less favorable evaluation than without the Deviation.

The Form for Proposal Deviation shall be included in the Technical package.

IP 11. Protest Procedures

All protests must be in writing, stating the name and address of the protestor, a contact person, Contract number and title. Protests shall specify in detail the grounds of the protest and the facts supporting the protest.

IP 11.1 Address

All protests must be addressed as follows:

- Agency contact: [insert name of contact of protests]
- For special delivery or hand delivery: [insert special delivery address of contact for protests]
- For U.S. mail: [insert U.S. Mail address of contact for protests]

Protests not properly addressed to the address shown above may not be considered by the Agency.

Copies of the Agency’s protest procedures and the protest provisions of FTA Circular 4220.1F or its successor may be obtained from [insert appropriate contact name, address and phone number]. Proposals will be opened and a Notice of Award will be issued by the Agency in accordance with the Agency’s protest procedures and the protest provisions of FTA Circular 4220.1F or its successor.

IP 11.2 Pre-Proposal Protests

Pre-Proposal protests are protests based upon the content of the solicitation documents. Three copies of Pre-Proposal protests must be received by the Agency’s office no later than fifteen (15) calendar days prior to the Due Date. Protests will be considered and either denied or sustained in part or in whole, in writing, in a manner that provides verification of receipt, prior to the Due Date for Proposals. A written decision specifying the grounds for sustaining all or part of or denying the protest will be transmitted to the protestor prior to the Due Date for Proposals in a manner that provides verification of receipt prior to the Due Date for Proposals. If the protest is sustained, then the Proposal Due Date may be postponed and an addendum issued to the solicitation documents or, at the sole discretion of the Agency, the solicitation may be canceled. If the protest is denied, then Proposals will be received and opened on the scheduled date unless a protest is filed with the FTA. See “FTA Review,” below.

IP 11.3 Protests on the Recommended Award

All Proposers will be notified of the recommended award. This notice will be transmitted to each Proposer at the address contained in its Proposal form in a manner that provides verification of receipt. Any Proposer whose Proposal has not lapsed may protest the recommended award on any ground not specified in “Pre-Proposal Protests,” above. Three (3) copies of a full and complete written statement specifying in detail the grounds of the protest and the facts supporting the protest must be received by the Agency at the appropriate address in “Address,” above, no later than fifteen (15) calendar days after the date such notification is received. Prior to the issuing of the Notice of Award, a written decision stating the grounds for allowing or denying the protest will be transmitted to the protestor and the Proposer recommended for award in a manner that provides verification of receipt.

IP 11.4 FTA Review

After such administrative remedies have been exhausted, an interested party may file a protest with the Federal Transit Administration of the U.S. Department of Transportation pursuant to the procedures provided in the FTA C 4220.1F or its successor. FTA review is limited to the alleged failure of the Agency to have written protest procedures, the alleged failure of the Agency to follow those procedures, the alleged failure of the Agency to review a protest, or the alleged violation of federal law or regulation.

IP 12. Preparation of Proposals

IP 12.1 Use of Proposal Forms

Proposers are advised that the forms contained in this RFP are required to be used for submission of a Proposal.

NOTE: Agencies should use a submission format that can be completed electronically.

IP 12.2 Alternate and Multiple Proposals (Reserved)

[insert alternate proposals as needed]

IP 12.3 Proposal Format Requirements

Proposals shall be submitted in four separately sealed packages identified below. Each package shall be marked as specified below and shall contain all the Proposal documents for which the package is required to be marked and shall include no other documents. These same requirements shall apply to any best and final offers (BAFOs) that may be requested.

Proposers shall submit one original (marked clearly as such), [insert number] hard copies, and [insert number] CDs, each containing an electronic PDF copy of the Proposal to the Agency. In case of any discrepancies, the original will be considered by the Agency in evaluating the Proposal, and the electronic version is provided for the Agency's administrative convenience only.

The hard-copy Proposals shall be prepared double-sided on 8½ × 11 in. paper in at least 11-point font. The hard copies shall be contained in three-ring binders, the contents of which are identified on the outside. Use of 11 × 17 in. foldout sheets for large tables, charts or diagrams is permissible but should be limited. Elaborate formatting is not necessary. Do not provide promotional or advertising information, unless this information is requested and/or is necessary to support the technical submittal.

Package 1: Technical Proposal Requirements

NOTE: The Agency should develop and insert instructions to Proposers specifying the format and content of the Technical Proposal. These instructions will fully define the requirements for the organization and contents of the Technical Proposal.

1. Letter of Transmittal
2. Technical Proposal
3. Acknowledgement of Addenda
4. Contractor Service and Parts Support Data
5. Form for Proposal Deviation (without price data)
6. Vehicle Questionnaire
7. References and Non-Priced Information
8. Engineering organization chart, engineering change control procedure, field modification process
9. Manufacturing facilities plant layout, other contracts, staffing
10. Production and delivery schedule and other Contract commitments for the duration of this Contract
11. Management Plan

NOTE: The Agency may want to specify the information required for any Management Plan that is to be included in the Proposal, consistent with any specific management requirements and any evaluation criteria detailed in "Proposal Selection Process."

Package 2: Price Proposal Requirements

Each Price Proposal shall be on the prescribed Proposal form(s) and shall be for the entire Contract, including all Proposal items.

NOTE: The Agency is to specify the specific pricing data required and include the appropriate forms where prices are to be proposed. The Agency should also specify if Proposer must propose on all or some of the line items in the RFP. The Agency shall furnish to all prospective Proposers a list of applicable state and local taxes imposed by the Agency's state or local governments. The Agency shall be liable for any such state and local taxes applicable to the complete bus as delivered that are promulgated and become effective between the Due Date and the delivery date.

1. Letter of Transmittal
2. Pricing Schedule, (including but not limited to such pricing elements as option buses, spare parts package, manuals, training, special tools and test equipment)

The Proposer is required to complete and execute the Agency's Pricing Schedule, contained as part of the Proposal documents, and provide same in the Price Proposal. The Contractor shall be liable for payment of all local taxes applicable to the complete bus as delivered and should add these amounts to the Proposal price.

Package 3: Qualification Package Requirements

1. Pre-Award Evaluation Data Form
2. A copy of the three (3) most recent financial statements audited by an independent third party or a statement from the Proposer regarding how financial information may be reviewed by the Agency
3. Letter for insurance, indicating the Contractor's ability to obtain the insurance coverage in accordance with the RFP requirements
4. Letter from a surety for a Performance Guarantee, if required, indicating the Contractor's ability to obtain financial guarantees in accordance with the RFP requirements
5. Form for Proposal Deviation, if applicable (without price data)
6. Proposal Form
7. All federal certifications: Buy America Certification, Debarment and Suspension Certification for Prospective Contractor, Debarment and Suspension Certification (Lower-Tier Covered Transaction), Non-Collusion Affidavit, Lobbying Certification, Certificate of Compliance with Bus Testing Requirement, DBE Approval Certification, and Federal Motor Vehicle Safety Standards

NOTE: In lieu of 4 above, an Agency may allow the submission of a Letter from Parent Company, indicating the willingness of the parent company to provide the financial guarantee upon award for a possible cost reduction. See also "Qualification Requirements," below.

Package 4: Proprietary/Confidential Information Package Requirements

The Proposer is directed to collect and submit any information it deems to be proprietary or confidential in nature in a separate marked and sealed package. If there is no confidential information, then the Proposer should include a statement to that effect. Subject package shall be submitted in accordance with the terms and conditions governing the submittal of Proposer's Proposal to this RFP. Blanket-type identification by designating whole pages or sections as containing proprietary information, trade secrets or confidential commercial and financial information will not ensure confidentiality. The specific proprietary information, trade secrets or confidential commercial and financial information must be clearly identified as such.

The Proposer is advised that the Agency is public and as such may be subject to certain state and/or local Public Records Act provisions regarding the release of information concerning this RFP. If a request is received by the Agency for the release of Proposer's proprietary/confidential information, then subject request will be referred to the Proposer for review and consideration. If Proposer chooses to declare the information proprietary/confidential and withhold it from release, then it shall defend and hold harmless the Agency from any legal action arising from such a declaration.

IP 12.4 Agency Treatment of Proprietary/Confidential Information

NOTE: The following provision should be considered a guideline for drafting a clause consistent with local laws.

Access to government records is governed by the [insert city, state or local open records law]. Except as otherwise required to be disclosed by applicable [insert optional city, state or local open records law], the Agency will exempt from disclosure proprietary information identified in Package 4.

Upon a request for records from a third party regarding this Proposal, the Agency will notify the Proposer in writing. The Proposer must respond within [insert number] business days with the identification of any and all “proprietary, trade secret or confidential commercial or financial” information. Failure to respond within the allowed period shall be deemed an approval to release. The Proposer shall indemnify the Agency’s defense costs associated with its refusal to produce such identified information; otherwise, the requested information may be released.

The Agency shall employ sound business practices no less diligent than those used for the Agency’s own confidential information to protect the confidence of all licensed technology, software, documentation, drawings, schematics, manuals, data and other information and material provided by Proposers and the Contractor pursuant to the Contract that contain confidential commercial or financial information, trade secrets or proprietary information as defined in or pursuant to the [insert city, state or local open records law] against disclosure of such information and material to third parties, except as permitted by the Contract. The Contractor shall be responsible for ensuring that confidential commercial or financial information, trade secrets or proprietary information—with such determinations to be made by the Agency at its sole discretion—bears appropriate notices relating to its confidential character.

IP 12.5 Signing of Proposal Forms

Proposals shall include firm name (and, in the event that the Proposer is a joint venture, the names of the individual firms comprising the joint venture); business address; and the name, title, business address, telephone number, facsimile (fax) number and email address of the responsible individual(s) who may be contacted during the Proposal evaluation period for scheduling oral presentations and for receiving notices from the Agency. The Proposer shall submit with its Proposal a copy of the joint venture agreement.

Proposals shall be signed by those individual(s) authorized to bind the Proposer. The Proposer shall submit evidence of the official’s authority to act for and bind the Proposer in all matters relating to the Proposal. (In the event that the Proposer is a joint venture or consortium, a representative of each of the members of the joint venture or consortium shall execute the Proposal. Each joint venture or consortium member is jointly and severally liable for the joint venture or consortium.)

NOTE: The Agency should check applicable state law for any specific requirements.

IP 12.6 Modification or Withdrawal of Proposals

A modification of a Proposal already received will be accepted by the Agency only if the modification is received prior to the Proposal Due Date, is specifically requested by the Agency or is made with a requested BAFO. All modifications shall be made in writing and executed and submitted in the same form and manner as the original Proposal.

A Proposer may withdraw a Proposal already received prior to the Proposal Due Date by submitting to the Agency, in the same manner as the original Proposal, a written request for withdrawal executed by the Proposer’s authorized representative. After the Proposal Due Date, a Proposal may be withdrawn only if the Agency fails to award the Contract within the Proposal validity period prescribed in “Duration of the Validity of Proposals,” or any agreed-upon extension thereof. The withdrawal of a Proposal does not prejudice the right of a Proposer to submit another Proposal within the time set for receipt of Proposals.

IP 12.7 Ownership and Cost of Proposal Development

All proposals will become the property of the Agency.

This RFP does not commit the Agency to enter into a Contract, to pay any costs incurred in the preparation or presentation of a Proposal, nor to procure or contract for the equipment.

NOTE: An Agency needs to be mindful of the significant costs that Proposers incur in proposal development activities and that cancellation of a procurement after receipt of proposals can end up raising prices for the entire industry.

IP 13. Proposal Evaluation, Negotiation and Selection

Proposals will be evaluated, negotiated, selected and any award made in accordance with the criteria and procedures described below. The approach and procedures are those applicable to a competitive negotiated procurement whereby Proposals are evaluated to determine which Proposals are within a Competitive Range. Discussions and negotiations may then be carried out with Proposers within the Competitive Range, after which BAFOs may be requested.

However, the Agency may select a Proposal for award without any discussions or negotiations or request for any BAFOs. Subject to the Agency's right to reject any or all Proposals, the Proposer whose Proposal is found to be most advantageous to the Agency will be selected, based upon consideration of the criteria of "Proposal Selection Process," below.

IP 13.1 Confidentiality of Proposals

Proposals will not be publicly opened. All Proposals and evaluations will be kept strictly confidential throughout the evaluation, negotiation and selection process, except as otherwise required by applicable law. Only the members of the Selection Committee and Evaluation Team and other Agency officials, employees and agents having a legitimate interest will be provided access to the Proposals and evaluation results during this period.

IP 13.2 Duration of the Validity of Proposals

Proposals and subsequent offers shall be valid for the period stated in "Section 1: Notice of Request for Proposals." The Agency may request Proposers to extend the period of time specified herein by written agreement between the Agency and the Proposer(s) concerned.

IP 13.3 Evaluation Committee

NOTE: The Agency should specify how it will organize the evaluation and appropriately title this section. The following is provided as an example. In some instances, a Selection Committee may be established to receive and review the results of the Evaluation Committee.

An Evaluation Committee, which will include officers, employees and agents of the Agency, will be established. The Evaluation Committee will carry out the detailed evaluations, including establishing the Competitive Range, carrying out negotiations and making the selection of the Proposer, if any, that may be awarded the Contract.

The Evaluation Committee may report its recommendations and findings to the appropriate Agency individual or body responsible for awarding the Contract.

IP 13.4 Review of Proposals for Responsiveness and Proposers for Responsibility

Each Proposal will be reviewed to determine if the Proposal is responsive to the submission requirements outlined in this RFP and if the Proposer is responsible.

A responsive Proposal is one that follows the requirements of this RFP, includes all documentation, is submitted in the format outlined in this RFP, is of timely submission, and has the appropriate signatures as required on each document. Failure to comply with these requirements may result in the Proposal being deemed nonresponsive.

A responsible Proposer is one that demonstrates the capability to satisfy the commercial and technical requirements set forth in the Solicitation. A Proposer's failure to demonstrate that it is responsible may result in the proposal being rejected.

Any Proposal found to be nonresponsive or Proposer found to be non-responsible will not be considered further for award. Proposals that do not comply with the RFP instructions and requirements or do not include the required information may be rejected as insufficient and may not be further considered. The Agency reserves the right to request that a Proposer provide additional information and/or to clarify information. The Agency's determination regarding the responsiveness of a Proposal and the responsibility of a Proposer shall be final.

IP 13.5 Proposal Selection Process

The following describes the process by which Proposals will be evaluated and a selection made for a potential award. Any such selection of a Proposal shall be made by consideration of only the criteria set forth below.

"Qualification Requirements" specifies the requirements for determining responsible Proposers, all of which must be met by a Proposer for it to be found qualified. Final determination of a Proposer's qualification will be made based upon all information received during the evaluation process and as a condition for award.

"Proposal Evaluation Criteria" contains all the evaluation criteria, and their relative order of importance, by which a Proposal from a qualified Proposer will be considered for selection. An award, if made, will be to a responsible Proposer for a Proposal that is found to be in the Agency's best interests, based on price and other evaluation criteria considered. The procedures to be followed for these evaluations are provided in "Evaluation Procedures," below.

Qualification Requirements

The following are the requirements for qualifying responsible Proposers. All of these requirements should be met; therefore, they are not listed in any particular order of importance. Any Proposal that the Evaluation Committee finds does not meet these requirements, and cannot be made to meet these requirements, may be determined by the Evaluation Committee not to be responsible and the Proposal rejected. The requirements are as follows:

NOTE: Requirements shown below are examples to serve as guidelines. The Agency is to choose and specify the appropriate requirements.

1. Sufficient financial strength, resources and capability to finance the Work to be performed and to complete the Contract in a satisfactory manner, as measured by the following:
 - Proposer’s financial statements prepared in accordance with generally accepted accounting principles of the jurisdiction in which the Proposer is located, and audited by an independent certified public accountant; oral statement from the Proposer regarding how financial information may be reviewed by the Agency.

NOTE: It is important only to determine if the Proposer will have sufficient financial strength to pay its bills on time, fund the cash flow, and meet obligations to Subcontractors. The evaluation of financial strength should take into account the Proposer’s other contractual commitments.

 - Proposer’s ability to secure financial guarantees, if required, as evidenced by a letter of commitment from an underwriter, surety or other guarantor confirming that the Proposer can provide the required guarantee.

NOTE: Willingness of any parent company to provide the financial guarantee if required, in lieu of a bank guarantee, can be evidenced by a letter of commitment signed by an officer of the parent company having the authority to execute the parent company guarantee.

 - Proposer’s ability to obtain required insurance with coverage values that meet minimum requirements, evidenced by a letter from an underwriter confirming that the Proposer can be insured for the required amount.
2. Evidence that the human and physical resources are sufficient to perform the Contract as specified and to ensure delivery of all equipment within the time specified in the Contract, to include the following:
 - Engineering, management and service organizations with sufficient personnel and requisite disciplines, licenses, skills, experience and equipment to complete the Contract as required and to satisfy any engineering or service problems that may arise during the warranty period.
 - Adequate manufacturing facilities sufficient to produce and factory-test equipment on schedule.
 - A spare parts procurement and distribution system sufficient to support equipment maintenance without delays and a service organization with skills, experience and equipment sufficient to perform all warranty and on-site Work.
3. Evidence that Proposer is qualified in accordance with the provisions of “Section 8: Quality Assurance.”
4. Evidence of satisfactory performance and integrity on contracts in making deliveries on time, meeting specifications and warranty provisions, parts availability and steps Proposer took to resolve any judgments, liens, Fleet Defects history or warranty claims. Evidence shall be by client references.

Proposal Evaluation Criteria

The following are the complete criteria, listed in their relative order of importance, by which Proposals from responsible Proposers will be evaluated and ranked for the purposes of determining any Competitive Range and to make any selection of a Proposal for a potential award. Any exceptions, conditions, reservations or understandings explicitly, fully and separately stated on the Form for Proposal Deviation, which do not cause

the Agency to consider a Proposal to be outside the Competitive Range, will be evaluated according to the respective evaluation criteria and sub-criteria that they affect.

The criteria are listed numerically by their relative order of importance. However, certain criteria may have sub-criteria identified that are listed by their relative order of importance within the criterion they comprise. Also, certain sub-criteria may have sub-criteria that are listed by their relative degree of importance within the specific sub-criterion they comprise.

NOTE: The Agency must define and insert the evaluation criteria to be used. At the option of the Agency, weights could be assigned to each criterion and sub-criterion and be shown in the document. At a minimum, the criteria must be listed by their order of importance in the evaluation. The following are suggested categories of evaluation criteria for Agency consideration, but they are not listed in a suggested order of importance:

- Technical
- Qualifications (resources, management, engineering, etc.)
- Price
- Delivery
- Other financial impacts

Example evaluation criteria are presented in Appendix C at the end of this document.

IP 13.6 Evaluation Procedures

Proposals will be analyzed for conformance with the instructions and requirements of the RFP and Contract documents. Proposals that do not comply with these instructions and do not include the required information may be rejected as insufficient or not be considered for the Competitive Range. The Agency reserves the right to request that a Proposer provide any missing information and make corrections. Proposers are advised that the detailed evaluation forms and procedures will follow the same Proposal format and organization specified in “Preparation of Proposals.” Therefore, Proposers should pay close attention to and strictly follow all instructions. Submittal of a Proposal will signify that the Proposer has accepted the whole of the Contract documents, except such conditions, exceptions, reservations or understandings explicitly, fully and separately stated on the forms and according to the instructions of the Form for Proposal Deviation. Any such conditions, exceptions, reservations or understandings that do not result in the rejection of the Proposal are subject to evaluation under the criteria set forth in “Proposal Selection Process.”

Evaluations will be made in strict accordance with all the evaluation criteria specified in “Proposal Selection Process,” above. The Agency will choose the Proposal that it finds to be most advantageous to the Agency, based upon the evaluation criteria.

IP 13.7 Evaluations of Competitive Proposals

1. **Qualification of responsible Proposers.** Proposals will be evaluated to determine the responsibility of Proposers. A final determination of a Proposer’s responsibility will be made upon the basis of initial information submitted in the Proposal, any information submitted upon request by the Agency, information submitted in a BAFO, and information resulting from Agency inquiry of Proposer’s references and its own knowledge of the Proposer.
2. **Detailed evaluation of Proposals and determination of Competitive Range.** The Agency will carry out and document its evaluations in accordance with the criteria and procedures set forth in “Proposal Selection Process.” Any Proposal deficiencies that may render a Proposal unacceptable will be documented. The Agency will make specific note of questions, issues, concerns and areas

requiring clarification by Proposers and to be discussed in any meetings with Proposers that the Agency finds to be within the Competitive Range.

Rankings of the Proposals against the evaluation will then be made for determining which Proposals are within the Competitive Range, or may reasonably be made to be within the Competitive Range.

3. **Proposals not within the Competitive Range.** Proposers of any Proposals that have been determined by the Agency as not in the Competitive Range, and that cannot be reasonably made to be within the Competitive Range, will be notified in accordance with the Agency's policies.
4. **Discussions with Proposers in the Competitive Range.** The Proposers whose Proposals are found by the Agency to be within the Competitive Range, or that may be reasonably made to be within the Competitive Range, will be notified and any questions or requests for clarifications provided to them in writing. Each such Proposer may be invited for an interview and discussions with the Agency to discuss answers to written or oral questions, clarifications and any facet of its Proposal.

In the event that a Proposal that has been included in the Competitive Range contains conditions, exceptions, reservations or understandings to any Contract requirements as provided in the Form for Proposal Deviation, said conditions, exceptions, reservations or understandings may be negotiated during these meetings. However, the Agency shall have the right to reject any and all such conditions and exceptions, and instruct the Proposer to amend its Proposal and remove said conditions and exceptions; and any Proposer failing to do so may cause the Agency to find such Proposal to be outside the Competitive Range.

No information, financial or otherwise, will be provided to any Proposer about any of the Proposals from other Proposers, to the extent permitted by applicable law. Proposers will not be given a specific price or specific financial requirements they must meet to gain further consideration, except that proposed prices may be considered to be too high with respect to the marketplace or unacceptable. Proposers will not be told of their rankings among the other Proposers prior to Contract award.

5. **Factory and site visits.** The Agency reserves the right to conduct factory visits of the Proposer's facilities and/or the facilities of major sub-suppliers included in the Proposal.
6. **Best and final offers.** After all interviews have been completed, the Proposers in the Competitive Range may be afforded the opportunity to amend their Proposals and make their BAFOs. The Request for BAFOs shall include the following:

NOTE: The items shown below are for illustrative purposes only; the Agency will make the determination on what to include in its request for BAFOs.

- Notice that discussions and negotiations are concluded.
- A complete listing of the conditions, exceptions, reservations or understandings that have been approved.
- A common date and time for submission of written BAFOs, allowing a reasonable opportunity for preparation of the written BAFOs.

- Notice that if any modification to a BAFO is submitted, it must be received by the date and time specified for the receipt of BAFOs.
- Notice to Proposers that do not submit a notice of withdrawal or a BAFO that their immediately previous Proposal will be construed as their BAFO.

Any modification to the initial Proposal made by a Proposer in its BAFO shall be identified in its BAFO. BAFOs will be evaluated by the Agency according to the same requirements and criteria as the initial Proposals (“Proposal Selection Process”). The Agency will make appropriate adjustments to the initial scores for any sub-criteria and criteria that have been affected by any Proposal modifications made by the BAFOs. These final scores and rankings within each criterion will again be arrayed by the Agency and considered according to the relative degrees of importance of the criteria defined in “Proposal Selection Process.”

The Agency will then choose the Proposal that it finds to be most advantageous to the Agency, based upon the evaluation criteria. The results of the evaluations and the selection of a Proposal for any award will be documented.

The Agency reserves the right to make an award to a Proposer whose Proposal it judges to be most advantageous to the Agency based upon the evaluation criteria, without conducting any written or oral discussions with any Proposers or solicitation of any BAFOs.

7. **Debriefing.** Subsequent to the award, the unsuccessful Proposers will be notified and may request a debriefing. Proposers will be debriefed in accordance with Agency policies, including information regarding the shortcomings of their Proposal.

IP 14. Response to Proposals

IP 14.1 Single Proposal Response

If only one Proposal is received in response to this RFP and it is found by the Agency to be acceptable, then a price or cost analysis, or both, possibly including an audit, may be performed by or for the Agency. The Proposer has agreed to such analysis by submitting a Proposal in response to this RFP.

NOTE: The use of a third-party auditor is recommended to ensure confidentiality of cost and pricing data. The Proposer may require a nondisclosure agreement.

IP 14.2 Availability of Funds

This procurement is subject to the availability of funding. [Agency to insert a description of the funding for this procurement, including any conditions upon which funding is dependent]

IP 14.3 Agency Contract Approval Process

[Agency to insert a provision outlining its internal approval and award process, advising Proposers on the steps to be taken after completion of any evaluation process]

IP 14.4 Agency Rights

The Agency reserves the right to cancel the procurement in whole or in part, at its sole discretion, at any time before the Contract is fully executed and approved on behalf of the Agency.

The Agency reserves the right to reject any or all Proposals, to undertake discussions with one or more Proposers, and to accept that Proposal or modified Proposal which, in its judgment, will be most advantageous to the Agency, considering price and other evaluation criteria. The Agency reserves the right to determine any specific Proposal that is conditional or not prepared in accordance with the instructions and requirements of this RFP to be nonresponsive. The Agency reserves the right to waive any Defects, or minor informalities or irregularities in any Proposal that do not materially affect the Proposal or prejudice other Proposers.

If there is any evidence indicating that two or more Proposers are in collusion to restrict competition or are otherwise engaged in anti-competitive practices, the Proposals of all such Proposers shall be rejected, and such evidence may be a cause for disqualification of the participants in any future solicitations undertaken by the Agency.

The Agency may reject a Proposal that includes unacceptable Deviations as provided in the Form for Proposal Deviation.

IP 14.5 Execution of Contract

The acceptance of a Proposal for award, if made, shall be evidenced in writing by a notice of award of Contract delivered to the Proposer whose Proposal is accepted. Upon notice of award of the Contract to a Proposer, the Proposer shall commence performance under the Contract by furnishing any required bonds, and by furnishing copies of the certificates of insurance required to be procured by the Contractor pursuant to the Contract documents within [insert number] calendar days after the date of receipt of the notice of award. Failure to fulfill these requirements within the specified time is cause for termination of the Contract under “Termination for Default” in Section 3.

IP 15. Conflicts of Interests and Gratuities

Proposers are prohibited from engaging in any practice that may be considered a conflict of interest under existing Agency policies and/or state law, and to refrain from participating in any gifts, favors or other forms of compensation that may be viewed as a gratuity in accordance with existing policies and laws.

IP 16. Agency-Specific Provisions

[to be inserted by Agency as required]

SECTION 3: GENERAL CONDITIONS

GC 1. Definitions

The following are definitions of special terms used in this document:

Agency: [insert Agency name]

Authorized Signer: The person who is executing this Contract on behalf of the Contractor and who is authorized to bind the Contractor.

Best and Final Offer (BAFO): The last Proposal made by a Proposer. If a BAFO is not specifically requested by the Agency, or if the Proposer does not promptly respond to a request for a BAFO, then the most recent, current Proposal is the BAFO.

Class 1 Failure (physical safety): A failure that could lead directly to passenger or operator injury and represents a severe crash situation.

Class 2 Failure (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.

Competitive Range: The range of proposals that are identified as the most highly rated, unless the range is further reduced for purposes of efficiency.

Contract: The Proposal and its acceptance by the Agency as manifested by the Contract documents specified in “Section 10: Contract.”

Contracting Officer: The person who is executing this Contract on behalf of the Agency and who has complete and final authority except as limited herein.

Contractor: The successful Proposer who is awarded a Contract for providing all buses and equipment described in the Contract documents.

Days: Calendar days, unless otherwise stated.

Defect: Patent or latent malfunction or failure in manufacture, installation or design of any component or subsystem.

Deviation: Variance from a requirement or specification that does not alter the basis of a Contract or adversely affects its performance.

Due Date: The date and time by which Proposals must be received by the Agency as specified in “Section 1: Notice of Request for Proposals.”

Extended Warranty: A warranty available for purchase above the standard warranty.

Fatigue Failure (Corrosion Fatigue): The mechanical degradation of a material under the joint action of corrosion and cyclic loading.

Pass-Through Warranty: A warranty provided by the Contractor but administered directly with the component Supplier.

Proposal: A promise, if accepted, to deliver equipment and services according to the underlying solicitation of the Agency documented using the prescribed form in the solicitation, including any Proposal or BAFO.

Proposer: A legal entity that makes a Proposal.

Related Defect: Damage inflicted on any component or subsystem as a direct result of a separate Defect.

Solicitation: An Agency's request for proposals.

Superior Warranty: A warranty still in effect after all contractually required warranties have expired. The remaining warranty is administered directly between the Sub-Supplier and the Agency.

Supplier: Any manufacturer, company or Agency providing units, components or subassemblies for inclusion in the bus that are installed by the Contractor. Supplier items shall require qualification by type and acceptance tests in accordance with requirements defined in "Section 8: Quality Assurance."

Subcontractor: Any manufacturer, company or Agency providing units, components or subassemblies for inclusion in the bus that are installed by a Subcontractor. Subcontractor items shall require qualification by type and acceptance tests in accordance with requirements defined in "Section 8: Quality Assurance."

Work: Any and all labor, supervision, services, materials, machinery, equipment, tools, supplies and facilities called for by the Contract and necessary to the completion thereof.

GC 2. Materials and Workmanship

The Contractor shall be responsible for all materials and workmanship in the construction of the bus and all accessories used, whether the same are manufactured by the Contractor or purchased from a Supplier. This provision excludes any equipment leased or supplied by the Agency, except insofar as such equipment is damaged by the failure of a part or component for which the Contractor is responsible, or except insofar as the damage to such equipment is caused by the Contractor during the manufacture of the buses.

GC 3. Conformance with Specifications and Drawings

Materials furnished and Work performed by the Contractor shall conform to the requirements of the Technical Specifications and other Contract documents. Notwithstanding the provision of drawings, technical specifications or other data by the Agency, the Contractor shall have the responsibility of supplying all parts and details required to make the bus complete and ready for service even though such details may not be specifically mentioned in the drawings and specifications. Items that are installed by the Agency shall not be the responsibility of the Contractor unless they are included in this Contract.

Omissions from the Contract specifications, or the inaccurate description of details of Work that are manifestly necessary to carry out the intent of the Contract specifications, or that are customarily performed, shall not relieve the Contractor from performing such omitted Work or inaccurately described details of the Work, and they shall be performed as if fully and correctly set forth and described.

GC 4. Inspection, Testing and Acceptance

GC 4.1 General

The Agency's Representative shall at all times have access to the Work, the Contractor and, through the Contractor, its Suppliers. The Contractor and its Suppliers shall furnish every reasonable facility for ascertaining that the materials and the workmanship are in accordance with the requirements of the Contract Documents. All Work done shall be subject to the Agency Representative's inspection and approval in accordance with the approved Work products developed as a result of the Contract Documents.

The pre-delivery tests and inspections shall be performed at the Contractor's plant; they shall be performed in accordance with the procedures defined in "Section 8: Quality Assurance"; and they may be witnessed by the resident inspector. When a bus passes these tests and inspections, the resident inspector shall authorize release of the bus.

Within fifteen (15) calendar days after arrival at the designated point of delivery, the bus shall undergo the Agency tests defined in "Post-Delivery Tests." If the bus passes these tests or if the Agency does not notify the Contractor of non-acceptance within 15 calendar days after delivery, then acceptance of the bus by the Agency occurs on the 15th day after delivery. If the bus fails these tests, it shall not be accepted until the repair procedures defined in "Repairs after Non-Acceptance" have been carried out and the bus retested until it passes. Acceptance occurs earlier if the Agency notifies the Contractor of early acceptance or places the bus in revenue service.

NOTE: Under federal requirements (49 CFR 663.37), no resident inspector is required for orders of 10 or fewer buses or 20 or fewer vehicles serving rural or urbanized areas of 200,000 people or fewer.

GC 4.2 Risk of Loss

The Agency shall assume risk of loss of the bus on delivery, as defined in "Bus Delivery." Prior to this delivery, the Contractor shall have risk of loss of the bus, including any damages sustained during the delivery regardless of the status of title or any payments related to the bus. Drivers shall keep a maintenance log en route, and it shall be delivered to the Agency with the bus. If the bus is released back to the Contractor for any reason, then the Contractor has the risk of loss upon such release.

GC 5. Title and Warranty of Title

Adequate documents for registering the bus in [insert jurisdiction] shall be provided to the Agency not fewer than 10 business days before delivery to the Agency. Upon acceptance of each bus, the Contractor warrants that the title shall pass to the Agency free and clear of all encumbrances.

GC 6. Intellectual Property Warranty

The Agency shall advise the Contractor of any impending patent suit related to this Contract against the Agency and provide all information available. The Contractor shall defend any suit or proceeding brought against the Agency based on a claim that any equipment, or any part thereof, furnished under this Contract constitutes an infringement of any patent, and the Contractor shall pay all damages and costs awarded therein, excluding incidental and consequential damages against the Agency. In case said equipment, or any part thereof, is in such suit held to constitute infringement and use of said equipment or parts is enjoined, the Contractor shall, at its own expense and at its option, either procure for the Agency the right to continue using said equipment or part, or replace same with non-infringing equipment, or modify it so it becomes non-infringing.

The Contractor's obligations under this section are discharged and the Agency shall hold the Contractor harmless with respect to the equipment or part if it was specified by the Agency and all requests for substitutes were rejected, and the Contractor advised the Agency under "Questions, Clarifications and Omissions" of a potential infringement, in which case the Contractor shall be held harmless.

GC 7. Data Rights

GC 7.1 Proprietary Rights/Rights in Data

The term "subject data" used in this clause means recorded information, whether or not copyrighted, that is delivered or specified to be delivered under the Contract. It includes the proprietary rights of the following:

- Shop drawings and working drawings
- Technical data including manuals or instruction materials, computer or microprocessor software
- Patented materials, equipment, devices or processes
- License requirements

The Agency shall protect proprietary information provided by the Contractor to the fullest extent of the law. The Contractor shall grant a non-exclusive license to allow the Agency to utilize such information in order to maintain the vehicles. In the event that the Contractor no longer provides the information, the Agency has the right to reverse-engineer patented parts and software.

The Agency reserves a royalty-free, non-exclusive and irrevocable license to reproduce, publish or otherwise use, and to authorize others to use, the following subject data for its purposes: (1) any subject data required to be developed and first produced in the performance of the Contract and specifically paid for as such under the Contract, whether or not a copyright has been obtained; and (2) any rights of copyright to which the Contractor, Subcontractor or Supplier purchases ownership for the purpose of performance of the Contract and specifically paid for as such under the Contract. The Contractor agrees to include the requirements of this clause, modified as necessary to identify the affected parties, in each subcontract and supply order placed under the Contract.

GC 7.2 Access to Onboard Operational Data

The Agency grants to the Contractor the right to inspect, examine, download and otherwise obtain any information or data available from components provided by the Contractor, including but not limited to any electronic control modules or other data-collection devices, to the extent necessary to enable the Contractor to perform reliability maintenance analysis, corrective action and/or other engineering type Work for the bus. This right expressly excludes access to information or data collected on any equipment not provided and installed by the Contractor.

GC 8. Changes

GC 8.1 Contractor Changes

Any proposed change in this Contract shall be submitted to the Agency for its prior approval. Oral change orders are not permitted. No change in this Contract shall be made without the prior written approval of the Contracting Officer. The Contractor shall be liable for all costs resulting from, and/or for satisfactorily correcting, any specification change not properly ordered by written modification to the Contract and signed by the Contracting Officer.

GC 8.2 Agency Changes

The Agency may obtain changes to the Contract by notifying the Contractor in writing. As soon as reasonably possible but no later than thirty (30) calendar days after receipt of the written change order to modify the Contract, the Contractor shall submit to the Contracting Officer a detailed price and schedule Proposal for the Work to be performed. This Proposal shall be accepted or modified by negotiations between the Contractor and the Contracting Officer. At that time, a detailed modification shall be executed in writing by both parties. Disagreements that cannot be resolved within negotiations shall be resolved in accordance with “Disputes,” below. Regardless of any disputes, the Contractor shall proceed with the Work ordered.

GC 9. Legal Clauses

GC 9.1 Indemnification

GC 9.1.1 The Contractor shall, to the extent permitted by law: (1) protect, indemnify and save the Agency and its officers, employees and agents, including consultants, harmless from and against any and all liabilities, damages, claims, demands, liens, encumbrances, judgments, awards, losses, costs, expenses and suits or actions or proceedings, including reasonable expenses, costs and attorneys’ fees incurred by the Agency and its officers, employees and agents, including consultants, in the defense, settlement or satisfaction thereof, for any injury, death, loss or damage to persons or property of any kind whatsoever, arising out of or resulting from the intentional misconduct or negligent acts, errors or omissions of the Contractor in the performance of the Contract, including intentional misconduct, negligent acts, errors or omissions of its officers, employees, servants, agents, Subcontractors and Suppliers; and (2) upon receipt of notice and if given authority, shall settle at its own expense or undertake at its own expense the defense of any such suit, action or proceeding, including appeals, against the Agency and its officers, employees and agents, including consultants, relating to such injury, death, loss or damage. Each party shall promptly notify the other in writing of the notice or assertion of such claim, demand, lien, encumbrance, judgment, award, suit, action or other proceeding hereunder. The Contractor shall have sole charge and direction of the defense of such suit, action or proceeding. The Agency shall not make any admission that might be materially prejudicial to the Contractor unless the Contractor has failed to take over the conduct of any negotiations or defense within a reasonable time after receipt of the notice and authority above provided. The Agency shall at the request of the Contractor furnish to the Contractor all reasonable assistance that may be necessary for the purpose of defending such suit, action or proceeding, and shall be repaid all reasonable costs incurred in doing so. The Agency shall have the right to be represented therein by advisory council of its own selection at its own expense.

GC 9.1.2 The obligations of the Contractor under the above paragraph shall not extend to circumstances where the injury, death or damages are caused solely by the negligent acts, errors or omissions of the Agency, its officers, employees, agents or consultants, including, without limitation, negligence in: (1) the preparation of the Contract documents, or (2) the giving of directions or instructions with respect to the requirements of the Contract by written order. The obligations of the Contractor shall not extend to circumstances where the injury, death or damages are caused, in whole or in part, by the negligence of any third-party operator, not including an assignee or Subcontractor of the Contractor, subject to the right of contribution. In case of joint or concurrent negligence of the parties giving rise to a claim or loss against either one or both, each shall have full rights of contribution from the other.

GC 9.2 Suspension of Work

GC 9.2.1 The Agency may at any time and for any reason within its sole discretion issue a written order to the Contractor suspending, delaying or interrupting all or any part of the Work for a specified period of time.

GC 9.2.2 The Contractor shall comply immediately with any such written order and take all reasonable steps to minimize costs allocable to the Work covered by the suspension during the period of work stoppage. Contractor shall continue the Work that is not included in the suspension and shall continue such ancillary activities as are not suspended. The Contractor shall resume performance of the suspended Work upon expiration of the notice of suspension, or upon direction from the Agency.

GC 9.2.3 The Contractor shall be allowed an equitable adjustment in the Contract price (excluding profit) and/or an extension of the Contract time, to the extent that cost or delays are shown by the Contractor to be directly attributable to any suspension. However, no adjustment shall be made under this section for any suspension, delay or interruption due to the fault or negligence of the Contractor, or for which an equitable adjustment is provided for, or excluded under any other term or condition of the Contract. As soon as reasonably possible but no later than forty-five (45) calendar days, or any other period of time agreed to by the parties, after receipt of the written suspension of work notice, the Contractor shall submit to the Contracting Officer a detailed price and schedule Proposal for the suspension, delay or interruption.

GC 9.3 Excusable Delays/Force Majeure

GC 9.3.1 If the Contractor is delayed at any time during the progress of the Work by the neglect or failure of the Agency or by a cause as described below, then the time for completion and/or affected delivery date(s) shall be extended by the Agency subject to the following cumulative conditions:

- a. The cause of the delay arises after the Notice of Award and neither was nor could have been anticipated by the Contractor by reasonable investigation before such award. Such cause may also include force majeure events such as any event or circumstance beyond the reasonable control of the Contractor, including but not limited to acts of God; earthquake, flood and any other natural disaster; civil disturbance, strikes and labor disputes; fires and explosions; war and other hostilities; embargo; or failure of third parties, including Suppliers or Subcontractors, to perform their obligations to the Contractor;
- b. The Contractor demonstrates that the completion of the Work and/or any affected deliveries will be actually and necessarily delayed;
- c. The Contractor has taken measures to avoid and/or mitigate the delay by the exercise of all reasonable precautions, efforts and measures, whether before or after the occurrence of the cause of delay; and
- d. The Contractor makes written request and provides other information to the Agency as described in paragraph GC 9.3.4 below.

A delay in meeting all the conditions of this section shall be deemed an excusable delay. Any concurrent delay that does not constitute an excusable delay shall not be the sole basis for denying a request hereunder.

GC 9.3.2 None of the above shall relieve the Contractor of any liability for the payment of any liquidated damages owing from a failure to complete the Work by the time for completion that the Contractor is required to pay pursuant to “Liquidated Damages for Late Delivery of the Bus” for delays occurring prior to, or subsequent to the occurrence of an excusable delay.

GC 9.3.3 The Agency reserves the right to rescind or shorten any extension previously granted, if subsequently the Agency determines that any information provided by the Contractor in support of a request for an extension of time was erroneous; provided, however, that such information or facts, if known, would have resulted in a denial of the request for an excusable delay. Notwithstanding the above, the Agency will not rescind or shorten any extension previously granted if the Contractor acted in reliance upon the granting

of such extension and such extension was based on information that, although later found to have been erroneous, was submitted in good faith by the Contractor.

GC 9.3.4 No extension or adjustment of time shall be granted unless: (1) written notice of the delay is filed with the Agency within fourteen (14) calendar days after the commencement of the delay and (2) a written application therefore, stating in reasonable detail the causes, the effect to date and the probable future effect on the performance of the Contractor under the Contract, and the portion or portions of the Work affected, is filed by the Contractor with the Agency within thirty (30) calendar days after the commencement of the delay. No such extension or adjustment shall be deemed a waiver of the rights of either party under this Contract. The Agency shall make its determination within thirty (30) [or insert time specified by regulation or law] calendar days after receipt of the application.

GC 9.4 Termination

GC 9.4.1 Termination for Convenience

The performance of Work under this Contract may be terminated by the Agency in accordance with this clause in whole, or from time to time in part, whenever the Contracting Officer shall determine that such termination is in the best interest of the Agency. Any such termination shall be effected by delivery to the Contractor of a notice of termination specifying the extent to which performance of Work under the Contract is terminated, and the date upon which such termination becomes effective.

After receipt of a notice of termination, and except as otherwise directed by the Contracting Officer, the Contractor shall do the following:

- Stop Work under the Contract on the date and to the extent specified in the notice of termination.
- Place no further orders or subcontracts for materials, services or facilities, except as may be necessary for completion of such portion of the Work under the Contract as is not terminated.
- Terminate all orders and subcontracts to the extent that they relate to the performance of work terminated by the notice of termination; assign to the Agency in the manner, at the times, and to the extent directed by the Contracting Officer, all of the right, title and interest of the Contractor under the orders and subcontracts so terminated, in which case the Agency shall have the right, in its discretion, to settle or pay any or all claims arising out of the termination of such orders and subcontracts.
- Settle all outstanding liabilities and all claims arising out of such termination of orders and subcontracts, with the approval or ratification of the Contracting Officer, to the extent he or she may require, which approval or ratification shall be final for all the purposes of this clause.
- Transfer title to the Agency and deliver in the manner, at the times and to the extent, if any, directed by the Contracting Officer the fabricated or unfabricated parts, Work in process, completed Work, supplies and other material produced as part of, or acquired in connection with the performance of, the Work terminated, and the completed or partially completed plans, drawings, information and other property which, if the Contract had been completed, would have been required to be furnished to the Agency.
- Use its best efforts to sell, in the manner, at the times, to the extent, and at the price(s) directed or authorized by the Contracting Officer, any property of the types referred to above, provided, however, that the Contractor shall not be required to extend credit to any purchaser, and may acquire any such property under the conditions prescribed by and at prices approved by the Contracting Officer, and provided further that the proceeds of any such transfer or disposition shall be applied in reduction of any payments to be made by the Agency to the Contractor under this Contract or shall otherwise be

credited to the price or cost of the Work covered by this Contract or paid in such other manner as the Contracting Officer may direct.

- Complete performance of such part of the Work as shall not have been terminated by the notice of termination.
- Take such action as may be necessary, or as the Contracting Officer may direct, for the protection or preservation of the property related to this Contract that is in the possession of the Contractor and in which the Agency has or may acquire an interest.

The Contractor shall be paid its costs, including Contract closeout costs, and profit on Work performed up to the time of termination. The Contractor shall promptly submit its termination claim to the Agency to be paid the Contractor. Settlement of claims by the Contractor under this termination for convenience clause shall be in accordance with the provisions set forth in Part 49 of the Federal Acquisition Regulations (48 CFR 49) except that wherever the word “Government” appears, it shall be deleted and the word “Agency” shall be substituted in lieu thereof.

GC 9.4.2 Termination for Default

The Agency may, by written notice of default to the Contractor, terminate the whole or any part of this Contract if the Contractor fails to make delivery of the supplies or to perform the services within the time specified herein or any extension thereof; or if the Contractor fails to perform any of the other material provisions of the Contract, or so fails to make progress as to endanger performance of this Contract in accordance with its terms, and in either of these two circumstances does not cure such failure within a period of ten (10) business days, or such longer period as the Contracting Officer may authorize in writing, after receipt of notice from the Contracting Officer specifying such failure.

If the Contract is terminated in whole or in part for default, the Agency may procure, upon such terms and in such manner as the Contracting Officer may deem appropriate, supplies or services similar to those so terminated. The Contractor shall be liable to the Agency for any excess costs for such similar supplies or services and shall continue the performance of this Contract to the extent not terminated under the provisions of this clause.

Except with respect to defaults of Subcontractors, the Contractor shall not be liable for any excess costs if the failure to perform the Contract arises out of a cause beyond the control and without the fault or negligence of the Contractor. If the failure to perform is caused by the default of a Subcontractor, and if such default arises out of causes beyond the control of both the Contractor and Subcontractor, and without the fault or negligence of either of them, then the Contractor shall not be liable for any excess costs for failure to perform, unless the supplies or services to be furnished by the Subcontractor were obtainable from other sources and in sufficient time to permit the Contractor to meet the required delivery schedule.

Payment for completed supplies delivered to and accepted by the Agency shall be at the Contract price. The Agency may withhold from amounts otherwise due the Contractor for such completed supplies such sum as the Contracting Officer determines to be necessary to protect the Agency against loss because of outstanding liens or claims of former lienholders.

If, after notice of termination of this Contract under the provisions of this clause, it is determined for any reason that the Contractor was not in default under the provisions of this clause, or that the default was excusable under the provisions of this clause, then the rights and obligations of the parties shall be the same as if the notice of termination had been issued pursuant to termination for convenience of the Agency.

GC 9.5 Compliance with Laws and Regulations

The Contractor shall at all times comply with all applicable laws, regulations, policies, procedures and directives (together, the “Law”), including without limitation FTA regulations, policies, procedures and directives, including those listed directly or by reference in the agreement between the Agency and FTA that funds any part of this Contract, as they may be amended or promulgated from time to time during the term of this Contract. Contractor’s failure to so comply shall constitute a material breach of this Contract.

GC 9.6 Changes of Law

Changes of Law that become effective after the Proposal due date may result in price changes. If a price adjustment is indicated, either upward or downward, it shall be negotiated between the Agency and the Contractor, and the final Contract price will be adjusted upward or downward to reflect such changes in Law. Such price adjustment may be audited, where required.

GC 9.7 Governing Law and Choice of Forum

This Contract shall be governed by the laws of [insert state name] without regard to conflict of law rules. The Contractor consents to the jurisdiction of the identified state, County of [insert county name].

GC 9.8 Disputes

NOTE: The following section deals with disputes arising after Contract award and not during the procurement process. The latter are “protests” that should be dealt with under the Agency’s procurement procedures as outlined in “Protest Procedures.”

Outlined below are example provisions and recommendations for drafting a dispute resolution clause to be included in the Contract. Included are stepped negotiations, submission for Agency executive decision and alternative dispute resolution. However, by mutual agreement, the matter may be taken immediately to any higher step in the resolution process, or a mutually agreed-to alternative dispute resolution process (which may include structured negotiations, mediation or arbitration) or litigation.

Except as otherwise provided in this Contract, any dispute concerning a question of fact arising under or related to this Contract that is not disposed of by agreement shall be decided in accordance with the following steps. However, by mutual agreement the matter may be taken immediately to any higher step in the dispute resolution process, or a mutually agreed-to alternative dispute resolution process (which may include structured negotiations, mediation or arbitration) or litigation. Pending final resolution of a dispute hereunder, the Contractor shall proceed diligently with the performance of the Contract and in accordance with the Contracting Officer’s or Chief Executive Officer’s decision, as the case may be.

1. **Notice of dispute.** All disputes shall be initiated through a written dispute notice submitted by either party to the other party within ten (10) calendar days of the determination of the dispute.
2. **Negotiation between Contracting Officers.** The parties shall attempt in good faith to resolve any dispute arising out of or relating to this Contract promptly by negotiation between executives who have authority to settle the controversy and who are at a higher level of management than the people with direct responsibility for administration of this Contract. Any party may give the other party written notice of any dispute not resolved in the normal course of business as provided in paragraph 1 above. Within fourteen (14) calendar days after delivery of the dispute notice, the receiving party shall submit to the other party a written response. The dispute notice and written response shall include (a) a statement of the party’s position and a summary of the arguments supporting that position, (b) any evidence supporting the party’s position and (c) the name of the executive who will

represent that party and of any others who will accompany the executive in negotiations. Within twenty-eight (28) calendar days after delivery of the dispute notice, the Contracting Officer of both parties shall meet at a mutually acceptable time and place, and thereafter as they reasonably deem necessary to attempt to resolve the dispute. All reasonable requests for information by one party to the other shall be honored.

If the matter has not been resolved by these people within forty-two (42) calendar days of the dispute notice, then the dispute may be referred to more senior executives of both parties who have authority to settle the dispute and who shall likewise meet to attempt to resolve the dispute.

3. **Chief Executive Officer's decision.** Should the dispute not be resolved by negotiation between Contracting Officers, as provided in paragraph 2 above, the Agency's Contracting Officer from paragraph 2 above shall submit a written request for decision to the Agency's Chief Executive Officer (CEO) along with all documentation and minutes from the negotiations. The Chief Executive Officer shall issue a written decision within fourteen (14) days of receipt of a request.
 - A. For disputes involving \$50,000 or less, the decision of the CEO shall be administratively final and conclusive. For disputes involving \$50,000 or less, it is the intent of the parties that such administratively final and conclusive decision pursuant to either this paragraph or paragraph 4 shall be overturned only if determined by a court of competent jurisdiction to be fraudulent, arbitrary, capricious, unsupported by the evidence or so grossly erroneous as to imply bad faith. For disputes greater than \$50,000, the decision of the CEO shall be administratively final and conclusive unless, within thirty (30) days from the date of delivery of the written decision, the Contractor appeals the decision in writing to the Agency's Chief Executive Officer or designee, who shall render a written decision within fourteen (14) days of delivery of such written appeal. Such decision by the Chief Executive Officer or his or her designee shall be administratively final and conclusive.
 - B. Within thirty (30) days of the issuance of any administratively final and conclusive decision under this paragraph, the Contractor shall notify the Agency in writing of the Contractor's agreement with the final decision. Failure to provide such written notice of agreement shall indicate an intent by the Contractor to litigate the claim.
 - C. Any dispute that is not resolved by the parties through the operation of the provisions of this paragraph, or any mutually agreed-upon alternative dispute resolution process pursuant to paragraph 4, may be submitted to any court in [insert state name].
 - D. Pending final resolution of a dispute hereunder, the Contractor shall proceed diligently with the performance of its obligations under the Contract in accordance with the written directions of the Agency.
4. **Alternative dispute resolution.** If agreed to by both parties, disputes may be resolved by a mutually agreed-to alternative dispute resolution process that may include structured negotiations different from paragraph 2 above, mediation or arbitration.

NOTE: If arbitration is not to be included, then the following clause is to be deleted. It is only an example of an arbitration clause that may be included. It is not intended as a recommendation but is provided for purposes of illustration.

5. **Arbitration.** Disputes appealed to arbitration involving more than \$50,000 but less than \$250,000 shall be decided by a qualified and disinterested arbitrator, selected through the American Arbitration Association and mutually agreed to by both parties. The arbitrator shall conduct all proceedings in accordance with the rules of the American Arbitration Association and shall consider the Contract, equity, the prevailing law and established commercial practices in rendering a decision.

Disputes appealed to arbitration involving \$250,000 or more shall be decided by three (3) qualified and disinterested arbitrators selected through the American Arbitration Association. One arbitrator shall be selected by each of the parties, and the two selected arbitrators shall select a third arbitrator within ten (10) calendar days of their selection. The arbitrators shall conduct all proceedings in accordance with the rules of the American Arbitration Association and shall consider the Contract, equity, the prevailing law and established commercial practice in rendering a decision.

DEFAULT

The decision of the arbitrators shall not be binding, and either party shall have the right to remedies provided by law.

ALTERNATIVE

The decision by the arbitrators shall be final and enforceable in any court having jurisdiction over the parties.

GC 9.9 Maintenance of Records; Access by Agency; Right to Audit Records

In accordance with 49 CFR § 18.36(i), 49 CFR § 19.48(d) and 49 USC § 5325(a), provided that the Agency is the FTA recipient or a sub-grantee of the FTA recipient, the Contractor agrees to provide the Agency, FTA, the Comptroller General of the United States, the Secretary of the U.S. Department of Transportation, [insert state name] or any of their duly authorized representatives access to any books, documents, papers and records of the Contractor that are directly pertinent to or relate to this Contract (1) for the purpose of making audits, examinations, excerpts and transcriptions and (2) when conducting an audit and inspection.

1. In the event of a sole-source Contract, single Proposal, single responsive Proposal, or competitive negotiated procurement, the Contractor shall maintain and the Contracting Officer, the U.S. Department of Transportation (if applicable) or the representatives thereof shall have the right to examine all books, records, documents and other cost and pricing data related to the Contract price, unless such pricing is based on adequate price competition, established catalog or market prices of commercial items sold in substantial quantities to the public, or prices set by law or regulation, or combinations thereof. Data related to the negotiation or performance of the Contract shall be made available for the purpose of evaluating the accuracy, completeness and currency of the cost or pricing data. The right of examination shall extend to all documents necessary for adequate evaluation of the cost or pricing data, along with the computations and projections used therein, including review of accounting principles and practices that properly reflect all direct and indirect costs anticipated for the performance of the Contract.
2. For Contract modifications or change orders, the Contracting Officer, the U.S. Department of Transportation, if applicable, or their representatives shall have the right to examine all books, records, documents and other cost and pricing data related to a Contract modification, unless such pricing is based on adequate price competition, established catalog or market prices of commercial items sold in substantial quantities to the public, or prices set by law or regulation, or combinations

thereof. Data related to the negotiation or performance of the Contract modification or change order shall be made available for the purpose of evaluating the accuracy, completeness and currency of the cost or pricing data. The right of examination shall extend to all documents necessary for adequate evaluation of the cost or pricing data, along with the computations and projections used therein, either before or after execution of the Contract modification or change order for the purpose of conducting a cost analysis. If an examination made after execution of the Contract modification or change order reveals inaccurate, incomplete or out-of-date data, the Contracting Officer may renegotiate the Contract modification or change order price adjustment, and the Agency shall be entitled to any reductions in the price that would result from the application of accurate, complete or up-to-date data.

The requirements of this section are in addition to other audit, inspection and record-keeping provisions specified elsewhere in the Contract documents.

NOTE: FTA does not require Contractors to flow down these requirements to Subcontractors.

GC 9.10 Confidential Information

Access to government records is governed by the [insert city, state or local open records law]. Except as otherwise required by the [insert optional city, state or local open records law], the Agency will exempt from disclosure proprietary information, trade secrets and confidential commercial and financial information submitted or disclosed during the Contract period. Any such proprietary information, trade secrets or confidential commercial and financial information that a Contractor believes should be exempted from disclosure shall be specifically identified and marked as such. Blanket-type identification by designating whole pages or sections as containing proprietary information, trade secrets or confidential commercial and financial information will not ensure confidentiality. The specific proprietary information, trade secrets or confidential commercial and financial information must be clearly identified as such.

Upon a request for records from a third party regarding the Contract, the Agency will notify the Contractor in writing. The Contractor must respond within twenty (20) days with the identification of any and all “proprietary, trade secret or confidential commercial or financial” information, and the Contractor shall indemnify the Agency’s defense costs associated with its refusal to produce such identified information; otherwise, the requested information may be released.

The Agency shall employ sound business practices no less diligent than those used for the Agency’s own confidential information to protect the confidence of all licensed technology, software, documentation, drawings, schematics, manuals, data and other information and material provided by the Contractor pursuant to the Contract that contain confidential commercial or financial information, trade secrets or proprietary information as defined in or pursuant to the [insert city, state or local open records law] against disclosure of such information and material to third parties except as permitted by the Contract. The Contractor shall be responsible for ensuring that confidential commercial or financial information, trade secrets or proprietary information, with such determinations to be made by the Agency at its sole discretion, bears appropriate notices relating to its confidential character.

During the performance of the Work under the Contract, it may be necessary for either party (the “Discloser”) to make confidential information available to the other party (the “Recipient”). The Recipient agrees to use all such information solely for the performance of the Work under the Contract and to hold all such information in confidence and not to disclose same to any third party without the prior written consent of the Discloser. Likewise, the Recipient agrees that all information developed in connection with the Work under the Contract

shall be used solely for the performance of the Work under the Contract, and shall be held in confidence and not disclosed to any third party without the prior written consent of the Discloser.

This Confidentiality section shall survive the termination or expiration of the Contract.

GC 9.11 Conflicts of Interest, Gratuities

No member, officer, or employee of the Agency 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.

[Insert Agency requirements in accordance with the appropriate ethics guidelines.]

GC 9.12 General Nondiscrimination Clause

In connection with the performance of Work provided for under this Contract, the Contractor agrees that it will not, on the grounds of race, religious creed, color, national origin, ancestry, physical disability, medical condition, marital status, sex, sexual orientation or age, discriminate or permit discrimination against any person or group of people in any manner prohibited by federal, state or local laws.

GC 9.13 Amendment and Waiver

GC 9.13.1 Amendment

Any modification or amendment of any provisions of any of the Contract documents shall be effective only if in writing, signed by authorized representatives of both the Agency and Contractor, and specifically referencing this Contract.

GC 9.13.2 Waiver

In the event that either party elects to waive its remedies for any breach by the other party of any covenant, term or condition of this Contract, such waiver shall not limit the waiving party's remedies for any succeeding breach of that or of any other term, covenant or condition of this Contract.

GC 9.14 Remedies Not Exclusive

The rights and remedies of the Agency provided herein shall not be exclusive and are in addition to any other rights and remedies provided by law or under the Contract.

GC 9.15 Counterparts

This Contract may be executed in any number of counterparts. All such counterparts shall be deemed to constitute one and the same instrument, and each of said counterparts shall be deemed an original thereof.

GC 9.16 Severability

Whenever possible, each provision of the Contract shall be interpreted in a manner as to be effective and valid under applicable law. However, if any provision, or part of any provision, should be prohibited or invalid under applicable law, then such provision, or part of such provision, shall be ineffective to the extent of such prohibition or invalidity without invalidating the remainder of such provision or the remaining provisions of the Contract.

GC 9.17 Third-Party Beneficiaries

No provisions of the Contract shall in any way inure to the benefit of any third party, including the public at large, so as to constitute such person a third-party beneficiary of the Contract or of any one or more of the terms and conditions of the Contract or otherwise give rise to any cause of action in any person not a party to the Contract, except as expressly provided elsewhere in the Contract.

GC 9.18 Assignment of Contract

Neither party will assign or subcontract its rights or obligations under the Contract without prior written permission of the other party, and no such assignment or subcontract will be effective until approved in writing by the other party.

GC 9.19 Independent Parties

The Contractor is an independent contractor with respect to the performance of all Work hereunder, retaining control over the detail of its own operations, and the Contractor shall not be considered the agent, employee, partner, fiduciary or trustee of the Agency.

GC 9.20 Survival

The following sections shall survive the nominal expiration or discharge of other Contract obligations, and the Agency may obtain any remedy under law, Contract or equity to enforce the obligations of the Contractor that survive the manufacturing, warranty and final payment periods:

- “Intellectual Property Warranty”
- “Data Rights”
- “Indemnification”
- “Governing Law and Choice of Forum”
- “Disputes”
- “Confidential Information”
- “Parts Availability Guarantee”
- “Access to Records”
- “Training”

GC 10. Agency-Specific Provisions

[Insert as required.]

SECTION 4: SPECIAL PROVISIONS

NOTE: This section should be customized to meet the Agency's specific requirements for each individual project or Contract, as well as local and state requirements. The special provisions are intended to amend and supplement the General Conditions to meet the individual requirements of each project. These provisions should be considered as guidance and be modified, added to or deleted by the Agency, as appropriate.

SP 1. Inspection, Tests and Repairs

SP 1.1 Repair Performance

SP 1.1.1 Repairs by Contractor

After non-acceptance of a bus, the Contractor must begin Work within five (5) working days after receiving notification from the Agency of failure of acceptance tests. The Agency shall make the bus available to complete repairs timely with the Contractor repair schedule.

The Contractor shall provide, at its own expense, all spare parts, tools and space required to complete the repairs. At the Agency's option, the Contractor may be required to remove the bus from the Agency's property while repairs are being made. If the bus is removed from the Agency's property, then repair procedures must be diligently pursued by the Contractor's representatives, and the Contractor shall assume risk of loss while the bus is under its control.

SP 1.1.2 Repairs by the Agency

The Agency will not take responsibility to correct Defects, except to replace defective parts as instructed by the Contractor.

1. **Parts used.** If the Agency performs the repairs after non-acceptance of the bus, it shall correct or repair the Defect and any Related Defects using Contractor-specified parts available from its own stock or those supplied by the Contractor specifically for this repair. Reports of all repairs covered by this procedure shall be submitted by the Agency to the Contractor for reimbursement or replacement of parts monthly, or at a period to be mutually agreed upon. The Contractor shall provide forms for these reports.
2. **Contractor-supplied parts.** If the Contractor supplies parts for repairs being performed by the Agency after non-acceptance of the bus, then these parts shall be shipped prepaid to the Agency.
3. **Return of defective components.** The Contractor may request that parts covered by this provision be returned to the manufacturing plant. The total costs for this action shall be paid by the Contractor.
4. **Reimbursement for labor.** The Agency shall be reimbursed by the Contractor for labor. The amount shall be determined by the Agency for a qualified mechanic at a straight time wage rate of [insert amount per hour], which includes fringe benefits and overhead adjusted for the Agency's most recently published rate in effect at the time the Work is performed, plus the cost of towing in the bus, if such action was necessary. These wage and fringe benefits rates shall not exceed the rates in effect in the Agency's service garage at the time the Defect correction is made.
5. **Reimbursement for parts.** The Agency shall be reimbursed by the Contractor for defective parts that must be replaced to correct the Defect. The reimbursement shall include taxes where applicable and fifteen (15) percent handling costs.

SP 1.2 Pilot Bus

The Contractor shall produce one pilot vehicle for each type of vehicle with respect to the base order. This vehicle shall be one of the ultimate quantity of the base vehicle order. The pilot vehicle shall demonstrate that the vehicles fully meet all requirements of the Contract. The pilot vehicle shall be produced and delivered to the Agency for a minimum of thirty (30) days prior to initiation of any production activities for the remaining vehicles unless otherwise authorized in writing by the Agency. In the event that noncompliance is identified, the Agency shall to the extent practicable notify the Contractor of said noncompliance. No later than seven (7) days after the end of the 30-day test, the Agency shall issue a written report to the Contractor that advises the Contractor of any noncompliance issues and/or any proposed modifications or changes required on the remaining vehicles.

In the event that the pilot vehicle does not initially comply with all performance criteria contained in the Technical Specifications, the Agency shall have the right to retain a portion of any progress payment that may have been established for the pilot vehicle. The amount to be withheld shall be based on the lack of compliance and may equal up to the entire progress payment amount for the pilot vehicle. This amount shall be withheld until compliance is demonstrated. In the event that the compliance is subsequently determined to be impossible to achieve, the Agency may require all or a portion of the progress payment for the pilot vehicle to be forfeited as a penalty for the noncompliance. The amount of the penalty shall be negotiated by the parties.

SP 1.3 Configuration and Performance Approval

In order to assess the Contractor's compliance with the Technical Specifications, the Agency and the Contractor shall, at the Pre-Production Meeting, jointly develop a configuration and performance review document for review of the pilot vehicle. This document shall include appropriate performance standards for each test that is being required, and the document shall become part of the official record of the Pre-Production Meeting.

SP 1.4 First Article Inspection – Production

The purpose of a first article inspection is to confirm that any components, systems, subsystems, major assemblies, subassemblies, products, parts, apparatuses, articles and other materials comply with the Technical Specifications and other Contract documents.

Where required by the Contract documents or requested by the Agency, the Contractor shall cause first article inspections to be conducted. A first article inspection may include both a physical configuration inspection and a functional demonstration. First article inspections shall be conducted at the Contractor or Subcontractor's facility. The Contractor shall furnish to the Agency prior to each first article inspection a written inspection and demonstration plan for each item for review. The Agency's inspectors will attend each first article inspection unless the Agency provides a written waiver of its right to attend any such inspection. The results of each first article inspection shall be documented by the Contractor in a format deemed acceptable by the Agency, and all documents relating to the inspection shall be forwarded to the Agency.

SP 1.5 Post-Delivery Tests

The Agency will conduct acceptance tests on each delivered bus. These tests shall be completed within fifteen (15) days after bus delivery and shall be conducted in accordance with written test plans. The purpose of these tests is to identify Defects that have become apparent between the time of bus release and delivery to the Agency. The post-delivery tests shall include visual inspection and bus operations. No post-delivery test shall apply criteria that are different from the criteria applied in an analogous pre-delivery test (if any).

Buses that fail to pass the post-delivery tests are subject to non-acceptance. The Agency shall record details of all Defects on the appropriate test forms and shall notify the Contractor of acceptance or non-acceptance of each bus according to “Inspection, Testing and Acceptance” after completion of the tests. The Defects detected during these tests shall be repaired according to the procedures defined in “Repairs after Non-Acceptance.”

SP 1.6 Repairs after Non-Acceptance

The Contractor, or its designated representative, shall perform the repairs after non-acceptance. If the Contractor fails or refuses to begin the repairs within five (5) days, then the Work may be done by the Agency’s personnel with reimbursement by the Contractor.

SP 2. Deliveries

SP 2.1 Bus Delivery

Delivery of buses shall be determined by signed receipt of the Agency’s designated agent(s), [insert agent’s name and address], at the following point(s) of delivery and may be preceded by a cursory inspection of the bus: [insert point(s) of delivery address].

SP 2.2 Delivery Schedule

The buses shall be delivered at a rate not to exceed [insert number] buses per week. Delivery shall be completed within [insert number] weeks after delivery of the executed Contract documents. Hours of delivery shall be [insert time range] on the following days of the week: [insert days for delivery].

SP 2.3 Contract Deliverables

Contract deliverables associated with this Contract are set forth in **Table 1**, along with other pertinent information. Contract deliverables shall be submitted in accordance with “Section 6: Technical Specifications.” Due dates shown note the last acceptable date for receipt of Contract deliverables. The Agency will consider early receipt of Contract deliverables on a case-by-case basis. The reference section designates the appropriate specification section(s) where the requirement is referenced.

NOTE: Table 1 below provides a sample list of Contract deliverables. This list should be adapted by the Agency to reflect the Contract deliverables required by the Contract specifications.

TABLE 1
 Contract Deliverables

| | Deliverable | Agency Action | Reference Section | Due Date | Format | Quantity Due |
|----|--|----------------------|--------------------------|--|---------------------|----------------------------|
| 1. | Bus Testing— Altoona Test Report | Review | | Prior to pilot bus delivery | Hardcopy | 1 |
| 2. | List of serialized units installed on each bus | Review | | With each delivered bus | Electronic media | 1 per bus |
| 3. | Copy of Manufacturers’ formal Quality Assurance Program | Review | | Pre-award site visit | Hardcopy | 1 |
| 4. | QA manufacturing certificate | Review | | With each delivered bus | Hardcopy | 1 per bus |
| 5. | QA purchasing certifications acknowledging receipt of applicable specification | Review | | 30 days following first Pre- Production Meeting | Hardcopy | 1 per major Supplier |

TABLE 1
 Contract Deliverables

| | Deliverable | Agency Action | Reference Section | Due Date | Format | Quantity Due |
|-----|--|----------------------|--------------------------|--|------------------------------|---------------------|
| 6. | Pre-Delivery Bus Documentation Package | Review | | With each delivered bus | Hardcopy | 1 per bus |
| 7. | Motor Vehicle Pollution Requirements Certificate | Review | | With each bus | Hardcopy | 1 |
| 8. | Engine Emissions Certificate—NOx levels | Review | | Prior to completion of pilot bus | Hardcopy | 1 |
| 9. | Pre-Production Meeting minutes | Approval | | 30 days after each meeting | Hardcopy | 2 originals |
| 10. | Driver's log and incident report | Review | | With each bus delivery if drive-away service is used | Hardcopy | 1 per bus |
| 11. | Title documentation | Review | | 10 days prior to bus delivery | Hardcopy | 1 per bus |
| 12. | Performance bond | Review | | 30 days following execution of Contract | Hardcopy | 1 |
| 13. | Insurance certificates | Approval | | Before Work commences | Hardcopy | 1 |
| 14. | Engineering support | Review | | During Pre-Production Meeting | Contracts | 1 |
| 15. | Training instructor information | Approval | | 30 days prior to delivery of pilot bus | | |
| 16. | Training curriculum | Approval | | 30 days prior to delivery of pilot bus | Electronic media | |
| 17. | Teaching materials | Review | | During classroom instruction | Hardcopy | 1 |
| 18. | Professionally prepared mechanics' "Bus Orientation" training video | Review | | 30 days prior to first production bus | Electronic Media | 20 each |
| 19. | Final preventative maintenance manuals | Review | | 90 days after Agency written approval | Hardcopy Electronic media | 10/100 buses 20 |
| 20. | Final diagnostic procedures manuals | Review | | 90 days after Agency written approval | Hardcopy Electronic media | 10/100 buses 20 |
| 21. | Final parts manuals | Approval | | 90 days after Agency written approval | Hardcopy Electronic media | 10/100 buses 20 |
| 22. | Component repair manuals (Agency approval/review period of 90 days from date of receipt) | Approval | | 90 days after Agency written approval of OEM component repair list | Hardcopy Electronic media | 2 2 |

TABLE 1
 Contract Deliverables

| | Deliverable | Agency Action | Reference Section | Due Date | Format | Quantity Due |
|-----|--|----------------------|--------------------------|---|--|---------------------|
| 23. | Draft preventative maintenance manuals (Agency approval/review period of 90 days from date of receipt) | Approval | | With pilot bus | Hardcopy | 10 |
| 24. | Draft diagnostic procedures manuals (Agency approval/review period of 90 days from date of receipt) | Approval | | With pilot bus | Hardcopy | 10 |
| 25. | Draft parts manuals (Agency approval/review period of 90 days from date of receipt) | Approval | | With pilot bus | Hardcopy | 10 |
| 26. | List of OEM component repair manuals | Approval | | With pilot bus | Hardcopy | 10 |
| 27. | Draft operators' manuals (Agency approval/review period of 90 days from date of receipt) | Approval | | With pilot bus or maximum of 30 days prior to start of production | Hardcopy | 10 |
| 28. | Final operators' manuals | Review | | 30 days following Agency approval of draft manual | Hardcopy | 1 per bus |
| 29. | Recommended spare parts list, including bill of materials | Review | | 60 days prior to shipment of first bus | Hardcopy | 1 |
| 30. | Part number index | Approval | | 60 days prior to shipment of first bus | Hardcopy Spreadsheet | 1 1 |
| 31. | Current price list | Review | | 90 days after Agency written approval of draft parts manual | Hardcopy | 20 |
| 32. | In-process drawings | Review | | 30 days prior to production | Scale drawings | 1 |
| 33. | Electrical and air schematics | Review | | 30 days prior to production | Hardcopy | 1 |
| 34. | As-built drawings | Review | | Within 60 days after final bus delivery | Electronic media | 1 |
| 35. | Material samples | Review | | By conclusion of Pre-Production Meetings | | 1 |
| 36. | Undercoating system program | Approval | | First Pre-Production Meeting | Hardcopy | 1 |
| 37. | Flooring certificate | Review | | First Pre-Production Meeting | Certificate/ copy of purchase order | 1 |
| 38. | Interior features – fire-resistance certificates | Review | | Prior to pilot bus completion | Certificates | 1 |
| 39. | Crashworthiness | Review | | Pre-award audit | Certificate | 1 |
| 40. | Technical review of electronic functionality | Approval | | Prior to production | Hardcopy | 1 |

TABLE 1
 Contract Deliverables

| | Deliverable | Agency Action | Reference Section | Due Date | Format | Quantity Due |
|-----|---|----------------------|--------------------------|-------------------------------|--------------------------|---------------------|
| 41. | Interior security camera layout | Approval | | Prior to pilot bus completion | Copies of interior views | 1 each |
| 42. | Technical review of power plant | | | Prior to production | | |
| 43. | Power plant certifications | Review | | Prior to pilot bus completion | Hardcopy | 1 each |
| 44. | Striping layout | Approval | | Prior to production | Hardcopy | 1 |
| 45. | Resolution of issues "subject to Agency approval" | Approval | | Prior to production | Hardcopy | 1 |

SP 3. Options and Option Pricing

The Contractor hereby grants the Agency and any permissible assignee options ("Options") to purchase up to [insert number of optional vehicles] additional vehicles ("Option Vehicles"). The Options shall be valid for a period of [insert period of time up to a maximum of five years] from the effective date of the Contract. There shall be no minimum order quantity for any permissible assignee. Subject to the Agency's right to order modifications, the Option Vehicles shall have the same specifications as the vehicles purchased under this Contract. The Agency may exercise the Options by written notice to the Contractor ("Notice of Exercise of Option") at any time on or before [insert period of time up to a maximum of five years] following the effective date of the Contract ("Option Date").

The price of the Option Vehicles shall be the unit price of the base order vehicles, ("Base Order Price") adjusted by multiplying the base order price by the following fraction:

$$\frac{\text{Latest Published Preliminary Index Number Prior to Notice of Exercise of Option}}{\text{Index Number on Effective Date of the Contract}}$$

The Index shall be the Producer Price Index for Truck and Bus Bodies, Series No. 1413, published by the United States Department of Labor, Bureau of Labor Statistics, or if such Index is no longer in use, then such replacement that is most comparable to the Index as may be designated by the Bureau of Labor Statistics, or as agreed by the parties.

Within thirty (30) days after delivery of the Notice of Exercise of Option to the Contractor, the Contractor shall submit a proposed delivery schedule. Along with the proposed delivery schedule, the Contractor will provide the Agency with access to its production schedule for the purpose of the parties verifying available production capacity. The production schedule shall include a reasonable time for mobilization and for coordinating with other vehicle orders, and it shall be based upon a production rate at least equal to the production rate actually realized with respect to the base order vehicles. If the parties are unable to agree on a production schedule, then the maximum term for the production of the Option Vehicles shall not exceed a total of [insert number] months after the date of Notice to Proceed with Option Vehicle production. The Agency or any permissible assignee may issue a Notice to Proceed at any time after the Contractor submits its proposed delivery schedule. The Contractor shall not commence production of the Option Vehicles prior to issuance of the Notice to Proceed by the Agency or any permissible assignee of the Agency for the Option Vehicles incorporating the agreed production delivery schedule or the [insert number]-month maximum term.

Except as otherwise specially provided in this Contract, all other terms of the Contract shall apply to the Option Vehicles.

SP 4. Assignability of Options

If the Agency does not exercise the option(s) as listed in “Options and Option Pricing,” then the Agency reserves the right to assign the option(s) to other grantees of FTA funds in accordance with FTA Circular 4220.1F or its successors.

NOTE: If the Agency chooses to assign options, it is recommended that it be done in conjunction with a formal written agreement, a sample of which is included as Appendix F.

SP 5. Payment

The Agency shall pay and the Contractor shall accept the amounts set forth in the price schedule as full compensation for all costs and expenses of completing the Work in accordance with the Contract, including but not limited to all labor, equipment and material required; overhead; expenses; storage and shipping; risks and obligations; taxes (as applicable); fees and profit; and any unforeseen costs.

SP 5.1 Payment Terms

NOTE: Three alternatives for payment are provided: payment upon delivery, payment upon delivery with retention, and progress payments. The Agency may select from these options or develop its own payment provision. It should be noted that restrictive payment requirements will increase the cost of the Contract. The provision below should be included if the Agency has no applicable prompt payment law or regulation.

Option 1: Payment upon Delivery

All payments shall be made as provided herein, less any additional amount withheld as provided below and less any amounts for liquidated damages in accordance with “Liquidated Damages for Late Delivery of the Bus.”

The Agency shall make payments for buses at the unit prices itemized in the price schedule within [insert number] calendar days after the delivery and acceptance of each bus and receipt of a proper invoice.

The Agency shall make payments for spare parts and/or equipment at the unit prices itemized in the price schedule within [insert number] calendar days after the delivery and acceptance of said spare parts and/or equipment and receipt of a proper invoice.

The Agency shall make a final payment for all withholding within [insert number] calendar days of receipt of a final proper invoice and the following:

1. Delivery and acceptance of all Contract deliverables, including manuals and other documentation required by the Contract, excluding training.
2. Contractor provision of any certifications as required by law and/or regulations.
3. Completion of post-delivery audits required under the Contract.

The Contractor may charge interest for late payment if payment is delayed more than ten (10) days after the payment Due Date set forth above. Interest will be charged at a rate not to exceed the prime rate of interest published by The Wall Street Journal on the 10th day.

Option 2: Payment upon Delivery with Retention

All payments shall be made as provided herein, less a retention of [insert retention percentage] plus any additional amount retained as provided below and less any amounts for liquidated damages in accordance with “Liquidated Damages for Late Delivery of the Bus.”

The Agency shall make payments for buses at the unit prices itemized in the price schedule within [insert number] calendar days after the delivery and acceptance of each bus and receipt of a proper invoice.

The Agency shall make payments for spare parts and/or equipment at the unit prices itemized in the price schedule within [insert number] calendar days after the delivery and acceptance of said spare parts and/or equipment and receipt of a proper invoice.

The Agency shall make a final payment for all retained funds within [insert number] calendar days of receipt of a final proper invoice and the following:

1. Delivery and acceptance of all Contract deliverables, including manuals and other documentation required by the Contract, excluding training.
2. Contractor provision of any certifications as required by law and/or regulations.
3. Completion of post-delivery audits required under the Contract.

The Contractor may charge interest for late payment if payment is delayed more than ten (10) days after the payment Due Date set forth above. Interest will be charged at a rate not to exceed the prime rate of interest published by The Wall Street Journal on the 10th day.

Option 3: Progress Payments

NOTE: Include the following provision if progress payments are to be made. The following is a model clause that the Agency can use as a guideline in preparing any progress payment provision. If progress payments are to be included, then security for the progress payments of Milestone No. 1 to the Contractor may be required of the Contractor through a performance bond. The bond amount should not be less than the Agency’s financial exposure for cumulative payments for Milestone No. 1 and any advance payment.

All payments shall be made as provided herein, less any amount to be withheld as provided below and less any amounts for liquidated damages in accordance with “Liquidated Damages for Late Delivery of the Bus.”

The Agency shall make progress payments to the Contractor for buses in accordance with the performance milestones set forth below.

Title to material included in any progress payment request shall pass to the Agency upon payment by the Agency. Said title shall be free of all encumbrances. However, such transfer of title shall not relieve the Contractor of its responsibility for the furnishing, installation, fabrication or inclusion of said materials as a deliverable element of buses procured in accordance with the requirements of the Contract.

The performance milestones and payment limits shall be as follows:

NOTE: The Agency needs to establish the milestones for which it will make progress payments. The following is an example of milestones that could be used.

1. The Agency shall make payments for buses at [insert percentage] of the unit price(s) for each bus itemized in the price schedule upon verification by the Agency’s inspector that said bus(es) have [specify event in the manufacturing process] and within [insert number] calendar days of receipt of a proper invoice. Invoices submitted under this milestone shall include a listing of all major components and component serial numbers that shall be the same as in the final bus record.
2. The Agency shall make payments for buses at [insert percentage] of the unit price(s) for each bus itemized in the price schedule when the Agency’s inspector has approved shipment of said bus(es) from the Contractor’s plant and within [insert number] calendar days of receipt of a proper invoice.
3. The Agency shall make payments for buses at [insert percentage] of the unit price(s) for each bus itemized in the price schedule upon the delivery and acceptance of each bus and within [insert number] calendar days of receipt of a proper invoice.
4. The Agency shall make payments for spare parts and/or equipment at the unit prices itemized in the price schedule upon the delivery and acceptance of said spare parts and/or equipment and within [insert number] calendar days of receipt of a proper invoice.

Title for spare parts and/or equipment shall transfer to the Agency upon payment. Said title shall be free of all encumbrances.

5. The Agency shall make a final payment of [insert percentage] of the total Contract price plus any amount withheld, within [insert number] calendar days of receipt of a proper invoice and the following:
 - Delivery and acceptance of all Contract deliverables, including manuals and other documentation required by the Contract, excluding training.
 - Contractor provision of any certifications as required by law and/or regulations.
 - Completion of post-delivery audits required under the Contract.

Progress payment requests shall be accompanied by a certification, or affidavit, signed by the Contractor’s officer certifying that the Work covered by the progress payment requested has been completed. The Agency reserves the rights of inspection and audit to verify said progress as provided in “Maintenance of Records; Access by Agency; Right to Audit Records.”

The Contractor may charge interest for late payment if payment is delayed more than ten (10) days after the payment Due Date set forth above. Interest will be charged at a rate not to exceed the prime rate of interest published by The Wall Street Journal on the 10th day.

SP 5.2 Performance Guarantee (Optional)

The Contractor shall furnish, at its own expense, performance guarantee in the form of a cashier’s check, a letter of credit in a form approved by the Agency before Proposal submission, or a performance bond from a surety duly licensed to do business in the state of [insert Agency’s state] having a financial rating from A.M. Best Company of “A VIII” or better, in the amount of [insert dollar amount (not a percentage) of a performance bond] where there are no progress payments and payment is made upon delivery and acceptance; or in the case of progress payments set at the Agency’s financial exposure for cumulative payments. The bond

shall cover all of the Contractor's obligations under the Contract except for the warranty and shall remain in force until said obligations have been fulfilled. The bond amount may be reduced as follows:

1. To sixty-five (65) percent of the original amount when fifty (50) percent of the required number of buses are delivered and accepted;
2. To thirty (30) percent of the original amount when seventy-five (75) percent of the required number of buses are delivered and accepted; and
3. To zero (0) percent of the original amount when one hundred (100) percent of the required number of buses are delivered and accepted.

In the case that a surety becomes insolvent, its license is revoked or suspended, or in the case of a surety approved on the basis that it is listed as an approved federal surety and such federal approval is revoked or suspended, the Contractor, within five (5) days after notice by the Agency, shall substitute other and sufficient surety or sureties. If the Contractor fails to do so, such failure shall be an event of default.

NOTE: In such event as described above, the Agency may, in lieu of declaring the Contractor in default, deduct money for the risk or negotiate the purchase of a replacement bond.

SP 5.3 Payment of Taxes

Unless otherwise provided in this Contract, the Contractor shall pay all federal, state and local taxes, and duties applicable to and assessable against any Work, goods, services, processes and operations incidental to or involved in the Contract, including but not limited to retail sales and use, transportation, export, import, business and special taxes. The Contractor is responsible for ascertaining and paying the taxes when due. The total Contract price shall include compensation for all taxes the Contractor is required to pay by laws in effect on the Proposal Due Date. At the present time, the Agency asserts that the taxes applicable to this Contract are [insert list of current applicable taxes]. The Contractor will maintain auditable records, subject to the Agency reviews, confirming that tax payments are current at all times.

SP 6. Liquidated Damages for Late Delivery of the Bus

It is mutually understood and agreed by and between the parties to the Contract that time is of the essence with respect to the completion of the Work and that in case of any failure on the part of the Contractor to deliver the buses within the time specified in "Delivery Schedule," except for any excusable delays as provided in "Excusable Delays/Force Majeure" or any extension thereof, the Agency will be damaged thereby. The amount of said damages, being difficult if not impossible of definite ascertainment and proof, it is hereby agreed that the amount of such damages due to the Agency shall be fixed at [insert dollar amount] per calendar day per bus not delivered in substantially good condition as inspected by the Agency at the time released for shipment.

NOTE: See Appendix A, "Guidelines for Calculating Liquidated Damages." If the Agency does not accept buses seven days per week, then it may consider basing damage calculations on "business days."

The Contractor hereby agrees to pay the aforementioned amounts as fixed, agreed and liquidated damages, and not by way of penalty, to the Agency and further authorizes the Agency to deduct the amount of the damages from money due the Contractor under the Contract, computed as aforesaid. If the money due the Contractor is insufficient or no money is due the Contractor, then the Contractor shall pay the Agency the difference or the entire amount, whichever may be the case, within thirty (30) days after receipt of a written demand by the Contracting Officer.

The payment of aforesaid fixed, agreed and liquidated damages shall be in lieu of any damages for any loss of profit, loss of revenue, loss of use, or for any other direct, indirect, special or consequential losses or damages of any kind whatsoever that may be suffered by the Agency arising at any time from the failure of the Contractor to fulfill the obligations referenced in this clause in a timely manner.

NOTE: In order to balance the risk in the Contract, which adds to the cost of the bus, the Agency may want to consider capping liquidated damages at an amount between 10 and 20 percent of the total Contract amount or to negotiate an amount with the Contractor. In that case, the following language should be inserted: “The total amount of such liquidated damages shall not exceed [insert number] percent of the total Contract amount.”

The following may be considered for inclusion if early delivery will create a savings to the Agency. The Agency may wish to modify “Excusable Delays” to determine delivery date for purposes of this incentive option:

“In the event that the Contractor completes the Work earlier than required in ‘Delivery Schedule,’ the Contractor shall be paid an incentive of [insert amount] per calendar day per bus that is delivered and accepted early. The total amount of such incentive payments shall not exceed [insert number] percent of the total Contract amount.”

See Appendix B, “Guidelines for Calculating Early Delivery Incentives.”

SP 7. Service and Parts

SP 7.1 Contractor Service and Parts Support

The Contractor shall state on the form Contractor Service and Parts Support Data the representatives responsible for assisting the Agency, as well as the location of the nearest distribution center, which shall furnish a complete supply of parts and components for the repair and maintenance of the buses to be supplied. The Contractor also shall state below, or by separate attachment, its policy on transportation charges for parts other than those covered by warranty.

SP 7.2 Documentation

The Contractor shall provide an electronic copy and [insert number] printed current maintenance manual(s) to include preventative maintenance procedures, diagnostic procedures or troubleshooting guides and major component service manuals, an electronic copy and [insert number] printed current parts manual(s), and an electronic copy and [insert number] printed standard operator’s manual(s) as part of this Contract. The Contractor also shall exert its best efforts to keep maintenance manuals, operator’s manuals and parts books up to date for a period of fifteen (15) years. The supplied manuals shall incorporate all equipment ordered on the buses covered by this procurement. In instances where copyright restrictions or other considerations prevent the Contractor from incorporating major components information into the bus parts and service manuals, separate manual sets as published by the subcomponent Supplier will be provided.

SP 7.3 Parts Availability Guarantee

The Contractor hereby guarantees to provide, within reasonable periods of time, the spare parts, software and all equipment necessary to maintain and repair the buses supplied under this Contract for a period of at least twelve (12) years after the date of acceptance. Parts shall be interchangeable with the original equipment and shall be manufactured in accordance with the quality assurance provisions of this Contract. Prices shall not exceed the Contractor’s then-current published catalog prices.

Where the parts ordered by the Agency are not received within two (2) working days of the agreed-upon time and date and a bus procured under this Contract is out of service due to the lack of said ordered parts, then the

Contractor shall provide the Agency, within eight (8) hours of the Agency's verbal or written request, the original Suppliers' and/or manufacturers' part numbers, company names, addresses, telephone numbers and contact persons' names for all the specific parts not received by the Agency.

Where the Contractor fails to honor this parts guarantee or parts ordered by the Agency are not received within thirty (30) days of the agreed-upon delivery date, then the Contractor shall provide to the Agency, within seven (7) days of the Agency's verbal or written request, the design and manufacturing documentation for those parts manufactured by the Contractor and the original Suppliers' and/or manufacturers' part numbers, company names, addresses, telephone numbers and contact persons' names for all of the specific parts not received by the Agency. The Contractor's design and manufacturing documentation provided to the Agency shall be for its sole use in regard to the buses procured under this Contract and for no other purpose.

SP 7.4 Agency-Furnished Property

In the event that equipment or other goods or materials are specified in the Technical Specifications to be furnished by the Agency to the Contractor for incorporation in the Work, the following provisions shall apply:

1. The Agency shall furnish the equipment, goods or materials in a timely manner so as not to delay Contract delivery or performance dates. If Agency-furnished property is received in a condition not suitable for the intended use, then the Contractor shall promptly notify the Agency, detailing the facts, and at the Agency's expense repair, modify, return or take such other action as directed by the Agency. The parties may conduct a joint inspection of the property before the Contractor takes possession to document its condition.
2. The Agency retains title to all Agency-furnished property. Upon receipt of the Agency-furnished property, the Contractor assumes the charge and care of the property and bears the risk of loss or damage due to action of the elements or from any other cause. The Contractor shall provide appropriate protection for all such property during the progress of the Work. Should any Agency-furnished equipment or materials be damaged, such property shall be repaired or replaced at the Contractor's expense to the satisfaction of the Agency. No extension of time will be allowed for repair or replacement of such damaged items. Should the Contractor not repair or replace such damaged items, the Agency shall have the right to take corrective measures itself and deduct the cost from any sums owed to the Contractor.
3. Warranty administration and enforcement for Agency-furnished equipment are the responsibility of the Agency, unless the parties agree to transfer warranty responsibility to the Contractor.

SP 8. Federal Motor Vehicle Safety Standards (FMVSS)

The Contractor shall submit a manufacturer's FMVSS self-certification, Federal Motor Vehicles Safety Standards, that the vehicle complies with relevant FMVSS or two manufacturer's certified statement that the contracted buses will not be subject to FMVSS regulations.

SP 9. Insurance

NOTE: Excessive or unnecessary insurance requirements can cost substantial sums and provide little or no benefit to the Agency. Inadequate insurance requirements can present an excessive risk to the Agency because of the potential that a loss will exceed the limits of coverage. The numbers identified below are examples and reflect current industry practice.

The Contractor shall maintain in effect during the term of this Contract, including any warranty period, at its own expense, at least the following coverage and limits of insurance:

- Statutory Workers Compensation and Employers Liability insurance and/or qualified self-insurance program covering Supplier's employees while on Agency property.
- Commercial General Liability Insurance:
 - Bodily Injury and Property Damage, including Contractual Liability covering the indemnification contained herein, \$10,000,000 combined single limits per occurrence, \$10,000,000 aggregate, where applicable.
 - Product liability: \$5,000,000 per occurrence, for a period of five (5) years after acceptance of the last bus delivered under this Contract (Products Liability coverage may be effected through one or more excess liability policies).
- Automobile Liability Insurance: Bodily Injury and Property Damage, \$1,000,000 combined single limits per occurrence.

Contractor shall deliver to the Agency, within ten (10) days after receiving Notice of Award of this Contract, evidence of the above. Prior to the expiration of any insurance during the time required, the Supplier shall furnish evidence of renewal to the Agency's Contract Administrator.

SP 10. Software Escrow Account

All the Contractor's policies shall contain an endorsement naming the Agency as an additional insured and providing that written notice shall be given to the Agency's location at least thirty (30) days prior to termination, cancellation or material reduction of coverage in the policy, provided, however, that such notice may be given on ten (10) days' notice if the termination is due to nonpayment of premium.

NOTE: Software escrow accounts detail an Agency's rights to access software code or other confidential data of the Contractor, Subcontractor and/or Suppliers under situations such as bankruptcy of the Contractor or material breach of the Contract. They are infrequently used and when used are used for technology or systems that are software-controlled. An example of a software escrow agreement can be found in Appendix G.

Upon execution of the Contract, the Contractor shall provide the Agency a list of all OEM software comprising proprietary works ("Proprietary Software") for all major vehicle subsystems. From time to time and only upon request, information contained within the listed software may be made available to the Agency through the OEM of the vehicle subsystem. The Contractor and OEM are not obligated to provide copies of source code, as this is proprietary intellectual property; however, the Contractor is obligated to assist the Agency with any technical assistance for the duration of the life of the vehicle. It is the Agency's prerogative to evaluate the long-term viability of the Contractor and its Subcontractors and Suppliers based upon the criteria set forth in "Qualification Requirements."

SP 11. Sustainability

NOTE: If the Agency has its own sustainability policy that includes the responsibility to make sure all of its Contractors are informed of this policy, then the following language is recommended.

The Agency recognizes that being sustainable (environmentally, economically and socially responsible) involves everyone, both internal and external to the Agency. The Agency expects its Contractors to have their own sustainability policies and programs in place and to provide services in line with the principles established therein. Implementation of sustainable practices may include maximizing the use of

environmentally and socially responsible materials and services, using energy-efficient and non-polluting vehicles, equipment and processes, and ensuring employee awareness of sustainability initiatives.

The Agency has a sustainability policy that includes the responsibility to make sure all of its Contractors are informed of this policy. The Contractor will provide the Agency with a statement indicating that responsible parties have read and understand the Agency's sustainability policies and that it agrees to use reasonable efforts to conduct its work and operations in a manner that is consistent with them. In addition the Contractor will provide the Agency with a copy of its corporate sustainability policy.

SP 12. Agency-Specific Provisions

[Insert as required.]

SECTION 5: FEDERAL REQUIREMENTS

FR 1. Access to Records

The Contractor agrees to maintain all books, records, accounts and reports required under this Contract for a period of not less than three years after the date of termination or expiration of this Contract, except in the event of litigation or settlement of claims arising from the performance of this Contract, in which case Contractor agrees to maintain same until the Agency, the FTA Administrator, the Comptroller General or any of their duly authorized representatives have disposed of all such litigation, appeals, claims or exceptions related thereto. Reference 49 CFR 18.39(i)(11).

The following access to records requirements apply to this Contract:

FR 1.1 Local Governments

In accordance with 49 CFR 18.36(i), the Contractor agrees to provide the Agency, the FTA Administrator, the Comptroller General of the United States or any of their authorized representatives access to any books, documents, papers and records of the Contractor that are directly pertinent to this Contract for the purposes of making audits, examinations, excerpts and transcriptions. Contractor also agrees, pursuant to 49 CFR 633.17 to provide the FTA Administrator or his authorized representatives including any PMO Contractor access to Contractor's records and construction sites pertaining to a major capital project, defined at 49 USC 5302(a)1, which is receiving federal financial assistance through the programs described at 49 USC 5307, 5309 or 5311.

FR 1.2 State Governments

In accordance with 49 CFR 633.17, the Contractor agrees to provide the Agency, the FTA Administrator or his authorized representatives, including any PMO Contractor, access to the Contractor's records and construction sites pertaining to a major capital project, defined at 49 USC 5302(a)1, which is receiving federal financial assistance through the programs described at 49 USC 5307, 5309 or 5311. By definition, a major capital project excludes contracts of less than the simplified acquisition threshold currently set at \$100,000.

The Contractor agrees to permit any of the foregoing parties to reproduce by any means whatsoever or to copy excerpts and transcriptions as reasonably needed.

FR 2. Federal Funding, Incorporation of FTA Terms and Federal Changes

The preceding provisions include, in part, certain standard terms and conditions required by the Department of Transportation, whether or not expressly set forth in the preceding Contract provisions. All contractual provisions required by DOT, as set forth in FTA Circular 4220.1F or its successors 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 Contractor shall not perform any act, fail to perform any act or refuse to comply with any [insert Agency name] requests that would cause [insert Agency name] to be in violation of the FTA terms and conditions.

The Contractor 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 Agency and FTA, as they may be amended or promulgated from time to time during the term of this Contract. Contractor's failure to so comply shall constitute a material breach of this Contract.

FR 3. Federal Energy Conservation Requirements

The Contractor agrees to comply with mandatory standards and policies relating to energy efficiency that are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act.

FR 4. Civil Rights Requirements

The following requirements apply to the underlying Contract:

1. **Nondiscrimination:** In accordance with Title VI of the Civil Rights Act, as amended, 42 USC § 2000d, section 303 of the Age Discrimination Act of 1975, as amended, 42 USC § 6102, section 202 of the Americans with Disabilities Act of 1990, 42 USC § 12132, and federal transit law at 49 USC § 5332, the Contractor 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 Contractor 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 to the underlying Contract:
 - (a) **Race, Color, Creed, National Origin, Sex:** In accordance with Title VII of the Civil Rights Act, as amended, 42 USC § 2000e, and federal transit laws at 49 USC § 5332, the Contractor 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 CFR 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 USC § 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 Contractor 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, the following: 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 Contractor 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 USC §§ 623 and federal transit law at 49 USC § 5332, the Contractor agrees to refrain from discrimination against present and prospective employees for reason of age. In addition, the Contractor 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 USC § 12112, the Contractor 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 CFR Part 1630, pertaining to employment of persons with disabilities. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.

3. The Contractor also agrees to include these requirements in each subcontract financed in whole or in part with federal assistance provided by FTA, modified only if necessary to identify the affected parties.

FR 5. No Government Obligation to Third Parties

1. The Agency and Contractor 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 Agency, Contractor, or any other party (whether or not a party to that Contract) pertaining to any matter resulting from the underlying Contract.
2. The Contractor agrees to include the above clause in each subcontract financed in whole or in part with federal assistance provided by FTA. It is further agreed that the clause shall not be modified, except to identify the Subcontractor who will be subject to its provisions.

FR 6. Program Fraud and False or Fraudulent Statements or Related Acts

1. The Contractor acknowledges that the provisions of the Program Fraud Civil Remedies Act of 1986, as amended, 31 USC §§ 3801 *et seq.* and U.S. DOT regulations, “Program Fraud Civil Remedies,” 49 CFR Part 31, apply to its actions pertaining to this Project. Upon execution of the underlying Contract, the Contractor certifies or affirms the truthfulness and accuracy of any statement it has made, it makes, it may make, or it causes to be made, pertaining to the underlying Contract or the FTA-assisted project for which this Contract Work is being performed. In addition to other penalties that may be applicable, the Contractor 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 Contractor to the extent the federal government deems appropriate.
2. The Contractor 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 USC § 5307, the government reserves the right to impose the penalties of 18 USC § 1001 and 49 USC § 5307(n)(1) on the Contractor, to the extent the federal government deems appropriate.
3. The Contractor agrees to include the above two clauses in each subcontract financed in whole or in part with federal assistance provided by FTA. It is further agreed that the clauses shall not be modified, except to identify the Subcontractor who will be subject to the provisions.

FR 7. Suspension and Debarment

This Contract is a covered transaction for purposes of 49 CFR Part 29. As such, the Contractor is required to verify that none of the Contractor, its principals, as defined at 49 CFR 29.995, or affiliates, as defined at 49 CFR 29.905, are excluded or disqualified as defined at 49 CFR 29.940 and 29.945.

The Contractor is required to comply with 49 CFR 29, Subpart C, and must include the requirement to comply with 49 CFR 29, Subpart C, in any lower-tier covered transaction it enters into.

By signing and submitting its bid or Proposal, the Bidder or Proposer certifies as follows:

The certification in this clause is a material representation of fact relied upon by [insert Agency name]. If it is later determined that the Bidder or Proposer knowingly rendered an erroneous certification, in addition to remedies available to [insert Agency name], 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 49 CFR 29, Subpart C, while this Proposal is valid and throughout the period of any Contract that may arise from this Proposal. The Bidder or Proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

FR 8. Disadvantaged Business Enterprise (DBE)

This Contract is subject to the requirements of Title 49, Code of Federal Regulations, Part 26, Participation by Disadvantaged Business Enterprises in Department of Transportation Financial Assistance Programs.

The Contractor shall maintain compliance with “DBE Approval Certification” throughout the period of Contract performance.

The Contractor shall not discriminate on the basis of race, color, national origin or sex in the performance of this Contract. The Contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of this DOT-assisted Contract. Failure by the Contractor to carry out these requirements is a material breach of this Contract, which may result in the termination of this Contract or such other remedy as [insert Agency name] deems appropriate. Each subcontract the Contractor signs with a Subcontractor must include the assurance in this paragraph (see 49 CFR 26.13(b)).

FR 9. Clean Water Requirements

1. The Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 USC 1251 *et seq.* The Contractor agrees to report each violation to the Agency and understands and agrees that the Agency will, in turn, report each violation as required to ensure notification to FTA and the appropriate EPA Regional Office.
2. The Contractor also agrees to include these requirements in each subcontract exceeding \$100,000 financed in whole or in part with federal assistance provided by FTA.

FR 10. Clean Air Requirements

1. The Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 USC §§ 7401 *et seq.* The Contractor agrees to report each violation to the Agency and understands and agrees that the Agency will, in turn, report each violation as required to ensure notification to FTA and the appropriate EPA Regional Office.
2. The Contractor also agrees to include these requirements in each subcontract exceeding \$100,000 financed in whole or in part with federal assistance provided by FTA.

FR 11. Compliance with Federal Lobbying Policy

Contractors who apply or bid for an award of \$100,000 or more shall file the certification required by 49 CFR Part 20, “New Restrictions on Lobbying.” Each tier certifies to the tier above that it will not and has not used federal appropriated funds to pay any person or organization for influencing or attempting to influence 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 obtaining any federal Contract, grant or any other award covered by 31 USC 1352. Each tier shall also disclose the name of any registrant under the Lobbying

Disclosure Act of 1995 who has made lobbying contacts on its behalf with non-federal funds with respect to that federal Contract, grant or award covered by 31 USC 1352. Such disclosures are forwarded from tier to tier up to the recipient.

FR 12. Buy America

The Contractor agrees to comply with 49 USC 5323(j) and 49 CFR Part 661, which provide that federal funds may not be obligated unless steel, iron and manufactured products used in FTA-funded projects are produced in the United States, unless a waiver has been granted by FTA or the product is subject to a general waiver. General waivers are listed in 49 CFR 661.7. A general public interest waiver from the Buy America requirements applies to microprocessors, computers, microcomputers, software or other such devices, which are used solely for the purpose of processing or storing data. This general waiver does not extend to a product or device that merely contains a microprocessor or microcomputer and is not used solely for the purpose of processing or storing data.

Separate requirements for rolling stock are set out at 49 USC 5323(j)(2)(C) and 49 CFR 661.11. Rolling stock must be assembled in the United States and have a 60 percent domestic content.

A Bidder or Proposer must submit to the Agency the appropriate Buy America Certification with all offers on FTA-funded contracts, except those subject to a general waiver. Proposals that are not accompanied by a properly completed Buy America certification are subject to the provisions of 49 CFR 661.13 and may be rejected as nonresponsive.

FR 13. Testing of New Bus Models

The Contractor agrees to comply with 49 USCA 5323(c) and FTA's implementing regulation at 49 CFR Part 665 and shall perform the following:

1. A manufacturer of a new bus model or a bus produced with a major change in components or configuration shall provide a copy of the final test report to the recipient at a point in the procurement process specified by the recipient, which will be prior to the recipient's final acceptance of the first vehicle.
2. A manufacturer who releases a report under paragraph 1 above shall provide notice to the operator of the testing facility that the report is available to the public.
3. If the manufacturer represents that the vehicle was previously tested, the vehicle being sold should have the identical configuration and major components as the vehicle in the test report, which must be provided to the recipient prior to recipient's final acceptance of the first vehicle. If the configuration or components are not identical, the manufacturer shall provide a description of the change and the manufacturer's basis for concluding that it is not a major change requiring additional testing.
4. If the manufacturer represents that the vehicle is "grandfathered" (has been used in mass transit service in the United States before Oct. 1, 1988, and is currently being produced without a major change in configuration or components), the manufacturer shall provide the name and address of the recipient of such a vehicle and the details of that vehicle's configuration and major components.

FR 14. Pre-Award and Post-Delivery Audits

The Contractor agrees to comply with 49 USC § 5323(l) and FTA’s implementing regulation at 49 CFR Part 663 and to submit the following certifications:

1. **Buy America requirements:** The Contractor shall complete and submit a declaration certifying either compliance or noncompliance with Buy America. If the recommended Bidder/Proposer certifies compliance with Buy America, it shall submit documentation that lists (1) component and subcomponent parts of the rolling stock to be purchased identified by manufacturer of the parts, their country of origin and costs; and (2) the location of the final assembly point for the rolling stock, including a description of the activities that will take place at the final assembly point and the cost of final assembly.
2. **Solicitation specification requirements:** The Contractor shall submit evidence that it will be capable of meeting the bid specifications.
3. **Federal Motor Vehicle Safety Standards (FMVSS):** The Contractor shall submit (1) manufacturer’s FMVSS self-certification, Federal Motor Vehicle Safety Standards, that the vehicle complies with relevant FMVSS or (2) manufacturer’s certified statement that the contracted buses will not be subject to FMVSS regulations.

FR 15. Cargo Preference

The Contractor agrees to the following:

- To use privately owned U.S.-flag commercial vessels to ship at least fifty (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 U.S.-flag commercial vessels;
- To furnish within twenty (20) working days following the date of loading for shipments originating within the United States or within thirty (30) working days following the date of leading for shipments originating outside the United States, a legible copy of a rated, “onboard” commercial ocean bill of lading in English for each shipment of cargo described in the preceding paragraph 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.)
- To include these requirements in all subcontracts issued pursuant to this Contract when the subcontract may involve the transport of equipment, material or commodities by ocean vessel.

FR 16. Fly America

The Contractor agrees to comply with 49 USC 40118 (the “Fly America” Act) in accordance with the General Services Administration’s regulations at 41 CFR Part 301-10, which provide that recipients and sub-recipients of federal funds and their Contractors are required to use U.S. flag air carriers for U.S. government-financed international air travel and transportation of their personal effects or property, to the extent such service is available, unless travel by foreign air carrier is a matter of necessity, as defined by the Fly America Act. The Contractor shall submit, if a foreign air carrier was used, an appropriate certification or memorandum adequately explaining why service by a U.S.-flag air carrier was not available or why it was necessary to use a foreign air carrier and shall, in any event, provide a certificate of compliance with the Fly America requirements. The Contractor agrees to include the requirements of this section in all subcontracts that may involve international air transportation.

FR 17. Contract Work Hours and Safety Standards Act

1. **Overtime requirements:** No Contractor or Subcontractor contracting for any part of the Contract Work that 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 40 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 40 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 the unpaid wages. In addition, 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 40 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 [insert Agency name] 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 monies 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 insert in any subcontracts the clauses set forth in paragraphs 1 through 4 of this section and also a clause requiring the 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 the clauses set forth in paragraphs 1 through 4 of this section.

SECTION 6: TECHNICAL SPECIFICATIONS

GENERAL

TS 1. Scope

Technical specifications define requirements for heavy-duty transit buses and commuter coaches, which, by the selection of specifically identified alternative configurations, may be used for both suburban express service and general service on urban arterial streets. Buses shall have a minimum expected life of twelve (12) years or 500,000 miles, whichever comes first, and are intended for the widest possible spectrum of passengers, including children, adults, the elderly and people with disabilities.

TS 2. Definitions

Agency Operating Profile: The operational requirements under Agency-specific operating conditions that the bus must be able to achieve.

Alternative: An alternative specification condition to the default bus configuration. The Agency may define alternatives to the default configuration to satisfy local operating requirements. Alternatives for the default configuration will be clearly identified.

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).

Analog Signals: A continuously variable signal that is solely dependent upon magnitude to express information content.

NOTE: Analog signals are used to represent the state of variable devices such as rheostats, potentiometers, temperature probes, etc.

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.

Battery Compartment: Low-voltage energy storage, i.e. 12/24 VDC batteries.

Battery Management System (BMS): Monitors energy, as well as temperature, cell or module voltages, and total pack voltage. The BMS adjusts the control strategy algorithms to maintain the batteries at uniform state of charge and optimal temperatures.

Battery Pack: An electrical equivalent of a collection of cells or modules or physical sub-packs forming the highest-level energy storage system. Often multiple physical sub-packs are connected in series, and these may also be connected in parallel.

Braking Resistor: Device that converts electrical energy into heat, typically used as a retarder to supplement or replace the regenerative braking.

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).

Cell: Simplest discrete component of the battery storage system, such as a battery or a capacitor.

Charging Equipment: The equipment that encompasses all the components needed to convert, control and transfer electricity from the grid to the vehicle for the purpose of charging batteries. May include chargers, controllers, couplers, transformers, ventilation, etc. See *Electric Vehicle Supply Equipment (EVSE)*.

Charging Interface: The equipment and/or coupler used to create a connection between the charging equipment and the vehicle for the purpose of recharging a vehicle's batteries.

Charging Station: The location that houses the charging equipment connected to a utility's electric service to provide electricity to a vehicle's battery system through a charging interface.

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.

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.

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.

dBA: Decibels with reference to 0.0002 microbar as measured on the "A" scale.

DC to DC Converter: A module that converts a source of direct current from one voltage level to another.

Default Configuration Bus: The bus described if no alternatives are selected. Signing, colors, the destination sign reading list and other information must be provided by the Agency.

Defueling: The process of removing fuel from a tank.

Defueling Port: Device that allows for vehicle defueling, or the point at which this occurs.

Design Operating Profile: The operational requirements under standard operating conditions that the bus must be able to achieve.

Destroyed: Physically made permanently unusable.

Discrete Signal: A signal that can take only pre-defined values, usually of a binary 0 or 1 nature, where 0 is battery ground potential and 1 is a defined battery positive potential.

DPF: Diesel particulate filter.

Driver's Eye Range: The 95th-percentile ellipse defined in SAE J941, except that the height of the ellipse shall be determined from the seat at its reference height.

Electrical Pack: See "Battery Pack"

Electric Vehicle Supply Equipment (EVSE): The conductors, including the ungrounded, grounded and equipment grounding conductors, the electric vehicle connectors, the attachment plugs, and all other fittings, devices, power outlets or apparatuses installed specifically for the purpose of delivering energy from the premise's wiring to the electric vehicle.

End of Life: A condition reached when an energy storage system fails to meet specified capacity, power or function in specified use conditions.

Energy Density: The relationship between the weight of an energy storage device and its power output in units of watt-hours per kilogram (Wh/kg).

Energy Storage System (ESS): A component or system of components that stores energy and for which its supply of energy is rechargeable by the on-vehicle system(engine/regenerative braking/ generator)or an off-vehicle energy source.

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 shall not exceed 125 percent of service pressure.

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.

Fireproof: Materials that will not burn or melt at temperatures less than 2000 °F.

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.

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 sq. ft. shall be allocated for the feet of each seated passenger protruding into the standee area.

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.

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., main throttle, waste gate).

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.

Generator (Electric): A device that converts mechanical energy into electrical energy.

Gross Load: 150 lb for every designed passenger seating position, for the driver, and for each 1.5 sq. ft. of free floor space.

GVW (Gross Vehicle Weight): Curb weight plus gross load.

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.

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

High Voltage (HV): Greater than 50 V(AC and DC).

Hose: Flexible line.

Hybrid: A vehicle that uses two or more distinct power sources to propel the vehicle.

Hybrid System Controller (HSC): Regulates energy flow throughout hybrid system components in order to provide motive performance and accessory loads, as applicable, while maintaining critical system parameters (voltages, currents, temperatures, etc.) within specified operating ranges.

Hybrid Drive System (HDS): The mechanical and/or electromechanical components, including the engine, traction motors and energy storage system, which comprise the traction drive portion of the hybrid propulsion system.

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 to 70 psi).

Inverter: A module that converts DC to and from AC.

Labeled: Equipment or materials to which has been attached a label, symbol or other identifying mark of an organization, which is acceptable to the authority having jurisdiction and concerned with product evaluation, which 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 a crack. See *Rupture*.

Line: All tubes, flexible and hard, that carry fluids.

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

Local Regulations: Regulations below the state level.

Low-Floor Bus: A bus that, 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.

Low Voltage (LV): 50 V or less (AC and DC).

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.

Module: A collection of cells forming a physical and electrical subassembly contained within an enclosure.

Motor (Electric): A device that converts electrical energy into mechanical energy.

Motor (Traction): An electric motor used to power the driving wheels of the bus.

Nameplate Capacity (or Nominal Capacity): The total amount of energy available between 0% State of Charge (SoC) and 100% SoC.

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

Pack: A collection of cells or modules described on the basis of electrical or physical attributes, to include Battery *Pack* and *Physical Pack*.

Physical Layer: The first layer of the seven-layer International Standards Organization (ISO) Open Systems Interconnect (OSI) reference model. This provides the mechanical, electrical, functional and procedural characteristics required to gain access to the transmission medium (e.g., cable) and is responsible for transporting binary information between computerized systems.

Physical Pack: An enclosure consisting of a collection of cells or modules at a location or multiple locations. Physical packs differ from battery packs, as they are defined by layout rather than electrical equivalent.

Pipe: Nonflexible line.

Pressure Relief Device (PRD): A pressure and/or temperature activated device used to vent the container/cylinder contents and thereby prevent rupture of an 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.

Power: Work or energy divided by time

Power Density: Power divided by mass, volume or area.

Propulsion System: System that provides propulsion for the vehicle proportional to operator commands. Includes, as applicable, engine, transmission, traction motors, the hybrid drive system,(HDS), energy storage system (ESS), and system controllers including all wiring and converter/inverter.

Real-Time Clock (RTC): Computer clock that keeps track of the current time.

Regenerative Braking: Deceleration of the bus by switching motors to act as generators, which return vehicle kinetic energy to the energy storage system.

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.

Retarder: Device used to augment or replace some of the functions of primary friction based braking systems of the bus.

Rupture: Sudden and unstable damage propagation in the structural components of the container resulting in a loss of contents. See *Leakage*.

Seated Load: 150 lb for every designed passenger seating position and for the driver.

Seated Load Weight (SLW): Curb weight plus seated load.

Serial Data Signals: A current loop based representation of ASCII or alphanumeric data used for transferring information between devices by transmitting a sequence of individual bits in a prearranged order of significance.

NOTE: An example is the communication that takes place between two or more electronic components with the ability to process and store information.

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.

Solid State Alternator: A module that converts high-voltage DC to low-voltage DC (typically 12/24 V systems).

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.

Special Tools: Tools not normally stocked by the Agency.

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.

Standard: A firm guideline from a consensus group. Standards referenced in “Section 6: Technical Specifications” are the latest revisions unless otherwise stated.

Standee Line: A line marked across the bus aisle to designate the forward area that passengers may not occupy when the bus is moving.

State of Charge (SoC): Quantity of electric energy remaining in the battery relative to the maximum rated amp-hour (Ah) capacity of the battery expressed in a percentage. This is a dynamic measurement used for the energy storage system. A full SoC indicates that the energy storage system cannot accept further charging from the engine-driven generator or the regenerative braking system.

Stress Loops: The “pigtailed” commonly used to absorb flexing in piping.

Structure: The basic body, including floor deck material and installation, load-bearing external panels, structural components, axle mounting provisions and suspension beams and attachment points.

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 over-pressure from improper charging practices.

Useable Capacity: Nameplate Capacity x Allowable Depth of Discharge (for example, 95%)

Warrantable End of Life (WEOL): A measure of battery degradation determined as the point at which the batteries can no longer provide the energy or power required to meet the design operating profile. It is expressed as a percentage of remaining battery capacity as compared with gross capacity at the beginning of useful life. For purposes of this specification, WEOL shall be a measure of the useful and intended life of the energy storage device.

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 in. in width and 48 in. in length measured 2 in. above the ground, and does not weigh more than 600 lb when occupied.

Zero-Emission Vehicle (ZEV): A vehicle that emits no tailpipe emissions from the onboard source of power.

TS 3. Referenced Publications

The documents or portions thereof referenced within this specification shall be considered part of the requirements of the specification. The edition indicated for each referenced document is the current edition, as of the date of the issuance of this specification. The Contractor is responsible for complying with current referenced documents.

Any inconsistency in compliance with this Technical Specification and its referenced documents shall be resolved by giving precedence in the following order:

1. Federal requirements (Title 49, FMVSS, etc.)
2. State requirements (in California, for example, it would be Title 13 Vehicle Code)
3. Local requirements
4. Referenced standards, practices and codes (SAE, ASTM, UL, ISO, etc.)
5. Technical content of this Technical Specification section

As an attachment to this RFP, CER 9.3 identifies the specifications, standards, regulations and references used within the RFP. The form must be returned with a proposal and requires an indication of the state of compliance and an opportunity for listing other pertinent references. Please indicate “compliance” as full, partial or N/A (not applicable). If “partial” or “N/A,” please describe.

TS 4. Legal Requirements

The Contractor shall comply with all applicable federal, state and local regulations. These shall include but not be limited to the Americans with Disabilities Act (ADA), as well as state and local accessibility, safety and security requirements. Local regulations are defined as those below the state level.

Buses shall meet all applicable Federal Motor Vehicle Safety Standards (FMVSS) regulations and shall accommodate all applicable Federal Motor Carrier Safety Administration (FMCSA) regulations in effect at the location of the Agency and the date of manufacture.

NOTE: In the event of any conflict between the requirements of these specifications and any applicable legal requirement, the legal requirement shall prevail. Technical requirements that exceed the legal requirements are not considered to conflict.

TS 5. Overall Requirements

The Contractor shall ensure that the application and installation of major bus subcomponents and systems are compliant with all such subcomponent vendors’ requirements and recommendations. Contractor and Agency shall identify subcomponent vendors that shall submit installation/application approval documents with the completion of a pilot or lead bus. Components used in the vehicle shall be of heavy-duty design and proven in transit service.

TS 5.1 Weight

It shall be a design goal to construct each bus as light in weight as possible without degradation of safety, appearance, comfort, traction, longevity or performance.

Buses at gross vehicle weight (GVW) shall not exceed the tire factor limits, brake test criteria, structural design criteria or the gross vehicle weight rating (GVWR).

TS 5.2 Capacity

The vehicle shall be designed to carry the gross vehicle weight, which shall not exceed the bus GVWR and shall not exceed the GAWR.

TS 5.3 Service Life

The minimum useful design life of the bus in transit service shall be at least 12 years or 500,000 miles. It shall be capable of operating at least 40,000 miles per year, including the 12th year.

TS 5.4 Maintenance and Inspection

Scheduled maintenance tasks for buses shall be related and shall be in accordance with the manufacturer's recommended preventive maintenance schedule (along with routine daily service performed during the servicing). The overall PM schedule for buses shall be based upon a minimum of a 6000 mi interval and/or multiples of same.

The manufacturer is responsible for providing a written comprehensive 52-week and long-term rehab/replacement maintenance plan encompassing buses for their entire useful life. The plan should include times (in hours) to complete the jobs.

Test ports or connectors, as required, shall be provided for commonly checked functions on the bus, such as hydraulic, pneumatic, cooling, temperature, voltage, current and state of charge (SoC).

The Offeror shall give prime consideration to the routine problems of maintaining the vehicle. All vehicle components and systems, both mechanical and electrical, that will require periodic physical work or inspection processes, shall be installed so that a minimum of time is consumed in gaining access to the critical repair areas. It shall not be necessary to disassemble portions of the bus structure and/or equipment, such as seats and flooring under seats, in order to gain access to these areas. Each bus shall be designed to facilitate disassembly, reassembly, servicing or maintenance, using tools and equipment normally available as standard commercial items.

Requirements for the use of unique or specialized tools shall be minimized. The body and structure of the bus shall be designed for ease of maintenance and repair. Individual panels or other equipment that may be damaged in normal service shall be repairable or replaceable. Ease of repair shall be related to the vulnerability of the item to damage in service.

The Contractor shall provide a list of all special tools and pricing for maintaining this equipment as a supplement to the Pricing Schedule.

NOTE: Tools such as compartment door keys, bellows gauges and other tools required for daily maintenance and inspection shall not be included in the special tools list and shall be furnished for each bus.

TS 5.5 Interchangeability

Unless otherwise agreed, all units and components procured under this Contract, whether provided by Suppliers or manufactured by the Contractor, shall be duplicates in design, manufacture and installation to ensure interchangeability among buses in each order group in this procurement. This interchangeability shall extend to the individual components, as well as to their locations in the buses. These components shall

include, but are not limited to, passenger window hardware, interior trim, lamps, lamp lenses and seat assemblies. Components with non-identical functions shall not be, or appear to be, interchangeable.

Any one component or unit used in the construction of these buses shall be an exact duplicate in design, manufacture and assembly for each bus in each order group in this Contract. Contractor shall identify and secure approval for any changes in components or unit construction provided within a Contract.

In the event that the Contractor is unable to comply with the interchangeability requirement, the Contractor must notify the Agency and obtain the Agency's prior written approval, including any changes in pricing.

Agency shall review proposed product changes on a case-by-case basis and shall have the right to require extended warranties to ensure that product changes perform at least as well as the originally supplied products.

TS 5.6 Training

NOTE: The following is illustrative; the Agency should carefully specify its training requirements.

The Contractor shall have at least one qualified instructor who shall be available at the Agency's property for [insert number] calendar days between the hours of [insert starting time] and [insert closing time] per month for [insert number] months prior to, and [insert number] months after, acceptance of the first bus. Instructor(s) shall conduct schools and advise the personnel of the Agency on the proper operation and maintenance of the equipment. The Contractor also shall provide visual and other teaching aids (such as manuals, slide presentations and literature) for use by the Agency's own training staff, which become the property of the Agency.

NOTE: The Agency should insert language that specifies the hours when it wants the training to occur, the total number of hours of instruction it wants provided, what items it expects the curriculum to cover and the format in which it expects the training and teaching aids to be provided (print, DVD, etc.).

TS 5.6.1 Technical/Service Representatives

NOTE: The following examples are illustrative; the Agency should carefully specify its support requirements.

[example] The Contractor shall, at its own expense, have one or more competent technical service representatives available on request to assist the Agency in the solution of engineering or design problems within the scope of the specifications that may arise during the warranty period. This does not relieve the Contractor of responsibilities under the provisions of "Section 7: Warranty Requirements."

[example] The Contractor shall provide full-time, on-site technical support representative for the buses and charging equipment for the first two years after bus delivery, with annual renewal options for 10 more years.

TS 5.7 Operating Environment

DEFAULT

The bus shall be capable of satisfying the requirements of this specification while operating in ambient temperature ranges of 10 °F to 115 °F, at relative humidity between 5 and 100 percent, and at altitudes up to 3000 ft above sea level. Degradation of performance due to atmospheric conditions shall be minimized at temperatures below 10 °F, above 115 °F or at altitudes above 3000 ft. Altitude requirements above 3000 ft. will need separate discussions with propulsion/drive system manufacturer to ensure that performance requirements are not compromised. Speed, gradeability and acceleration performance requirements shall be met at, or corrected to, 77 °F, 29.31 inHg, dry air per SAE J1995.

ALTERNATIVE

Agency will define operating environment.

TS 5.8 Noise

The Contractor is expected to meet interior and exterior noise requirements specified in Section 5.8.1 and Section 5.8.2. Furthermore, it shall be a design goal to minimize noise. Component layout and packaging, material selection, and build quality shall reflect that goal.

TS 5.8.1 Interior Noise

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 bus shall have a sound level of 65 dBA or lower at any point inside the bus. These conditions shall prevail with all openings, including doors and windows, closed and with the propulsion/drive system and accessories switched off.

Maximum internal noise level shall not exceed 75 dBA in the operator's area near normal operator ear level and 80 dBA in all other areas in the interior of the vehicles under all normal operating conditions at locations inside the bus in adherence with the standards of ISO 5128.

TS 5.8.2 Exterior Noise

Airborne noise generated by the bus and measured from either side shall not exceed 80 dBA under full-power acceleration when operated at 0 to 35 mph at curb weight. The Contractor shall comply with the exterior noise requirements defined in local laws and ordinances identified by the Agency and SAE J366.

DEFAULT

Noise level should be as stated.

ALTERNATIVE

Agency to state what noise level should be required.

TS 5.9 Fire Safety

The bus shall be designed and manufactured in accordance with all applicable fire safety and smoke emission regulations.

TS 5.9.1 Materials

DEFAULT

All materials used in the construction of the passenger compartment of the bus shall be in accordance with the Recommended Fire Safety Practices defined in FMVSS 302.

ALTERNATIVE

All materials used in the construction of the passenger compartment of the bus shall be in accordance with the Recommended Fire Safety Practices defined in FTA Docket 90-A, dated Oct. 20, 1993. Materials entirely enclosed from the passenger compartment, such as insulation within the sidewalls and sub-floor, need not comply. In addition, smaller components and items, such as seat grab rails, switch knobs, small light lenses, door seals, window seals, steering wheel, steering column and escape hatches shall be exempt from this requirement.

TS 5.10 Fire Suppression

DEFAULT (DIESEL, CNG, HYBRID)

The bus shall have a fire suppression system in areas requested by the Agency and installed per manufacturer's recommendations.

DEFAULT (BATTERY ELECTRIC)

No fire suppression system needed

ALTERNATIVE

Fire Suppression/Gas Detection

The bus shall be equipped with a suitable means of automatically detecting and extinguishing fires and/or overtemperature situations that may cause unreliable or unsafe operation. If the energy storage device is capable of releasing combustible gas, then this same system shall incorporate an integrated gas detection and alarm feature. This system shall employ intrinsically safe detectors capable of reliable operation, alert and shutdown to ensure safe operation. Alert shall occur at approximately 25 percent lower flammability limit (LFL), and shutdown shall occur at approximately 50 percent LFL. This system shall include an uninterruptible power supply (UPS) capable of sustaining operation for a period of at least 72 h regardless of the primary energy source SoC and remain uninterrupted regardless of “run”/“ign” position. The quantity, location and technology for sensors, suppression, agents, etc. shall be best practice for the intended application and environment. Sensors shall be of the linear type, capable of measuring temperature and programmable at the controller. Fire suppression piping located in the immediate area(s) being protected shall be fireproof and capable of surviving gross thermal events. The subject piping shall include the flow path between the fire suppression bottle and nozzles, with metalized rigid/flexible stainless steel preferred. The system shall include a means to automatically monitor fire suppression storage container pressure and to provide low-pressure alerts to the integrated system controller/display.

TS 5.11 Respect for the Environment

In the design and manufacture of the bus, the Contractor shall make every effort to reduce the amount of potentially hazardous waste. In accordance with Section 6002 of the Resource Conservation and Recovery Act, the Contractor shall use, whenever possible and allowed by the specifications, recycled materials in the manufacture of the bus.

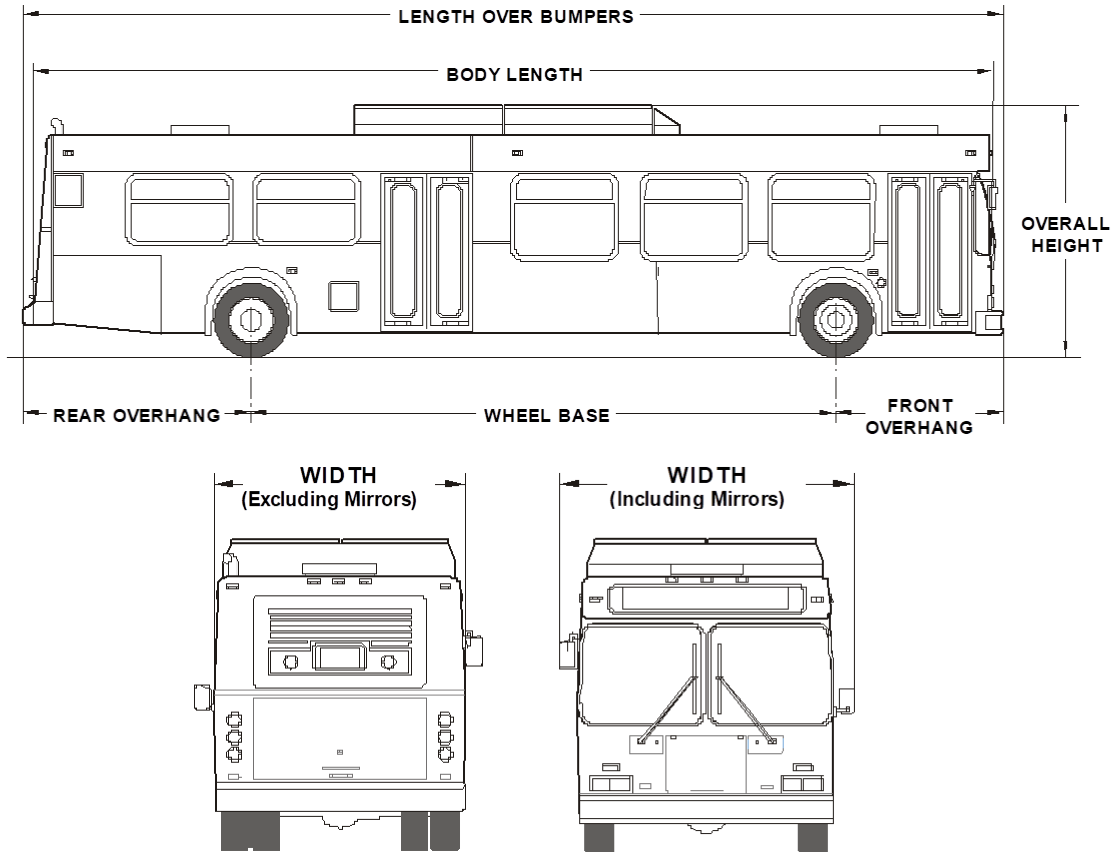
The Contractor shall provide a plan for reuse or recycling of replaced battery cells, modules and/or physical packs.

DIMENSIONS

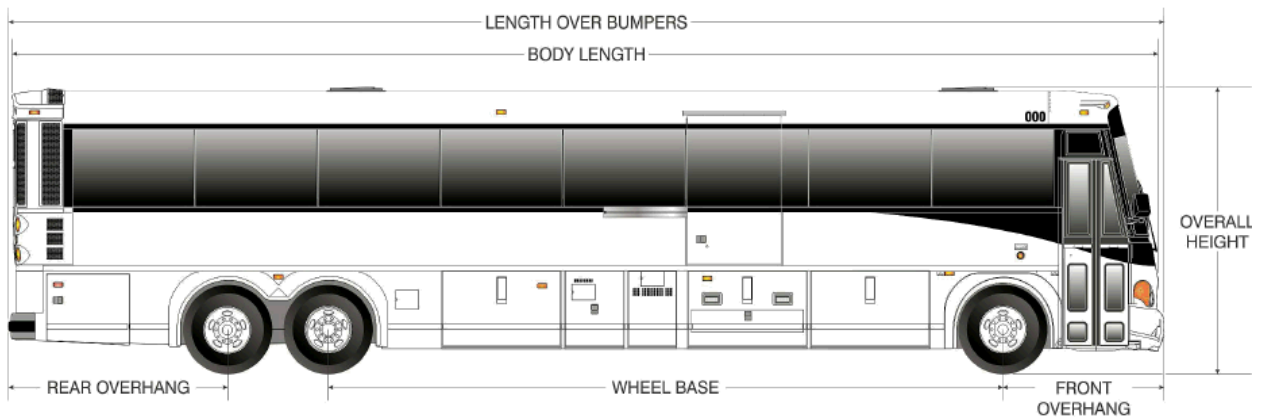
TS 6. Physical Size

With exceptions such as exterior mirrors, marker and signal lights, bumpers, fender skirts, washers, wipers, ad frames, cameras, object detection systems, bicycle racks, feelers and rubrails, the bus shall have the following overall dimensions as shown in **Figure 1** at static conditions and design height.

FIGURE 1
Transit Bus Exterior Dimensions



Commuter Coach Exterior Dimensions





TS 6.1 Bus Length

For ease of use, the following tolerances will be allowable for each given bus length. Bus length is determined as the measurement from bumper to bumper.

- **30 ft bus:** 29 ft, 11 in. to 34 ft, 11 in.
- **35 ft bus:** 35 ft to 39 ft, 11 in.
- **40 ft bus:** 40 ft to 44 ft, 11 in.
- **45 ft bus:** 45 to 47 ft
- **60 ft (articulated) bus:** 59 to 65 ft

TS 6.2 Bus Width

TS 6.2.1 Transit Coach

DEFAULT

102 in. Width Bus

Body width shall be 102 in. (+0, -1 in.).

ALTERNATIVE

96 in. Width Bus

Body width shall be 96 in. (+0, -1 in.).

TS 6.2.2 Commuter Coach

DEFAULT

102 in. Width Bus

Body width shall be 102 in. (+0, -1 in.).

ALTERNATIVE

96 in. Width Bus

Body width shall be 96 in. (+0, -1 in.).

TS 6.3 Bus Height

DEFAULT

Maximum Overall Height

Maximum overall height shall be 140 in., including all rigid, roof-mounted items such as A/C, exhaust, fuel system and cover, etc.

ALTERNATIVE

Maximum Height

Maximum height shall be specified by Agency.

TS 6.4 Step Height

TS 6.4.1 Transit Coach

The step height shall not exceed 16.5 in. at either doorway without kneeling and shall not exceed 15.5 in. at the step. A maximum of two steps are allowed to accommodate a raised aisle floor in the rear of the bus.

TS 6.4.2 Commuter Coach

The step height shall not exceed 16.5 in. at doorway without kneeling and shall not exceed 15.5 in. at the step.

TS 6.4.3 Articulated Coach

The step height shall not exceed 16.5 in. at either doorway without kneeling and shall not exceed 15.5 in. at the step.

TS 6.5 Underbody Clearance

The bus shall maintain the minimum clearance dimensions as defined and shown in Figure 2 of SAE J689, regardless of load up to the gross vehicle weight rating.

TS 6.6 Ramp Clearances

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.

DEFAULT

Refer to **Table 2a**.

Table 2a
 Default Breakover Angle

| Angle | 30 to 45 ft Bus | 60 ft Bus |
|-----------------------------------|-----------------|-----------------|
| Approach | 8.6 deg (min.) | 8.6 deg (min.) |
| Front breakover | 8 deg (min.) | 10.2 deg (min.) |
| Rear breakover (articulated only) | N/A | 8.7 deg (min.) |
| Departure | 8.6 deg (min.) | 8.6 deg (min.) |

| |
|--|
| <p>ALTERNATIVE Refer to Table 2b.</p> |
|--|

TABLE 2b
 Alternative Breakover Angle

| Angle | 30 to 45 ft Bus | 60 ft Bus |
|-----------------------------------|-----------------|-----------------|
| Approach | 8.6 deg (min.) | 8.6 deg (min.) |
| Front breakover | 7.5 deg (min.) | 10.2 deg (min.) |
| Rear breakover (articulated only) | n/a | 8.7 deg (min.) |
| Departure | 7.5 deg (min.) | 8.6 deg (min.) |

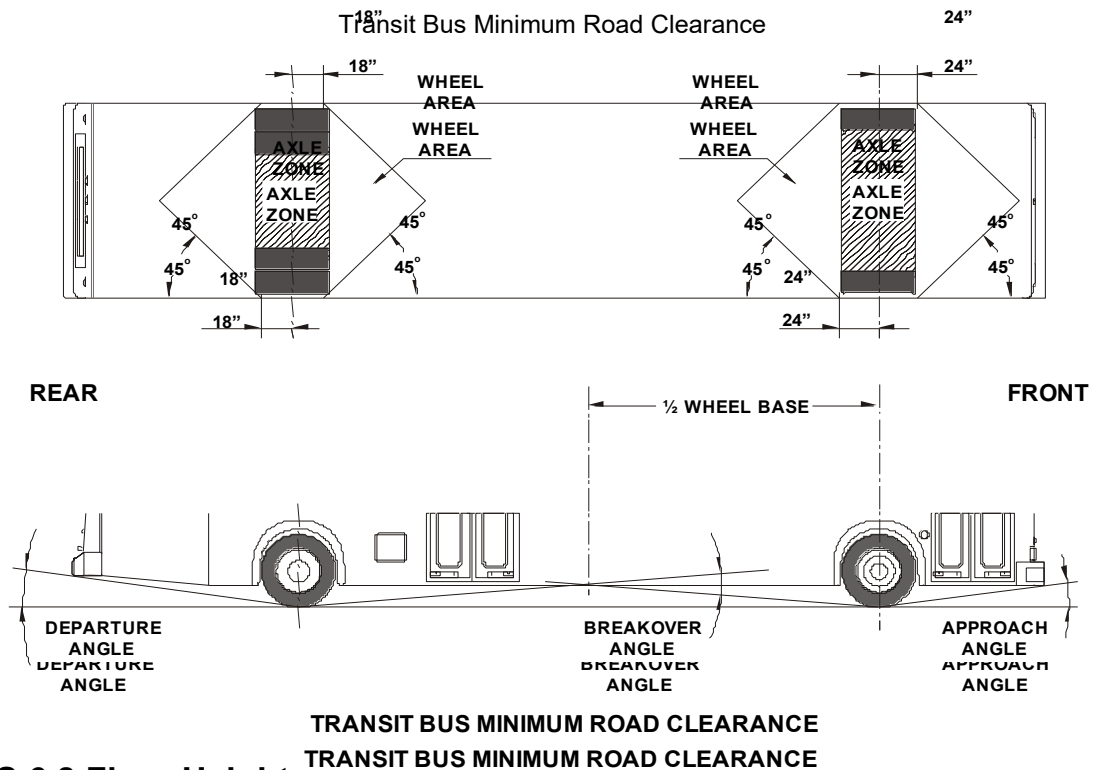
TS 6.7 Ground Clearance

Ground clearance shall be no less than 9 in., (8 in. at jacking pad) except within the axle zone and wheel area.

Axle zone clearance, which is the projected area between tires and wheels on the same axial centerline, shall be no less than 5.4 in.

Wheel area clearance shall be no less than 8 in. for parts fixed to the bus body and 6 in. for parts that move vertically with the axles.

— FIGURE 2



TS 6.8 Floor Height

TS 6.8.1 Transit Coach

Height of the step above the street shall be no more than 16 in. measured at the centerline of the front and rear doorway. All floor measurements shall be with the bus at the design running height and on a level surface and with the standard installed tires. A maximum of two steps are allowed to accommodate a raised aisle floor in the rear of the bus.

TS 6.8.2 Commuter Coach

Height of the step above the street shall be no more than 16 in. measured at the centerline of the doorway. All floor measurements shall be with the bus at the design running height and on a level surface and with the standard installed tires.

TS 6.9 Interior Headroom

Headroom above the aisle and at the centerline of the aisle seats shall be no less than 76.75 in. in the forward half of the bus, tapering to no less than 74 in. forward of the rear settee. At the centerline of the window seats, headroom shall be no lower than 65 in., except for parcel racks and reading lights, if specified. Headroom at the back of the rear bench seat may be reduced to a minimum of 56 in., but it shall 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 or her head, padding shall be provided on the overhead paneling.

VEHICLE PERFORMANCE

TS 7. Power Requirements

The system shall be sized to provide sufficient power to enable the bus to meet the defined acceleration, top speed, route, mileage, GVWR and gradeability requirements, while operating all accessories. This shall be verified using actual road test results and/or simulated vehicle performance data.

A loss of power to the bus shall not cause the driver to lose control of the bus or to lose steering or braking. The bus shall be able to be safely brought to a controlled stop.

TS 7.1 Top Speed

DEFAULT

The bus shall be capable of achieving a top speed of 65 mph on a straight, level road at GVWR with all accessories operating. The bus shall be capable of safely maintaining the vehicle speed according to the recommendations by the tire manufacturer. The top speed and speedometer revolution should meet SAE J678. Manufacturer shall supply Agency with data if there is a variance between peak performance and sustained vehicle performance.

ALTERNATIVE

Agency to specify top speed limit. The bus shall be capable of safely maintaining the vehicle speed according to the recommendations by the tire manufacturer. Values are assumed to be sustained. Manufacturer shall supply Agency with data if there is a variance between peak performance and sustained vehicle performance.

NOTE: Increasing top speed in combination with more aggressive gradeability requirements may lead to higher design and operating costs and possibly have adverse effects on performance.

TS 7.2 Startability and Gradeability

Startability and gradeability requirements shall be met on grades with a dry commercial asphalt or concrete pavement at GVWR with all accessories operating.

DEFAULT

The propulsion system shall enable the bus to start from a full stop and achieve and maintain a speed of 40 mph on a 2.5 percent ascending grade continuous and 10 mph on a 10 percent ascending grade continuous.

ALTERNATIVE

The propulsion system shall enable the bus to start from a full stop and achieve and maintain a speed of 40 mph on a 2.5 percent ascending grade continuous, 10 mph on a 10 percent ascending grade continuous, and 7 mph on a 16 percent ascending grade for a minimum of 60 seconds.

ALTERNATIVE

Agency will provide startability and gradeability requirements to the Contractor.

NOTE: Increasing gradeability requirements in combination with higher top speed requirements may lead to higher design and operating costs and possibly have adverse effects on other performance characteristics.

NOTE: Unless otherwise noted, values are assumed to be sustained. Manufacturer shall supply Agency with data if there is a variance between peak performance and sustained vehicle performance.

TS 7.3 Acceleration

The acceleration shall meet the requirements in **Table 3** and shall be sufficiently gradual and smooth to prevent throwing standing passengers off-balance. Acceleration measurement shall commence when the accelerator is depressed.

TABLE 3
Maximum Start Acceleration Times on a Level Surface¹

| Speed (mph) | Maximum time (seconds) |
|-------------|------------------------|
| 10 | 5 |
| 20 | 10 |
| 30 | 18 |
| 40 | 30 |
| 50 | 60 |
| Top speed | |

1. Vehicle weight = GVWR

NOTE: The system shall be programmable to allow optimization of acceleration. Performance may be affected when reprogramming. The manufacturer shall supply the new performance data.

TS 7.3.1 Acceleration (Hybrid or Battery Electric Coach)

The propulsion and braking systems shall meet the performance requirements of the duty cycle.

Braking application and performance shall remain consistent across the highest possible range of battery system state of charge (SoC) or other variances related to regenerative braking. At very high or very low SoC, or at other conditions such as very cold or very hot battery temperatures, the application and performance of regenerative braking can be reduced but this must be done in a smooth and predictable manner. At no time should the application and performance of the mechanical friction brakes be affected by these conditions.

The system shall be programmable to allow optimization of acceleration and deceleration rate. Performance may be affected when reprogramming. The manufacturer shall supply the new performance data.

TS 7.3.2 Acceleration (Commuter Coach)

The Contractor shall provide performance scans to the Agency based on the Agency’s specific drivetrain configuration.

TS 7.4 Operating Range

The operating range of the coach shall be designed to meet the operating profile as stated in the “Design Operating Profile” section.

TS 7.4.1 Diesel (Transit Coach)

DEFAULT

The operating range of the coach when run on the FTA ABD cycle shall be at least 350 miles (560 km) or 20 hours with full fuel capacity.

ALTERNATIVE

Agency to designate operating range.

TS 7.4.2 Diesel (Commuter Coach)

DEFAULT

A fuel tank with a minimum capacity 165 gallons shall be installed.

ALTERNATIVE

Agency to designate operating range.

TS 7.4.3 CNG

DEFAULT

The operating range of the coach when run on the FTA ABD cycle shall be at least 350 miles or 20 hours with an initial gas-settled pressure of 3600 psi at 70 °F.

ALTERNATIVE

Agency to designate operating range.

TS 7.4.4 Hybrid

DEFAULT

The operating range of the coach when run on the design operating profile “Design Operating Profile” shall be at least 350 miles on a full tank of fuel.

ALTERNATIVE

Agency to designate operating range.

TS 8. Fuel Economy/Range (Design Operating Profile)

The bus must be able to achieve operational requirements under standard operating conditions and in Agency-specific conditions. These conditions make up the design operating profile. The standard operating conditions are defined by the Bus Research Testing Center at Altoona, Pennsylvania (“Altoona”), and are used as a

benchmark and as a means to compare the performance of various buses across a set standard. The Agency-specific conditions are established to ensure that the bus will be able to meet the unique operational requirements of the Agency.

TS 8.1 Altoona Fuel Economy Tests

The Altoona Energy Economy and Range Test for buses is an energy consumption and range test for battery electric buses under Altoona’s pass/fail procedures. Buses are tested using the Manhattan cycle (a low average speed, highly transient urban cycle), the Orange County cycle (consists of urban and highway driving segments), and the EPA HD-UDDS cycle test results from the Energy Economy and Range Test or other applicable test procedures. Results shall include vehicle configuration and test environment information. Energy economy data shall be provided for each duty cycle.

TS 8.1.1 Diesel (Transit Coach)

DEFAULT

The operating range of the coach when run on the combined cycle shall be at least 350 miles or 20 hours with full fuel capacity.

ALTERNATIVE

Agency to designate operating range.

TS 8.1.2 Diesel (Commuter Coach)

DEFAULT

A fuel tank with a minimum capacity of 165 gallons shall be installed.

ALTERNATIVE

Agency to designate operating range.

TS 8.1.3 CNG

DEFAULT

The operating range of the coach when run on the combined cycle shall be at least 350 miles or 20 hours with an initial gas-settled pressure of 3600 psi at 70 °F.

ALTERNATIVE

Agency to designate operating range.

TS 8.1.4 Hybrid

DEFAULT

The operating range of the coach when run on the design operating profile shall be at least 350 miles on a full tank of fuel.

ALTERNATIVE

Agency to designate operating range.

TS 8.1.5 Battery Electric

DEFAULT

Agency shall define minimum operating range and time between charges.

ALTERNATIVE

OEM-provided solution to Agency to respect Agency operation profile (range and time between charges).

NOTE: Charging can be on-route or depot.

TS 8.2 Agency Operating Profile (Battery Electric Bus)

In addition to the Altoona-defined profile, the bus must also be able to meet the Agency operating profile addressing the needs presented below. The Proposer must validate that the proposed bus will meet the Agency operating profile using sound mathematical modeling and simulation or empirical methods. Proposers must demonstrate the agreement of their mathematical models and methods against Altoona results using the Manhattan cycle, the Orange County cycle and the EPA HD-UDDS cycle test results from the Energy Economy and Range Test.

The Agency operating profile must be met under maximum auxiliary loads and at GVWR. It is assumed that buses will start daily duty cycle at maximum standard operating SoC. Batteries shall not be depleted below minimum standard operating SoC during operations. Minimum standard operating SoC shall allow for reserve battery capacity that the bus can draw upon to return to the closest charging point in degraded mode. Charging of the batteries during normal operations shall not exceed maximum standard operating SoC at any time during charging.

Nominal conditions

- **Ambient temperature:** 68 °F
- **Bus weight:** SLW

Worst-case conditions

- **Ambient temperature:** [Agency to define worst-case heating and cooling loads when operating in local Agency environmental conditions (summer or winter depending on location) as defined by NOAA.com, weather.gov, or other website as specified by the Agency.]
- **Bus weight:** GVWR

DEFAULT

Agency block information and route number(s) or name(s) are to be used as representatives of the Agency’s operating profile.

The following are general operating profile data: [insert desired Agency profile]

| | | |
|--|-------|---------|
| Average route speed (nominal) | _____ | mph |
| Average route speed (worst case) | _____ | mph |
| Average distance between stops | _____ | miles |
| Maximum required trip duration | _____ | minutes |
| Average required trip duration | _____ | minutes |
| Distance from depot to start of route | _____ | miles |
| Longest distance from depot | _____ | miles |
| Average miles per bus per day | _____ | miles |
| Longest miles per day for a bus | _____ | miles |
| Minimum layover time for charging during day | _____ | minutes |
| Average layover time for charging during day | _____ | minutes |
| Available depot charge time | _____ | hours |
| Minimum depot charge time required for full charge | _____ | hours |
| Maximum number of buses required to operate daily | _____ | buses |

ALTERNATIVE

The Agency will supply [alternatively, “Proposers shall collect”] second-by-second route and duty cycle data for a bus on the actual route(s) for modeling purposes only. The data should include time (seconds), speed (mph), and grade (%) or elevation (ft) and may be collected with a GPS data logger and noise filtered. The GPS data may use or be augmented with elevation data from the U.S. Geological Survey and NASA to determine grades. [Insert desired Agency profile.]

| | | |
|---|-------|---------|
| Maximum required trip duration | _____ | minutes |
| Average required trip duration | _____ | minutes |
| Distance from depot to start of route | _____ | miles |
| Furthest distance from depot | _____ | miles |
| Average miles per bus per day (local) | _____ | miles |
| Longest miles per day per bus | _____ | miles |
| Minimum layover time for charging during day | _____ | minutes |
| Average layover time for charging during day | _____ | minutes |
| Maximum number of buses required to operate daily | _____ | buses |

ALTERNATIVE

The Agency will provide a percentage of each standard duty cycle (Manhattan cycle, Orange County cycle, and EPA HD-UDDS) that is representative of its service.

The Contractor shall provide the following narratives with its Technical Proposal:

- Narrative description of the methods used to validate that the proposed system will meet the Agency operating profile under nominal and worst-case conditions. Detailed results should include, at a minimum, the following for both nominal and worst-case conditions:

- expected bus range (miles)
- fuel economy (kWh/mile)
- auxiliary loads (kW)
- Projected performance on the Agency operating profile when the battery reaches end-of-life (EOL) state. The Proposer will provide specific details on EOL criteria. Detailed results should include, at a minimum, the following:
 - expected battery life from factory delivery under normal operating conditions (months)
 - EOL battery capacity (kWh)
 - EOL bus range (miles)
- Description of any required or recommended charge strategies or other bus operation strategies that are necessary to meet the Agency operating profile. Note that the Agency requires that operational impacts be minimized.
- Description of the flexibility and considerations necessary to place the proposed bus and its charging solution on any Agency route at the Agency's discretion.
- Description of any required charge strategies, on-route charge requirements, bus blocking requirements or other bus operational requirements necessary to meet the Agency operating profile. Note that the Agency requires that operational impacts be minimized.
- Description of the flexibility and considerations necessary to place the proposed bus and its charging solution on any Agency route at the Agency's discretion.

POWERPLANT

TS 9. Engine

TS 9.1 Engine (Diesel and CNG)

The engine shall comply with applicable local, state and/or federal emissions and useful life requirements. The engine shall have a design life of not less than 300,000 miles without replacement or major service. The lifetime estimate is based on the design operating profile.

NOTE: For commuter coaches, minimum rating horsepower of 400 and minimum torque rating of 1400 ft-lb shall be installed.

The engine shall be equipped with an electronically controlled management system, compatible with either 12 or 24 V power distribution. The engine control system shall be capable of transmitting and receiving electronic inputs and data from other drivetrain components and broadcasting that data to other vehicle systems. Communication between electronic drivetrain components and other vehicle systems shall be made using the communications networks. The engine's electronic management system shall monitor operating conditions and provide instantaneous adjustments to optimize both engine and bus performance. The system shall be programmable to allow optimization of programmable features.

The engine starting system shall be protected by an interlock that prevents its engagement when the engine is running. Special equipment or procedures may be employed to start the bus when exposed to temperatures lower than 30 °F (-1 °C) for a minimum of 4 hours without the engine in operation. All cold-weather starting aids, engine heating devices and procedures shall be of the type recommended by the engine manufacturer and approved by the Agency. The integration of all systems on the vehicle relative to engine idle speed shall be the responsibility of the vehicle manufacturer to meet the requirements of the transit property.

The engine control system shall protect the engine against progressive damage. The system shall monitor conditions critical for safe operation and automatically derate power and/or speed and initiate engine shutdown as needed.

DEFAULT

Automatic Engine Protection/Shutdown Override Feature

A control shall be available to the operator/driver that when constantly depressed and released will delay the engine shutdown or allow the bus to be moved. Override action shall be recorded. This data shall be retrievable by the Agency.

ALTERNATIVE

No requirement for an automatic engine protection/shutdown override feature.

TS 9.2 Engine (CNG)

The engine shall meet all regulatory requirements 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.

TS 9.3 Propulsion System (Hybrid or All Electric)

TS 9.3.1 Propulsion System Description (Hybrid)

The bus shall be powered by a hybrid propulsion system. The OEM shall ensure that the bus structure can successfully accept the installation of the propulsion system and be operated on the stated duty cycle for a period of 12 years without a structural failure. At a minimum, the propulsion system shall comply with applicable local, state and/or federal emissions and useful life requirements. The propulsion system shall comply with local, state and federal (maintenance) and other applicable sections.

The hybrid drive system shall be rated for the GVWR or greater of the bus.

Labels should be posted on high-voltage devices to identify them as components containing high voltage potential. These labels shall be applied in such a way that they can be seen when access doors are opened or closed, so as to protect both emergency and maintenance personnel.

A detailed description of the propulsion system shall be provided with the proposal. The description shall include a written narrative, a block diagram showing major propulsion system components, an illustration showing the physical layout of propulsion components and high-voltage wire routing within the vehicle, and a detailed wiring diagram and/or electrical schematic for the high-voltage system. Proposer is required to provide a list of applicable industry standards that the proposed propulsion system meets.

TS 9.3.2 Propulsion System Description (All Electric)

The bus shall be powered by an electric propulsion system. To the greatest extent practical, the electric propulsion system shall conform to SAE J2910 and SAE J2344.

The propulsion system shall not be supplemented by any onboard range extenders, including but not limited to internal combustion engines, gas turbines and/or hydrogen fuel cells.

The OEM shall ensure that the bus structure is suitable for the electric propulsion system and can be operated safely on the design operating profile (TS 8) for the service life of the bus (TS 5.3) without a structural failure. The propulsion system shall comply with applicable local, state and/or federal emissions and useful-life requirements.

Labels should be posted on high-voltage devices to identify them as components conducting high-voltage potential. These labels shall be applied in such a way that they can be seen when access doors are opened or closed, so as to protect both emergency and maintenance personnel.

A detailed description of the propulsion system shall be provided with the proposal. The description shall include a written narrative, a block diagram showing major propulsion system components, an illustration showing the physical layout of propulsion components and high-voltage wire routing within the vehicle, and a detailed wiring diagram and/or electrical schematic for the high-voltage system. Proposer is required to provide a list of applicable industry standards that the proposed propulsion system meets.

TS 9.3.3 Propulsion System Service

The propulsion system shall be arranged so that accessibility for all routine maintenance is ensured. No special tools, other than dollies and hoists, shall be required to remove the propulsion system or any subsystems. The Agency recognizes that properly rated test equipment and safe electrical work practices are essential when servicing high-voltage components. The Contractor shall identify safe electrical work practices that are essential when servicing high-voltage components. The Contractor shall provide all specialty tools and diagnostic equipment required for maintaining the propulsion system in accordance with the Special Tools List.

TS 9.3.4 Primary Propulsion Unit and Traction Motor(s)

The propulsion system components may be arranged in a variety of configurations. The traction motor must be capable of providing and retarding mechanical motion.

TS 9.3.5 Energy Storage System

Energy Storage System

The energy storage system (ESS) shall be of a commercial design capable of operating in the Agency transit environment and design operating profile. The ESS shall use battery technology with a field-proven track record of safe, reliable and durable operation in similar transit applications. The ESS shall be designed, sized and selected to ensure that the vehicle performance specifications, compatibility with charging and other related requirements are met or exceeded, bearing in mind cost/benefit and reliability variables as they relate to the characteristics of the different battery types.

The ESS shall comply with ECE R100 Revision 2, UN/DOT 38.3, and/or SAE J2464 requirements for lithium batteries. For non-lithium batteries, the ESS shall comply with similar applicable standards.

The Contractor shall deliver the bus with an installed, functioning ESS charged with sufficient usable energy for delivery and to be maneuvered around the Agency's property. The ESS shall be fully formed, installed and tested in accordance with the battery manufacturer's recommended practices. The ESS design, including containers, module bracing systems, thermal-management systems, battery-management systems, watering/venting systems, interconnections, fusing, and traction-controller and charger interfaces shall be adequately described in the proposal. The proposal shall include a description of all battery maintenance requirements, including any periodic charge requirements necessary for cell balancing. The proposal shall also include a comprehensive statement of the warranty terms relating to the battery, including explanation of

all disclaimers within the warranty. The battery life shall be stated in terms of cyclic life and calendar life in the proposal with a description of all factors that will affect the battery life, including charging, operation and environmental effects. The Agency operating profile shall be considered when making this analysis. A life-cycle cost analysis of the proposed battery system in the specified application shall be provided.

The battery system shall be capable of withstanding the current and voltage profiles necessary to accomplish daily recharge events within the defined operating profile.

Thermal management will be provided as needed to ensure optimal life and performance of the ESS over the environmental operating range. The battery thermal management system shall be adequate to maintain the battery within the battery manufacturer's recommended temperature range during operation in the specified duty cycle and climatic conditions.

Proposals shall include complete descriptions of all life-cycle testing procedures used to validate the life of batteries used for this application at the proposed charging rates, charge durations, and expected ambient temperatures and operating profiles. Proposers shall include documented results of life-cycle testing. Proposers shall include certification of battery life-cycle testing by an independent testing agency.

Energy Storage System Capacity

The ESS shall have sufficient energy storage to meet the requirements of the intended duty cycle when new and up until the degradation has reached warrantable end of life (WEOL), or other such agreed upon End of Life (EOL) capacity, as defined within the warranty terms of this RFP by percent remaining capacity. As an example, if the capacity when new is 300 kWh and the WEOL is at 80 percent, then the useable capacity range shall be from 300 to 240 kWh.

The ESS shall be measured periodically during the 12-year design life of the bus per the following protocol by the bus manufacturer at an interval of at least every [insert number] years. The manufacturer will propose the test method and certify that the results are true and accurate. The test will be performed according to a documented test procedure. The Agency is allowed to engage third parties for capacity testing.

Energy Storage System Safety

The ESS shall be placed on the bus to optimize both interior space and vehicle weight distribution. The batteries shall be load-distributed within the bus to equalize weight between the wheels on the same axles and to achieve appropriate weight distribution between axles so as not to adversely affect handling of the bus.

The bus body shall be designed and constructed to ensure that passengers and the operator will not be exposed to hazardous high voltage. This design will also minimize potential exposure to hazardous electrical current in the event of a vehicle accident. Analysis and test data shall be provided to the Agency. The vehicle and energy storage system shall be designed and constructed to prevent gassing or fumes from the energy storage system from entering the interior of the bus, i.e., a vent path to the exterior, preferably at or above the roof, rearward.

Written confirmation from the battery manufacturer attesting to the safety of the proposed battery system in the specified application and charging profile shall be submitted as part of the proposal, and shall include full disclosure and discussion of any and all relevant issues or prior incidents relating to safety.

Proposals shall include complete descriptions of all safety standards followed in the design and manufacture of the battery system, safety testing procedures used to validate the safety of battery operation in this application, and documented results of safety testing to confirm that standards have been met.

Both automatic and manual battery disconnect devices must be included and documented. Contactors shall be rated to interrupt the full load of the bus. Service and emergency manual disconnects must be included and their usage documented. Contractor shall provide a means to isolate the high-voltage battery during maintenance operations. Manual and automatic disconnects should open both poles of each physical battery pack.

The HV system and ESS shall include isolation protection between the HV and bus chassis system, to include automatic detection of isolation faults, alerts to the operator, diagnostic system and appropriate action to prevent personnel from HV exposure. Detection, alerting and vehicle control shall occur in accordance with SAE J2910. Detection shall be provided at two levels, as per J2910, and detection at any level shall be alerted to the operator and maintenance personnel.

The system described above may also be an integral part of the overall emergency shutdown system, with functions to include the following:

- Offers a quick, safe and organized means for the operator, maintenance personnel and/or first responders to shut down the HV system.
- Shutting down the system shall include at least:
 - “opening” all HV contactors;
 - discharging capacitors (if used); and
 - disconnecting any devices that could provide HV during normal operation and including during charging.
- Devices used to initiate shutdown shall be located within and outside the bus to satisfy ease of use by the mentioned personnel and shall be clearly marked as to location and use.
- In addition to manual use, this same functionality shall extend to the charging operation in the event of a fault sensed by the GFI, to also include termination of charge.

Battery Containers

Battery containers shall be constructed to withstand the rigors of transit service for the design life of the bus. Construction shall be of materials compatible with the battery electrolyte. All electrical connections shall be fully shielded and hand-operable. Connector and cabling design shall be such that inappropriate or unsafe connections are prevented. Vent-and-fill system components for individual packs or containers shall not require any disassembly on removal or installation of the battery packs or containers. Pack design must comprehend the protection of battery cabling and vent/watering system components during pack removal and installation. The batteries, when installed, shall be secured to the chassis to prevent any movement that may cause damage or personal harm while the vehicle is in operation.

Battery Management System

The battery management system must be designed to ISO 26262, as applicable, safety principles to control state of charge, voltage, current and temperatures on a cell-to-cell level and provide diagnostic output at the lowest field-serviceable element. The diagnostic output must be made available to the maintainer.

As a minimum, the battery management system (BMS) must perform the following functions:

1. The BMS must be capable of monitoring the voltage of cells within each battery pack. The BMS must be able to read individual battery or block voltages at a frequency sufficient to ensure reliable, functional and safe operation.
2. The BMS must be capable of monitoring battery temperatures, mitigating damage to the battery and surroundings, and preventing thermal runaway.

3. The BMS must be capable of communicating when a battery fault (as defined by the battery manufacturer) has occurred and must be able to identify and communicate the location of the faulty battery in order to perform maintenance.
4. The BMS must be capable of engaging prudent safety interlocks when an unsafe battery condition has been detected.
5. The BMS must be able to monitor the battery SoC and provide information to the rest of the vehicle.
6. The BMS must be able to communicate all data to the bus level information system (reference TS 84) for storage and communication.

Battery Thermal Management

Thermal management shall be provided to ensure optimal life and performance of the ESS over the environmental operating range.

During operation, battery temperatures must never exceed the manufacturer’s recommended range in the design operating profile and specified ambient conditions. Battery cooling must be sufficient to prevent the temperature from exceeding the battery manufacturer’s recommended maximum temperature.

Battery Charging

The bus shall support an SAE-approved charging standard (SAE J1772 DC and/or SAE J3068 AC). The Manufacturer shall provide a detailed description of its charging system and specify its compliance with one of the above-listed standards. Proposers shall include a description of the charging infrastructure required to install and operate the charging equipment. All charging systems provided for use with the bus and in conjunction with the battery management system must comply with the battery manufacturer’s electrical and thermal limits.

The bus must be immobilized during all charging operations. Upon successful engagement of the charging interface, the bus shall be interlocked such that propulsion is rendered non-tractive and the brakes applied.

The charging receptacle located on the bus shall be at the [add location (front/rear, left/right, approximate area)] and located within a range of height from grade at normal suspension ride height between [add number] and [add number] in.

DEFAULT

Charging

The bus shall support an SAE-approved charging standard. Proposers shall include a detailed description of their charging system and specify its compliance with one of the above-listed standards. Proposers shall include a description of the charging infrastructure required to charge the bus on route and/or at the depot.

DEFAULT

DC Charging

The bus must support SAE J1772 DC. This means the bus would be capable of being charged from a direct current EVSE compliant with SAE J1772, using a Type 1 “J1772” CCS/Combo connector.

DEFAULT AC CHARGING/ALTERNATE DC CHARGING

The bus must support SAE J3068 charging standard. This means that the bus would be capable of being charged from an alternating current or direct current EVSE compliant with SAE J3068, using a Type 2 connector for AC₆ plugs or CCS Combo 2 connector for AC₆ and DC₈/AC₆ plugs.

DEFAULT

Overhead Conductive Charging

The bus must support published standards including [add applicable standards if published, e.g., SAE J3105] for overhead conductive bus charging. Proposers shall include a detailed description of their charging system and specify its compliance with one of the above-listed standards. Proposers shall include a description of the charging infrastructure required to charge the bus on route and/or at the depot. Proposers shall describe the expected level of interoperability of the proposed charging system with other vehicles and transit buses.

DEFAULT

Wireless Inductive Charging

The bus must support published standards including [add applicable standards if published, e.g., SAE J2954/2] for wireless inductive bus charging. Proposers shall include a detailed description of their charging system and specify its compliance with one of the above-listed standards. Proposers shall include a description of the charging infrastructure required to charge the bus on route and/or at the depot. Proposers shall describe the expected level of interoperability of the proposed charging system with other vehicles and transit buses.

TS 9.3.6 Propulsion System Controller (PSC)

The PSC regulates energy flow throughout hybrid system components in order to provide motive performance and accessory loads, as applicable, while maintaining critical system parameters (voltages, currents, temperatures, etc.) within specified operating ranges.

The controller shall monitor and process inputs and execute outputs as appropriate to control the operation of all propulsion system components.

Energy storage system SoC correction methods stated in SAE J2711 shall be used (for all-electric or hybrid only.)

TS 9.3.7 Engine (Hybrid)

The engine and related emission systems shall meet all applicable emissions and design/durability guidelines and standards.

The Contractor shall provide the Agency with expected durability of the engine and related emission systems.

NOTE: The Agency will provide desired fuel type.

DEFAULT

Supplier shall recommend power plant.

ALTERNATIVE

Agency shall define required power plant.

The engine shall be equipped with an electronically controlled management system, compatible with multiplex wiring systems and either 12 or 24 V electrical systems.

The engine shall have onboard diagnostic capabilities, be 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, shall be provided in the operator's area and near or inside the engine compartment. The onboard diagnostic system shall inform the operator via visual and/or audible alarms when out-of-parameter conditions exist for vital engine functions.

The engine starting system shall 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 (-1 °C) for a minimum of 4 hours without the engine in operation. All cold-weather starting aids, engine heating devices and procedures shall be of the type recommended by the engine manufacturer and approved by the Agency.

DEFAULT

Standard Requirements for a Fast Idle Device

The engine shall be equipped with an operator-controlled fast idle device. The fast idle control shall be a two-way switch mounted on the dash or side console and shall activate only with the transmission in neutral and the parking brake applied.

ALTERNATIVE

Automatically Activated Fast Idle as Required

The fast idle device shall be activated and controlled automatically by the control system.

TS 10. Cooling Systems

The capacity of the cooling system shall be adequate to maintain design component temperatures under all operating conditions for the design life of the vehicle in the service area and environment of the agency. The Contractor shall provide evidence that the cooling system selected has the capability to handle peak heat rejection from the traction motor, energy storage system, propulsion control system, and the intermediate and low-voltage power supply with a partially clogged radiator at maximum ambient temperature plus heat reflected off the pavement. The Contractor shall submit an analysis verifying cooling system capabilities. The entire cooling system shall be equipped with an electronic detection device to indicate overheating on the driver's control panel.

Operation of required battery thermal management systems shall be automatically controlled under all normally encountered operating and charging conditions and shall be powered by an onboard source at all times during operation. Thermal management shall be continuously monitored during all periods of charge and discharge with appropriate safety interlocks installed to react to adverse conditions.

Air intakes shall be properly positioned and configured to minimize the intake of water, road dust and debris and shall be adequately filtered.

In the event of a failure of the battery thermal management system (BTMS) subsequently resulting in battery temperature outside the allowable limits, the BMS shall limit, in a manner appropriate to the situation, the operation of the bus including charging. A diagnostic indicator shall accompany any BTMS failure.

A complete description of the battery thermal management systems shall accompany the bid package. Written confirmation from the battery manufacturer attesting to the suitability of the battery thermal management system shall be submitted to the Agency concurrent with or prior to delivery of the first bus.

TS 10.1 Component Thermal Management

Under the vehicle operating temperature range, the thermal management system shall be designed such that each component will remain in its allowed operating range.

Component temperature sensors may be used for monitoring, control or component/system protection. If equipped and serviceable, component temperature sensors shall be easily accessible. Under typical failure modes or out-of-limit conditions, component temperature sensors shall not disable the bus unless there is an immediate risk of hazardous fault propagation (e.g., temperature levels in the motor area known to start fires). In the event that a component temperature sensor must disable the bus, the component/system must comply with the automatic propulsion system protection/shutdown override feature requirement of TS 9.

Motor cooling fans shall be of durable, corrosion-resistant construction and designed so a mechanic can gain access. The cooling fan and mounting bracket shall be designed to withstand the thermal fatigue and vibration associated with the installed configuration.

A means of determining satisfactory component coolant level shall be provided. A spring-loaded, push-button type valve or lever shall be provided to safely release pressure or vacuum in the cooling system with both it and the water filler no more than ± 60 in. above the ground. Both shall be accessible through the same access door.

DEFAULT

The radiator and charge air cooler shall be of durable, corrosion-resistant construction with non-removable tanks.

ALTERNATIVE

The radiator and charge air cooler shall be of durable, corrosion-resistant construction with non-removable radiator headers.

ALTERNATIVE

For roof mounted radiators, a pressure filler will be provided in the engine compartment no more than ± 60 in. above the ground.

ALTERNATIVE

The radiator shall be made of replaceable or serviceable components (i.e., fans, mounting brackets, radiator core).

TS 10.1.1 Radiator Screen

DEFAULT

No screen in front of radiator.

ALTERNATIVE

The radiator input shall be protected by an easily cleanable screen designed to collect large debris. The radiator and charge air cooler cores shall be easily cleaned (to include engine side core surface) with standard pressure-washing equipment.

TS 10.1.2 Coolant

DEFAULT

Standard Requirement for Coolant Filtration

The engine cooling system shall 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. When replacing the water filter, only the water in the filter will be lost.

ALTERNATIVE

No requirement for coolant filtration.

ALTERNATIVE

Coolant Filtration Without Supplemental Additives

The engine cooling system shall be equipped with a properly sized water filter with a spin-on element. The filter shall not release or contain supplemental coolant additives.

TS 10.1.3 Drive Design

DEFAULT

Standard Control and Drive Design

Control and drive of the radiator and charge air cooler fan(s) shall be the Contractor's standard design.

ALTERNATIVE

Electric Fans

The bus shall be equipped with an electric fan drive bus cooling system. A screen guard must be installed on electric motor fans per SAE J1308.

TS 10.1.4 Mounting

DEFAULT

Standard Mounting Design

Mounting location of radiator and charge air cooler shall be the Contractor's standard design.

ALTERNATIVE

Higher Mounting Design

The lower edge of the radiator and charge air cooler core(s) shall be mounted at a height no less than 3 ft above street level to minimize core fouling caused by dirt, debris, leaves, etc.

TS 10.2 Charge Air Cooling

DEFAULT

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

ALTERNATIVE

The charge air radiator shall be stacked ahead of or behind the engine radiator and shall be positioned as close to the engine as possible unless integrated with the radiator.

TS 10.3 Transmission Cooling

If a transmission is present in the bus, the transmission shall be cooled by a heat exchanger sized to maintain operating fluid within the transmission manufacturer's recommended parameters of flow, pressure and temperature. Where applicable, the transmission cooling system shall be matched to the retarder and engine cooling systems to ensure that all operating fluids remain within recommended temperature limits established by each component manufacturer. Where applicable, the engine cooling system should provide coolant bypass flow to the transmission cooling system with the engine thermostats closed.

ALTERNATIVE

The transmission shall not have a cooler.

ALTERNATIVE

If a transmission is present in the bus, then the thermal management system shall ensure that the transmission remains in its manufacturer-specified operating temperature range. See Section TS 10.1 for additional requirements related to component thermal management.

TS 10.4 Hybrid Drive System Cooling

The thermal management system shall maintain hybrid system components within design operating temperature limits.

TS 11. Transmission

NOTE: Not applicable to battery electric buses.

If multiple-speed transmission is used, the transmission shall be automatic shift with torque converter, retarder and electronic controls. Gross input power, gross input torque and rated input speed shall be compatible with the propulsion system. The transmission shall be designed to operate for not less than 300,000 miles on the design operating profile without replacement or major service. The transmission should be easily removable without disturbing the engine and accessible for service.

The electronic controls shall be capable of transmitting and receiving electronic inputs and data from other drivetrain components and of broadcasting that data to other vehicle systems. Communication between electronic drivetrain components and other vehicle systems shall be made using the communications networks. Electronic controls shall be compatible with either 12 or 24 V power distribution, provide consistent shift quality, and compensate for changing conditions, such as variations in vehicle weight and engine or motor power. At a minimum, drivetrain components consisting of the motor(s), motor inverter(s), engine, transmission, retarder, ASR and anti-lock braking systems shall be powered by a dedicated and isolated ignition supply voltage to ensure that data communication among components exists when the vehicle ignition is switched to the “on” position.

The electronically controlled transmission shall have onboard diagnostic capabilities, be able to monitor functions, store and time-stamp out-of-parameter conditions in memory, and communicate faults and vital conditions to service personnel. The transmission shall contain built-in protection software to guard against severe damage. The onboard diagnostic system shall trigger a visual alarm to the driver when the electronic control unit detects a malfunction.

An electronic transmission fluid level monitoring and protection system shall be provided.

DEFAULT

A brake pedal application of 6 to 10 psi shall be required by the driver to engage forward or reverse range from the neutral position to prevent sudden acceleration of the bus from a parked position.

ALTERNATIVE

A brake pedal application of 15 to 20 psi shall be required by the driver to engage forward or reverse range from the neutral position to prevent sudden acceleration of the bus from a parked position.

DEFAULT

No Automatic Neutral Function

The transmission shall not incorporate an automatic neutral shift function.

ALTERNATIVE

Automatic Neutral Function with Manual Reengagement

The transmission shall automatically shift to neutral whenever the door brake interlock is applied or the parking brake is pulled for more than 5 minutes. The driver shall be required to first disengage the parking brake and then apply the service brake to re-engage a forward or reverse range.

ALTERNATIVE

Automatic Neutral Function with Automatic Reengagement

The transmission, when in forward direction, shall automatically shift the transmission to neutral when the vehicle registers zero road speed, engine is idle and service brakes are applied. If the status of any one or more of the three signals changes, then the transmission shall immediately and automatically resume forward mode operation.

ALTERNATIVE

Hill Holder

A vehicle hill holder function shall be integrated with an automatic or reduced engine load state function to prevent inadvertent vehicle movement while the transmission is not in forward range.

TS 12. Retarder (Transit Coach)

NOTE: Not applicable to battery or hybrid electric buses.

The powertrain shall be equipped with a retarder designed to extend brake lining service life. The application of the retarder shall cause a smooth blending of both retarder and service brake function and shall not activate the brake lights.

Actuation of ABS and/or automatic traction control (ATC) shall override the operation of the brake retarder.

DEFAULT

Brake lights shall not illuminate when the retarder is activated.

ALTERNATIVE

Brake lights shall illuminate when the retarder is activated.

DEFAULT

Standard Requirement for Retarder Activation

The retarder shall be adjustable within the limits of the powertrain and activated when the brake pedal is depressed. The Agency will work with the OEM/drive system manufacturer to determine retarder performance settings.

ALTERNATIVE

Throttle Pedal Activation of the Retarder

The retarder shall become partially engaged (approximately one-third of its total application, with a resulting deceleration of no greater than 0.077g) when the throttle pedal is completely released. Maximum retarder shall be achieved when the brake pedal is depressed prior to engagement of service brakes, with a maximum resulting deceleration of approximately 0.20g in an empty bus. The resulting decelerations specified include the effects of engine braking, wind resistance and rolling resistance.

The thermostatically controlled cooling fan shall be activated when the retarder is engaged and the coolant temperature reaches the maximum operating temperature established by the engine and transmission manufacturers.

DEFAULT

Accessible Retarder Disable Switch

The retarder disable switch shall be accessible to the seated driver.

ALTERNATIVE

Retarder Disable Switch Not Accessible

The retarder disable switch is not required to be accessible to the seated driver.

ALTERNATIVE

Disabling retarder shall be recorded for Agency data collection.

ALTERNATIVE

Unless specified by the transmission manufacturer, a retarder disable switch will not be supplied.

TS 13. Engine Brake (Commuter Coach)

The powertrain shall be equipped with an engine brake designed to extend brake lining service life. The application of the engine brake shall cause a smooth blending of both engine brake and service brake function and shall not activate the brake lights.

DEFAULT

Brake lights shall not illuminate when the retarder is activated.

ALTERNATIVE

Brake lights shall illuminate when the retarder is activated.

DEFAULT

Standard Requirement for Retarder Activation

The retarder shall be adjustable within the limits of the powertrain and activated when the brake pedal is depressed. The Agency will work with the OEM/drive system manufacturer to determine retarder performance settings.

ALTERNATIVE

Throttle Pedal Activation of the Retarder

The retarder shall become partially engaged (approximately one-third of its total application, with a resulting deceleration of no greater than 0.077g) when the throttle pedal is completely released. Maximum retarder shall be achieved when brake pedal is depressed prior to engagement of service brakes, with a maximum resulting deceleration of approximately 0.20g in an empty bus. The resulting decelerations specified include the effects of engine braking, wind resistance and rolling resistance.

The thermostatically controlled cooling fan shall be activated when the retarder is engaged and the coolant temperature reaches the maximum operating temperature established by the engine and transmission manufacturers.

DEFAULT

Accessible Retarder Disable Switch

The retarder disable switch shall be accessible to the seated driver.

ALTERNATIVE

Retarder Disable Switch Not Accessible

The retarder disable switch is not required to be accessible to the seated driver.

ALTERNATIVE

Disabling retarder shall be recorded for Agency data collection.

ALTERNATIVE

Unless specified by the transmission manufacturer, a retarder disable switch will not be supplied.

TS 14. Mounting

All electrical/electronic hardware shall be serviceable. All electrical/electronic hardware mounted in the interior of the vehicle shall be resistant to tampering from passengers.

All electrical/electronic hardware mounted on the exterior of the vehicle that is not designed to be installed in an exposed environment shall be mounted in a protective enclosure. The hardware shall be mounted in such a manner as to protect it from the environment.

All electrical/electronic hardware and its mounting shall comply with the shock and vibration requirements of SAE J1455.

TS 14.1 Service

All systems requiring routine maintenance shall be arranged for ease of access and maintenance. The Contractor shall list all special tools, fixtures or facility requirements recommended for servicing. All fillers shall be easily accessible with standard funnels, pour spouts and automatic dispensing equipment.

The propulsion system shall be arranged for ease of access and maintenance. The Contractor shall list all special tools, fixtures or facility requirements recommended for servicing. The muffler, exhaust system, air cleaner, air compressor, starter, alternator, radiator, all accessories and any other component requiring service or replacement shall be easily removable and independent of the engine and transmission removal. An engine oil pressure gauge and coolant temperature gauge shall be provided in the engine compartment. These gauges shall be easily read during service and mounted in an area where they shall not be damaged during minor or major repairs.

An air cleaner with a dry filter element and a graduated air filter restriction indicator shall be provided. The location of the air intake system shall be designed to minimize the entry of dust and debris and to maximize the life of the air filter. The engine air duct shall be designed to minimize the entry of water into the air intake system. Drainage provisions shall be included to allow any water/moisture to drain prior to entry into the air filter.

DEFAULT

Engine oil and the radiator filler caps shall be hinged to the filler neck and closed with spring pressure or positive locks to prevent leakage. All fluid fill locations shall be properly labeled with permanent metal tags to help ensure that correct fluid is added. All fillers shall be easily accessible with standard funnels, pour spouts and automatic dispensing equipment. All lubricant sumps shall be fitted with magnetic-type drain plugs or magnets in pan.

ALTERNATIVE

Unique Fluid (Lubricant) Fillers

The engine, transmission and hydraulic reservoir shall each incorporate a unique lubricant fill fitting to prevent cross-contamination of lubricant types. Fitting types shall be specified by the Agency.

The engine and transmission shall be equipped with sufficient heavy-duty fuel and oil filters for efficient operation and to protect the engine and transmission between scheduled filter changes. All filters shall be easily accessible, and the filter bases shall be plumbed to ensure correct reinstallation.

DEFAULT

No engine bypass oil filter.

ALTERNATIVE

Centrifugal, non-disposable engine bypass oil filter.

DEFAULT

Engine Oil Pressure and Coolant Temperature Display

Engine oil pressure and coolant temperature gauges required in engine compartment.

ALTERNATIVE

Oil Pressure and Coolant Temperature Display

No engine oil pressure and coolant temperature gauges required in engine compartment.

TS 15. Hydraulic Systems

Hydraulic system service tasks shall be minimized and scheduled no more frequently than those of other major coach systems. All elements of the hydraulic system shall be easily accessible for service or unit replacement. Critical points in the hydraulic system shall 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 when applicable. A tamperproof priority system shall prevent the loss of power steering during operation of the bus if other devices are also powered by the hydraulic system.

The hydraulic system shall operate within the allowable temperature range as specified by the lubricant manufacturer.

DEFAULT

No requirement for hydraulic system sensors.

ALTERNATIVE

Hydraulic System Sensors

Sensors in the main hydraulic system, excluding those in the power steering system, shall indicate on the driver's onboard diagnostic panel conditions of low hydraulic fluid level.

TS 15.1 Fluid Lines

All lines shall be rigidly supported to prevent chafing damage, fatigue failures, degradation and tension strain. Lines should be sufficiently flexible to minimize mechanical loads on the components. Lines passing through a panel, frame or bulkhead shall be protected by grommets (or similar devices) that fit snugly to both the line and the perimeter of the hole that the line passes through to prevent chafing and wear. Pipes and fluid hoses shall not be bundled with or used to support electrical wire harnesses.

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

All hoses, pipes, lines and fittings shall be specified and installed per the manufacturer's recommendations.

TS 15.2 Fittings and Clamps

All clamps shall maintain a constant tension at all times, expanding and contracting with the line in response to temperature changes and aging of the line material. The lines shall be designed for use in the environment

where they are installed (for example, high-temperature resistant in the engine compartment, resistant to road salts near the road surface, and so on).

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

TS 15.3 Charge Air Piping

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

Charge air piping shall be constructed of stainless steel, aluminized steel, or anodized aluminum rated at minimum 1000 hours of salt spray according to ASTM B117, except between the air filter and turbocharger inlet, where piping may be constructed of flexible, heat-resistant material. Connections between all charge air piping sections shall be sealed with a short section of reinforced hose and secured with stainless steel constant tension clamps that provide a complete 360 deg seal.

TS 16. Radiator

If liquid cooling is used, the radiator and/or heat exchanger shall be a heavy-duty metal unit, preferably constructed with a copper core. It is preferred to be of the tube type with bolted-on upper and lower tanks and with no solder-to-coolant contact. The radiator shall be accessible for cleaning. Any radiator shall be easily removable from the bus. Aluminum brazed/soldered radiator and/or heat exchanger may be used for low-temperature coolant systems only.

ALTERNATIVE

Agency to specify location of radiator.

Radiator piping shall be stainless steel, brass tubing or painted steel rated at 1000 hours of salt spray according to ASTM B117. Where practicable, hoses shall be eliminated. Necessary hoses shall be impervious to all bus fluids. All hoses shall be secured with stainless steel clamps that provide a complete 360 deg seal. The clamps shall maintain a constant tension at all times, expanding and contracting with the hose in response to temperature changes and aging of the hose material.

TS 17. Fluid Transfer Lines

All systems requiring lubrication shall meet or exceed component manufacturer's recommendation for installation, operation and maintenance. The fluid transfer lines shall be designed and intended for use in the environment where they are installed (for example, high-temperature resistant in the engine compartment, resistant to road salts near the road surface and so on). Fluid lines shall not be the lowest point of the bus undercarriage.

TS 18. Fuel

TS 18.1 Fuel Lines

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

Manifolds connecting fuel containers shall be designed and fabricated to minimize vibration and shall be installed in protected locations to prevent line or manifold damage from unsecured objects or road debris.

Fuel hose and hose connections, where permitted, shall be made from materials resistant to corrosion and fuel and protected from fretting and high heat. Fuel hoses shall be accessible for ease of serviceability.

DEFAULT

Agency to specify fuel type.

ALTERNATIVE

Fuel of choice.

TS 18.1.1 Fuel Lines, Diesel

Fuel lines shall be capable of carrying the type of fuel specified by the Agency (i.e., up to B20 type fuel).

TS 18.1.2 Fuel Lines, CNG

Fuel lines shall comply with NFPA-52. All tubing shall be a minimum of seamless Type 304 stainless steel (ASTM A269 or equivalent). Fuel lines and fittings shall not be fabricated from cast iron, galvanized pipe, aluminum, plastic or copper alloy with content exceeding 70 percent copper. Pipe fittings and hoses shall be clear and free from cuttings, burrs or scale. Pipe thread joining material that is impervious to CNG shall be used as required. Fuel lines shall be identifiable as fuel lines only.

High-pressure CNG lines shall be pressure tested to a minimum of 125 percent of system working pressure prior to fueling. CNG, nitrogen or clean, dry air shall be used to pressure-test the lines/assembly. The bus manufacturer shall have a documented procedure for testing the high-pressure line assembly.

Fuel lines shall be securely mounted, braced and supported using “split-block” type or stainless steel P clamps; all mounting clamps shall be mounted to a rigid structure to minimize vibration and shall be protected against damage, corrosion or breakage due to strain, rubbing or wear. “Floating clamps” (not mounted to a rigid structure) shall not be permitted. Fuel lines shall not be used to secure other components (wires, air lines, etc.).

Manifolds connecting fuel containers shall be designed and fabricated to minimize vibration and shall be installed in protected locations to prevent line or manifold damage from unsecured objects or road debris.

Fuel hose connections, where permitted, shall be less than 48 in. in length, made from materials resistant to corrosion and action of natural gas, and protected from fretting and high heat, and shall be supported approximately every 12 in.

TS 18.2 Design and Construction
TS 18.2.1 Design and Construction, Diesel
Fuel Tank(s)

DEFAULT

The fuel tank(s) shall be made of corrosion-resistant steel

ALTERNATIVE

The fuel tank(s) shall be made of corrosion-resistant stainless steel. The fuel tank shall be made of sufficiently heavy gauge 300 series or ASTM A240 stainless steel.

ALTERNATIVE

The fuel tank(s) shall be made of aluminum material.

ALTERNATIVE

The fuel tank(s) shall be made of high-density cross-linked polyethylene plastic material with or without baffles.

ALTERNATIVE

Protective shield mounted fully underneath the tank(s).

Installation

The fuel tank(s) shall be securely mounted to the bus to prevent movement during bus maneuvers.

The fuel tank(s) shall be equipped with an external, hex-head drain plug. It shall be at least $\frac{3}{8}$ in. size and shall be located at the lowest point of the tank(s). The fuel tank(s) shall have an inspection plate or easily removable filler neck to permit cleaning and inspection of the tank(s) without removal from the bus. The tank(s) shall be baffled internally to prevent fuel sloshing regardless of fill level. The baffles or fuel pickup location shall ensure continuous full power operation on a 6 percent upgrade for 15 minutes starting with no more than 25 gal of fuel over the unusable amount in the tank(s). The bus shall operate at idle on a 6 percent downgrade for 30 minutes starting with no more than 10 gal of fuel over the unusable amount in the tank(s).

The materials used in mounting shall withstand the adverse effects of road salts, fuel oils and accumulation of ice and snow for the life of the bus.

Labeling

The capacity, date of manufacture, manufacturer name, location of manufacture, and certification of compliance to Federal Motor Carrier Safety Regulations shall be permanently marked on the fuel tank(s). The markings shall be readily visible and shall not be covered with an undercoating material.

Fuel Filler

The fuel filler shall be located 7 to 32 ft behind the centerline of the front door on the curbside of the bus. The filler cap shall be retained to prevent loss and shall be recessed into the body so that spilled fuel will not run onto the outside surface of the bus.

The fuel lines forward of the engine bulkhead shall be in conformance to SAE standards.

DEFAULT

OEM to designate height of fuel filler.

ALTERNATIVE

Agency to specify height of fuel filler.

DEFAULT

Dry-Break Fuel Filler

The fuel filler shall accommodate a nozzle that forms a locked and sealed connection during the refueling process to eliminate spills. Fuel shall not be allowed to flow into the tank unless the nozzle has been properly coupled, locked and sealed to the filler. With the nozzle open, fuel shall enter the tank at a fill rate of not less than 40 gal per minute of foam-free fuel without causing the nozzle to shut off before the tank is full. The nozzle shall automatically shut off when the tank is essentially full. Once disconnected, fuel shall not be allowed to flow through the nozzle at any time. Any pressure over 3 psi shall be relieved from the fuel tank automatically. An audible signal shall indicate when the tank is essentially full. The dry break system shall be compatible with the Agency's system. The fuel filler cap shall be hinged.

ALTERNATIVE

The fuel filler shall accommodate a standard fuel nozzle. The nozzle shall automatically shut off when the tank is essentially full. An audible signal shall indicate when the tank is essentially full. The fuel filler cap shall be a screw-on cap.

ALTERNATIVE

The fuel filler cap shall be hinged.

TS 18.2.2 Design and Construction, CNG

Fuel Containers/Cylinders

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

- NFPA 52, "Standard for Compressed Natural Gas (CNG) Vehicular Fuel Systems"
- FMVSS 304
- Any local standard(s) specifically intended for CNG fuel containers

The design and construction of the fuel system supplied by the OEM shall comply with federal and local regulations.

Installation

Fuel cylinders shall 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 303. In the case of a low-floor transit bus, the

placement of tanks shall 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.

The roof and area above the engine-mounted tanks shall be contained within a skeletal structure resembling a roll cage and contained within an enclosure. The enclosure shall incorporate a hinged clamshell type access. The access panels shall be designed to offer protection from weather and to be sacrificial as a means of providing an escape path to atmosphere upon rapid enclosure pressure rise. The latching method shall use quick-release captive hardware that can be demonstrated to last the life of the bus. Additional shielding shall be provided surrounding end fittings and valves as needed. Shields shall be attached to the bus structure hinged in a manner that permits one mechanic to unlatch and swing the shield open for routine inspections. As practical, electrical components shall not be located within the roof enclosure, and if unavoidable, they shall be intrinsically safe.

CNG-fueled buses shall be equipped with an active automatic gas detection system, which shall annunciate unsafe levels of methane. The automatic gas detection system shall be integrated with an onboard fire suppression system.

DEFAULT

The access panels shall not be interlocked.

ALTERNATIVE

The access panels shall also be interlocked via proximity sensors, such that, if other than in their fully closed/locked position, an interlock will prevent engine starter engagement, prevent selection of forward or reverse transmission, and shall apply the brake interlock at speeds less than 3 mph.

Labeling

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

Pressure Relief Devices (PRDs)

PRDs must be designed, constructed, manufactured and tested in accordance with ANSI/IAS PRD1 (1998), “Pressure Relief Devices for Natural Gas Vehicle (NGV) Fuel Containers” and ANSI/IAS NGV2 (1998), “Basic Requirements for Compressed Natural Gas Vehicle (NGV) Fuel Containers.” All natural gas fuel system piping, including the PRD vent line, shall be stainless steel. All PRDs must be vented to the outside.

Valves

Valves must be installed in accordance with ANSI/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 shall be located 7 to 38 ft (on a 30, 35 and 40 ft coach) behind the centerline of the front door on a side determined by the Agency. The filler cap shall be retained to prevent loss and shall be recessed into the body.

The fill and vent receptacles shall be located within an enclosure on the right side of the bus. The access door shall be sized to allow full viewing of gauges, ease of hookups and maneuver of fuel nozzle.

The fuel fill receptacle and vent receptacle attachment shall be robust and capable of routine fueling connects/disconnects without deflection or metal fatigue, and capable of withstanding mechanical loads induced by a fueling drive-away incident without attachment failure.

DEFAULT

No static ground plug shall be installed.

ALTERNATIVE

The access door interlock shall also power on the fuel level gauges/illumination when in the open position.

ALTERNATIVE

A static ground plug shall be installed near the fueling receptacle for grounding during refueling operations.

Fueling System

The CNG fueling port receptacle shall be an ANSI/AGA NGV1 or NGV2 certified receptacle as designated by the Agency. The coach shall be capable of being fueled by a nozzle determined by the Agency. The fueling port receptacle location shall be such that connection by fueling personnel can be performed without physical strain or interference. A dust cap shall be permanently “tethered” to the fueling port receptacle. The fueling port receptacle access door shall be equipped with an interlock sensor that disables the engine starting system when the access door is open, to prevent drive-aways. The interlock shall be of the type such that if the sensor fails, the coach will not start.

Fueling site characteristics such as pressure, flow rate and temperature shall be provided by the Agency.

Defueling System

The CNG defueling port shall be an NGV-3.1/CGA-12.3 certified receptacle. The CNG defueling port shall be located on the curbside of the coach, in a location compatible with the Agency’s defueling station operation. The defueling system shall incorporate the following characteristics:

- Dust cap permanently “tethered” to the defueling port.
- Device(s) to prevent inadvertent defueling. Specifications to be provided by Agency.
- Components compatible with Agency’s defueling operation.
- The piping and fittings onboard the bus shall be sized to allow the fueling station to meet the following operating parameters:

DEFAULT

Fuel system shall be sized to allow a bus with 20,000 scf on board to defuel within 2.5 hours.

ALTERNATIVE

The atmospheric-vent system shall allow a bus with 20,000 scf of onboard CNG storage to defuel to atmospheric pressure within 80 minutes.

ALTERNATIVE

Location/method of attaching CNG fuel system to earth ground.

TS 19. Emissions and Exhaust

TS 19.1 Emissions (All-Electric)

The vehicle shall not have any EPA-regulated exhaust emissions except as noted in TS 55.1, “Auxiliary Heater.”

TS 19.2 Exhaust Emissions

The engine and related systems shall meet all applicable emission and engine design guidelines and standards.

TS 19.3 Exhaust System (HFC)

The exhaust pipe shall be of sufficient height to prevent exhaust gases and waste heat from discoloring or causing heat deformation to the bus. The entire exhaust system shall be adequately shielded to prevent heat damage to any bus component, including the exhaust after treatment compartment area. The exhaust outlet shall be designed to minimize rain, snow or water generated from high-pressure washing systems from entering into the exhaust pipe.

DEFAULT

Exhaust gases and waste heat shall be discharged from the street-side rear corner of the roof.

ALTERNATIVE

Exhaust gases and waste heat shall be discharged from the street-side under-rear bumper.

TS 19.4 Exhaust Aftertreatment

An exhaust aftertreatment system will be provided to ensure compliance to all applicable EPA regulations in effect.

TS 19.4.1 Diesel Exhaust Fluid Injection

If required by the engine manufacturer to meet NOx level requirements specified by the EPA, a DEF injection system will be provided. The DEF system will minimally include a tank, an injector, a pump, an ECM and a selective catalytic converter. The tanks shall be designed to store DEF in the operating environment described in the “Operating Environment” section.

DEFAULT

The DEF filler shall accommodate a standard nozzle. The nozzle shall automatically shut off when the tank is essentially full. The DEF filler cap shall be a screw-on cap and located curbside.

ALTERNATIVE

The DEF filler shall accommodate a nozzle that forms a locked and sealed connection during the refueling process to eliminate spills. DEF shall not be allowed to flow into the tank unless the nozzle has been properly coupled, locked and sealed to the filler. With the nozzle open, DEF shall enter the tank at a fill rate of not less than 5 gal per minute without causing the nozzle to shut off before the tank is 85 percent full. The nozzle shall automatically shut off when the tank is essentially 85 percent full. Once disconnected, fluid shall not be allowed to flow through the nozzle at any time. The filler cap shall be installed on the receiver.

DEFAULT

The DEF fluid lines shall be designed to prevent the DEF from freezing. The DEF injection system shall not be damaged from a cold soak at 10 °F (-12 °C).

ALTERNATIVE

The DEF fluid lines shall be designed with heated lines for temperatures up to -20 °F (-28 °C).

ALTERNATIVE

An audible signal shall indicate when the tank is essentially full.

TS 19.5 Particulate Aftertreatment

If required by the engine manufacturer to meet particulate level requirements specified by the EPA, a particulate trap will be provided. The particulate trap shall regenerate itself automatically if it senses clogging. Regeneration cycles and conditions will be defined by the engine manufacturer.

STRUCTURE

TS 20. General

TS 20.1 Design

The structure of the bus shall be designed to withstand the transit service conditions typical of an urban or intercity duty cycle throughout its service life. The vehicle structural frame shall be designed to operate with minimal maintenance throughout the 12-year design operating profile. The design operating profile specified by the Agency shall be considered for this purpose.

TS 21. Altoona Testing

Prior to acceptance of the first bus, the vehicle must have completed FTA-required Altoona testing. 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 that any and all such failures will not occur shall be submitted to the Agency.

DEFAULT

If available, the Altoona Test Report shall be provided to the Agency with the Proposal submittal. If not available, then the report shall be provided prior to first acceptance of bus.

ALTERNATIVE

Altoona Test Report Provided to Agency Prior to Start of Bus Production

Prior to the start of any bus manufacturing or assembly processes, the structure of the proposed bus model shall have undergone appropriate structural testing and/or analysis, including the complete regimen of FTA-required Altoona tests. Prior to assembly of the first bus, the OEM shall provide the Agency with a completed report of Altoona testing for the proposed bus model, along with a plan of corrective action to address deficiencies, breakdowns and other issues identified during Altoona testing. The bus model tested shall match the bus model proposed for procurement, including structure, axles and drivetrain. Base model and partial Altoona test reports are acceptable when the combination of these tests adequately represents the proposed bus model.

TS 21.1 Structural Validation

DEFAULT

Baseline Structural Analysis

The structure of the bus shall have undergone appropriate structural testing and/or analysis. At minimum, appropriate structural testing and analysis shall include Altoona testing or finite element analysis (FEA).

ALTERNATIVE

Detailed Structural Analysis

The structure of the proposed bus model shall have undergone structural testing prior to assembly of the first bus. The OEM shall provide the Agency with completed reports of other structural tests as specified by the Agency.

TS 22. Distortion

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

TS 23. Resonance and Vibration

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

TS 23.1 Propulsion Compartment Bulkheads

The passenger and propulsion system compartments shall be separated by a fire-resistant bulkhead. This bulkhead shall preclude or retard propagation of a compartment fire into the passenger compartment and shall be in accordance with the Recommended Fire Safety Practices defined in FTA Docket 90A, dated Oct. 20, 1993. Only necessary openings shall be allowed in the bulkhead, and these shall be fire-resistant. Any

passageways for the climate control system air shall be separated from the engine compartment by fire-resistant material. Piping through the bulkhead shall have fire-resistant fittings sealed at the bulkhead. Wiring may pass through the bulkhead only if connectors or other means are provided to prevent or retard fire propagation through the bulkhead. Engine access panels in the bulkhead shall be fabricated of fire-resistant material and secured with fire-resistant fasteners. These panels, their fasteners and the bulkhead shall be constructed and reinforced to minimize warping of the panels during a fire that will compromise the integrity of the bulkhead.

ALTERNATIVE

If the propulsion system doesn't contain combustion operations, then a fire-resistant bulkhead is not needed.

TS 23.2 Crashworthiness (Transit Coach)

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

The bus shall withstand a 25 mph impact by a 4000 lb automobile at any side, excluding doorways, along either side of the bus and the articulated joint, if applicable, with no more than 3 in. of permanent structural deformation at seated passenger hip height. This impact shall not result in sharp edges or protrusions in the bus interior.

Exterior panels below 35 in. from ground level shall withstand a static load of 2000 lb applied perpendicular to the bus by a pad no larger than 5 sq. in. This load shall not result in deformation that prevents installation of new exterior panels to restore the original appearance of the bus.

TS 24. Corrosion

The bus flooring, sides, roof, understructure and axle suspension components shall be designed to resist corrosion or deterioration from atmospheric conditions and deicing materials for a period of 12 years or 500,000 miles, whichever comes first. It shall maintain structural integrity and nearly maintain original appearance throughout its service life, with the Agency's use of proper cleaning and neutralizing agents.

All materials that are not inherently corrosion resistant shall be protected with corrosion-resistant coatings. All joints and connections of dissimilar metals shall be corrosion resistant and shall be protected from galvanic corrosion. Representative samples of all materials and connections shall withstand a two-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.

DEFAULT

Corrosion-Resistance Requirements

All exposed surfaces and the interior surfaces of tubing and other enclosed members below the lower window line shall be corrosion resistant through application of a corrosion protection system.

ALTERNATIVE

Corrosion Resistance Requirements

All exposed surfaces and the interior surfaces of tubing and other enclosed members shall be corrosion resistant through application of a corrosion protection system.

ALTERNATIVE

Additional Corrosion Resistance Requirements

The vehicle shall be constructed using only inherently corrosion-resistant materials and fasteners such as stainless steel or composites to minimize deterioration. The structure shall not require corrosion-preventive coatings or aftertreatments, either during construction or throughout the service life of the vehicle.

TS 25. Towing

Each towing device shall withstand, without permanent deformation, tension loads up to 1.2 times the curb weight of the bus within 20 deg of the longitudinal axis of the bus. If applicable, the rear towing device(s) shall not provide a toehold for unauthorized riders. The method of attaching the towing device shall not require the removal or disconnection of front suspension or steering components. Removal of the bike rack is permitted for attachment of towing devices. The OEM shall provide a towing procedure that ensures the traction motor does not generate high voltage during towing.

DEFAULT

Shop air connectors shall be provided at the front and rear of the bus and shall be capable of supplying all pneumatic systems of the bus with externally sourced compressed air. The location of these shop air connectors shall facilitate towing operations.

ALTERNATIVE

A plug connector permanently mounted at the front of the bus shall provide for bus tail lamp, marker, stop and turn signal lamp operation as controlled from the towing vehicle. The connector shall include a spring-loaded dust- and water-resistant cap.

DEFAULT

No Provision of Glad-Hand Type Connectors for Towing

No glad-hand type connector shall be provided.

ALTERNATIVE

Provision of Glad-Hand Type Connectors for Towing

Glad-hand type connectors shall be provided at the front of the bus to allow the towing vehicle to control and operate the bus braking system during a towing operation.

DEFAULT

Lifted (Supported) Front Axle and Flat Towing Capability

The front towing devices shall allow attachment of adapters for a rigid tow bar and shall permit the lifting of the bus until the front wheels are clear off the ground in order to position the bus on the towing equipment by the front wheels. These devices shall also permit common flat towing.

ALTERNATIVE

Lifted (Unsupported) Front Axle and Flat Towing Capability

The front towing devices shall allow attachment of adapters for a rigid tow bar and shall permit the lifting and towing of the bus, at curb weight, while the front wheels are clear off the ground. These devices shall also permit common flat towing.

Two rear recovery devices/tie-downs shall 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 the bus. The method of attaching the tow bar or adapter shall require the specific approval of the Agency. Any tow bar or adapter exceeding 50 lb should have means to maneuver or allow for ease of use and application. Each towing device shall accommodate a crane hook with a 1 in. throat.

TS 26. Jacking

It shall 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 shall permit raising the bus sufficiently high to remove and reinstall a wheel and tire assembly. Jacking pads located on the axle or suspension near the wheels shall permit easy and safe jacking with the flat tire or dual set on a 6 in. high run-up block not wider than a single tire. The bus shall withstand such jacking at any one or any combination of wheel locations without permanent deformation or damage.

DEFAULT

Yellow Pads

Jacking pads shall be painted safety yellow.

ALTERNATIVE

Decals

Apply decals to identify location of jacking pads.

ALTERNATIVE

Alternate Color Pads

Jacking pad color to be specified by the Agency.

TS 27. Hoisting

The bus axles or jacking plates shall accommodate the lifting pads of a two-post (or three-post if 60 ft. articulated bus) hoist system. Jacking plates, if used as hoisting pads, shall be designed to prevent the bus

from falling off the hoist. Other pads or the bus structure shall support the bus on jack stands independent of the hoist.

The vehicle shall be capable of lifting by the wheels and, as necessary to meet tire load requirements, the proper number for wheel lifts and/or adapters must be used.

TS 28. Floor

TS 28.1 Design (Transit Coach)

The floor shall be essentially a continuous plane, except at the wheel housings and platforms. Where the floor meets the walls of the bus, as well as other vertical surfaces such as platform risers, the surface edges shall be blended with a circular section of radius not less than ¼ in. or installed in a fully sealed butt joint. Similarly, a molding or cover shall prevent debris accumulation between the floor and wheel housings. The vehicle floor in the area of the entrance and exit doors shall have a lateral slope not exceeding 2 deg to allow for drainage.

DEFAULT

Bi-Level Floor Design

The floor design shall 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 no more than 21 in. above the lower level, with equally spaced steps. An increased slope shall be allowed on the upper level, not to exceed 3.5 deg off the horizontal.

ALTERNATIVE

Sloped Floor Design

The floor of the bus shall be of a sloped low-floor design. Aft of the rear door extending to the rear settee riser, the floor may be sloped but shall not exceed 5.5 deg off the horizontal.

ALTERNATIVE

Floor Drain

A floor drain of noncorrosive materials shall be provided on the bus behind the front, curbside wheelhouse near the wall to help drain any water that may accumulate due to ice, snow, rain, etc. The drain pipe shall be approximately 1½ in. in diameter and shall extend no more than 5 in. below the floor. The drain pipe shall be fitted with a rubber drain spout to minimize or prevent air drafts to the interior of the bus. The strainer shall be firmly retained but also removable to allow flushing of any accumulated debris.

TS 28.2 Design (Commuter Coach)

The floor shall be essentially a continuous plane, except at the wheel housings and platforms. Where the floor meets the walls of the bus, as well as other vertical surfaces such as platform risers, the surface edges shall be blended with a circular section of radius not less than ¼ in. or installed in a fully sealed butt joint. Similarly, a molding or cover shall prevent debris accumulation between the floor and wheel housings. The vehicle floor in the area of the entrance and exit doors shall have a lateral slope not exceeding 2 deg to allow for drainage.

The aisle of the bus shall be a sloped floor design and shall not exceed 5.5 deg off the horizontal or include one step not to exceed entrance door step heights. The floor shall be a continuous plane over the wheel housings. Where the floor meets the walls of the bus, as well as other vertical surfaces such

as platform risers, the surface edges shall be blended with a circular section of radius not less than ¼ in. or installed in a fully sealed butt joint.

TS 28.3 Design (Articulated Transit Coach)

The floor shall be essentially a continuous plane, except at the wheel housings and platforms. Where the floor meets the walls of the bus, as well as other vertical surfaces such as platform risers, the surface edges shall be blended with a circular section of radius not less than ¼ in. or installed in a fully sealed butt joint. Similarly, a molding or cover shall prevent debris accumulation between the floor and wheel housings. The vehicle floor in the area of the entrance and exit doors shall have a lateral slope not exceeding 2 deg to allow for drainage.

DEFAULT

Sloped Floor

Slope ahead aft the articulated joint shall not exceed 5.5 percent.

ALTERNATIVE

Floor Drain

A floor drain of noncorrosive materials shall be provided on the bus behind the front, curbside wheelhouse near the wall to help drain any water that may accumulate due to ice, snow, rain, etc. The drain pipe shall be approximately 1½ in. in diameter and shall extend no more than 5 in. below the floor. The drain pipe shall be fitted with a rubber drain spout to minimize or prevent air drafts to the interior of the bus. The strainer shall be firmly retained but also removable to allow flushing of any accumulated debris.

TS 28.4 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 shall not be used to retain the floor, and all floor fasteners shall be serviceable from one side only. Any adhesives, bolts or screws used to secure the floor to the structure shall last and remain effective throughout the life of the coach. Tapping plates, if used for the floor fasteners, shall be no less than the same thickness as a standard nut, and all floor fasteners shall be secured and protected from corrosion for the service life of the bus.

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 0.60 in. from the normal plane. The floor shall withstand the application of 2.5 times gross load weight without permanent detrimental deformation. The floor, with coverings applied, shall withstand a static load of at least 150 lb applied through the flat end of a ½ in. diameter rod, with 1/32 in. radius, without permanent visible deformation.

TS 28.5 Construction

The floor shall consist of the subfloor and the floor covering that will last the life of the bus. The floor as assembled, including the sealer, attachments and covering, shall be waterproof, non-hygroscopic and resistant to mold growth. The subfloor shall be resistant to the effects of moisture, including decay (dry rot). It shall be impervious to wood-destroying insects such as termites.

DEFAULT

Pressure-Preserved Plywood Panel

Plywood shall 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 shall be of a thickness adequate to support design loads, shall be manufactured with exterior glue, shall 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 shall be of a grade manufactured with a solid face and back. Plywood shall be installed with the highest grade, veneer side up. Plywood shall be pressure-treated with a preservative chemical and process such as alkaline copper quaternary (ACQ) that prevents decay and damage by insects. Preservative treatments shall use no EPA-listed hazardous chemicals. The concentration of preservative chemicals shall 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 shall have a moisture content at or below 15 percent.

ALTERNATIVE

Composite flooring.

ALTERNATIVE

Flooring with manufactured noise-reduction characteristics.

TS 28.6 Construction (Commuter Coach)

The floor shall consist of the subfloor and the floor covering that will last the life of the bus. The floor as assembled, including the sealer, attachments and covering, shall be waterproof, non-hygroscopic and resistant to mold growth. The subfloor shall be resistant to the effects of moisture, including decay (dry rot). It shall be impervious to wood-destroying insects such as termites.

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 in. (10 mm) from the normal plane. The floor shall withstand the application of 3.0 times gross load weight without permanent detrimental deformation.

TS 29. Platforms

TS 29.1 Driver’s Area

The covering of platform surfaces and risers, except where otherwise indicated, shall be the same material as specified for floor covering. Trim shall be provided along top edges of platforms unless integral nosing is provided.

DEFAULT

No specific trim material specified.

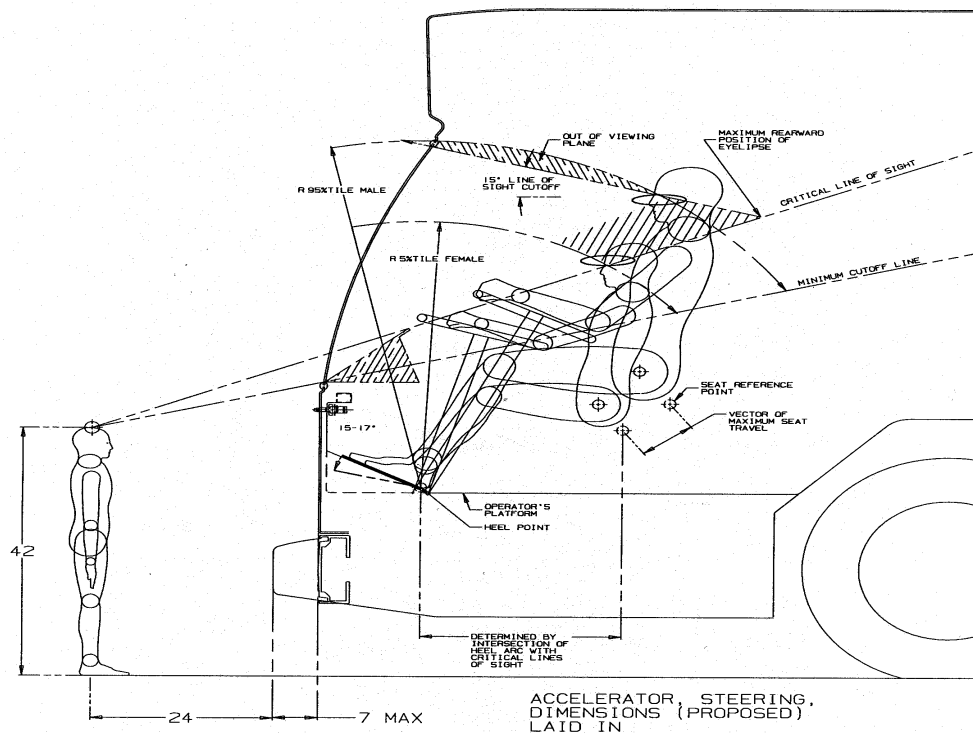
ALTERNATIVE

Specific trim required to be specified by the Agency.

TS 29.2 Driver's Platform

The driver's platform shall be of a height such that, in a seated position, the driver can see an object located at an elevation of 42 in. above the road surface, 24 in. from the leading edge of the bumper or bike rack. Notwithstanding this requirement, the platform height shall not position the driver such that the driver's vertical upward view is less than 15 deg. A warning decal or sign shall be provided to alert the driver to the change in floor level. **Figure 2** illustrates a means by which the platform height can be determined, using the critical line of sight.

FIGURE 2
Determining Platform Height



TS 29.3 Farebox

Farebox placement should minimize impact to passenger access and minimize interference with the driver's line of sight.

DEFAULT

Driver Interface Required; Platform Needed to Bring Height to Driver Access

If the driver's platform is higher than 12 in., then the farebox is to be mounted on a platform of suitable height to provide accessibility for the driver without compromising passengers' access.

ALTERNATIVE

No interface, no platform.

ALTERNATIVE

Stanchions

Stanchions shall be located around the farebox.

TS 29.4 Rear Step Area to Rear Area (Transit Coach)

If the vehicle is of a bi-level floor design, then a rear step area shall be provided along the center aisle of the bus to facilitate passenger traffic between the upper and lower floor levels. This step area shall be cut into the rear platform and shall be approximately the aisle width, a minimum 12 in. deep and approximately half the height of the upper level relative to the lower level. The horizontal surface of this platform shall be covered with skid-resistant material with a visually contrasting nosing and shall be sloped slightly for drainage. A warning decal or sign shall be provided at the immediate platform area to alert passengers to the change in floor level.

TS 30. Wheel Housing

TS 30.1 Design and Construction

Sufficient clearance and air circulation shall be provided around the tires, wheels and brakes to preclude overheating when the bus is operating on the design operating profile. Wheel housings shall be constructed of corrosion-resistant and fire-resistant material.

Wheel housings, as installed and trimmed, shall withstand impacts of a 2 in. steel ball with at least 200 ft-lb of energy without penetration.

TS 30.2 Design and Construction (Transit Coach)

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

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

The finish of the front wheel housings shall be scratch-resistant and complement interior finishes of the bus to minimize the visual impact of the wheel housing. If fiberglass wheel housings are provided, then they shall be color-impregnated to match interior finishes. The lower portion extending to approximately 10 to 12 in. above the floor shall be equipped with scuff-resistant coating or stainless steel trim.

Wheel housings not equipped with seats or equipment enclosure shall have a horizontal assist mounted on the top portion of the housing no more than 4 in. higher than the wheel well housing.

Where wheel housings are equipped with seats or equipment enclosures, all fasteners passing through to the outside of the coach shall be fully sealed to prevent the intrusion of water into the coach.

DEFAULT

No provision shall be made to chain buses.

ALTERNATIVE

The wheel housing shall be designed to have the ability to chain buses.

TS 30.3 Articulated Joint (Articulated Transit Coach)

60 ft articulated buses shall be equipped with a turntable that permanently joins the lead unit and trailing unit sections, allows relative motion between the sections about the pitch and yaw axes, and allows a small amount of relative roll between the sections without damage. A rotating turntable connection shall be provided between the lead unit and trailing unit to serve as a floor and to allow passenger access between the sections of the bus under all operating conditions. The turntable design shall provide for all horizontal and vertical turns that the bus is capable of making without introducing discontinuities between the turntable and adjacent vehicle floors.

The structures and finishes in the interconnecting section shall be designed to prevent passenger injury under all conditions. The turntable floor cover plate shall be supported so that there will be no honing of the floor plate, making it sharp at the outer edge. The gap between the floor and the turntable shall be minimized in order to prevent a tripping hazard. It shall be designed for ease of access for inspection and repairs of all devices that are part of it or devices that pass through the turntable area. Underfloor turntable components shall be easily accessible. Floor plates must be easily lifted and secured in the open position by one person for inspection and repairs. Turntable seats shall be quickly and easily removable by one person. The underfloor turntable area shall be completely enclosed by the bellows and bulkheads on the lead and trailing units to prevent drafts into the passenger compartment. The area between the turntable floor and the bellows shall be closed to prevent collection of trash in the bottom of the bellows. Closeouts shall be attached with removable fasteners. An access hatch shall be provided for routine maintenance (i.e., greasing, adjusting potentiometer, maintenance items).

An anti-jackknife joint shall be provided. This joint—by sensing vehicle speed, relative angle between the lead and trailing sections, throttle and braking actions, and any other necessary inputs—will control the degree of stiffness in the joint to ensure that the bus does not jackknife or operate in a dangerous or unsafe condition. The Agency shall approve the anti-jackknife joint. The interconnecting structure shall be designed to prevent separation of the lead and trailing units as a result of a road accident with a commercial or private vehicle. A means shall be provided so that the driver can override the control or recover from the situation. The bus shall be equipped with a reverse speed governor that shall apply the brake and accelerator interlocks when the bus speed in reverse gear exceeds 1.5 mph, but the bus shall have sufficient power in reverse to back out of wheel locator depressions at a floor hoist. The proposed configuration of these devices and the reverse-speed requirements shall be submitted for approval of the Agency.

Easy access shall be provided to overhead lines (electric, air, hydraulic, refrigerant) passing through the turntable. Hydraulic fittings shall be suitable for the given application and must be compatible with other fittings throughout the vehicle.

In order to prevent damage to the structure and electrical, air, hydraulic and refrigerant lines when the vertical or horizontal bending capabilities of the hinge are exceeded, the bus shall be provided with appropriate

warning devices, brake interlocks and positive mechanical stops. These devices shall operate when the maximum bend angle is being approached in either plane.

TS 30.4 Raceway (Articulated Transit Coach)

A raceway shall be provided through the turntable area to accommodate to maximum deflection of the turntable. The raceway shall prevent chafing, binding, rubbing, crimping or leakage of all hydraulic, air, fuel and system support lines, as well as all electrical and electronic cabling through or to the turntable area. Lines shall be secured, separated and labeled at the lead and trailing unit bulkheads. Separation shall be maintained on the flexible portion of all lines through the use of a raceway. All electrical terminations and hose fittings shall be easily visible and easily tightened or removed without removing any other component. Lines, routing, securement and labeling shall be approved by the Agency.

Bulkhead fitting shall be provided for all lines: air, coolant, electrical, hydraulic and AC at both ends of the raceway. The bulkhead area shall be easily accessible for servicing.

TS 30.5 Bellows

Replacement fabric type bellows with draft-free, no-sag bottom closure and water drains shall be provided between the lead and trailing sections to seal the bus interior and keep it free of water, dirt and drafts. Bellows hardware shall be corrosion resistant, and the underfloor area of the bellows shall be easy to clean when necessary. The passageway between the lead unit and trailing unit shall have an inside cross-section that is as nearly equal as possible to the inside cross-section of the bus bodies, with no tripping or pinching hazards created by the turntable cross-section or closeouts. The bellows shall be durable, and its supporting structure and stiffeners shall support the bellows material in a neat, sag-free manner. The Contractor shall supply information on the actual service life achieved by the type of bellows being proposed. A sample of the bellows and attaching hardware may be requested for evaluation at the Agency's option. Bellows shall be approved by the Agency.

DEFAULT

No bellows liner required.

ALTERNATIVE

Bellows liner shall be provided.

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TS 31. Suspension

TS 31.1 General Requirements

The front, rear and mid (if articulated) suspensions shall be pneumatic type. The basic suspension system shall last the service life of the bus without major overhaul or replacement. Adjustment points shall be minimized and shall not be subject to a loss of adjustment in service. Routine adjustments shall be easily accomplished by limiting the removal or disconnecting the components.

TS 31.2 Alignment

All axles should be properly aligned so the vehicle tracks accurately within the size and geometry of the vehicle.

TS 31.3 Springs and Shock Absorbers

TS 31.3.1 Suspension Travel

The suspension system shall permit a minimum wheel travel of 2.75 in. jounce-upward travel of a wheel when the bus hits a bump (higher than street surface), and 2.75 in. rebound-downward travel when the bus comes off a bump and the wheels fall relative to the body. 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. Suspensions shall 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 ½ in. at any point from the height required. The safe operation of a bus cannot be impacted by ride height up to 1 in. from design normal ride height.

TS 31.3.2 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 three cycles or fewer after hitting road perturbations. The shock absorber bushing shall be made of elastomeric material that will last the life of the shock absorber. The damper shall incorporate a secondary hydraulic rebound stop.

TS 31.3.3 Lubrication

DEFAULT

Standard Grease Fittings

All elements of steering, suspension and drive systems requiring scheduled lubrication shall be provided with grease fittings conforming to SAE J534. These fittings shall be located for ease of inspection and shall be accessible with a standard grease gun from a pit or with the bus on a hoist. Each element requiring lubrication shall have its own grease fitting with a relief path. The lubricant specified shall be standard for all elements on the bus serviced by standard fittings and shall be required no fewer than every 6000 miles.

ALTERNATIVE

Auto-lube.

ALTERNATIVE

Remote grease manifold.

TS 31.3.4 Kneeling

DEFAULT

A kneeling system shall lower the entrance(s) of the bus a minimum of 2 in. during loading or unloading operations regardless of load up to GVWR, measured at the longitudinal centerline of the entrance door(s) by the driver. The kneeling control shall provide the following functions:

- Downward control must be held to allow downward kneeling movement.
- Release of the control during downward movement must completely stop the lowering motion and hold the height of the bus at that position.
- Upward control actuation must allow the bus to return to normal floor height without the driver having to hold the control.

The brake and throttle interlock shall prevent movement when the bus is kneeled. The bus shall kneel at a maximum rate of 1.25 in. per second at essentially a constant rate. After kneeling, the bus shall rise within 4 seconds to a height permitting the bus to resume service and shall rise to the correct operating height within 7 seconds regardless of load up to GVWR. During the lowering and raising operation, the maximum vertical acceleration shall not exceed 0.2g, and the jerk shall not exceed 0.3g per second.

An indicator visible to the driver shall 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, a minimum 2.5 in. diameter amber lens, shall be provided that will blink when the kneel feature is activated. Kneeling shall not be operational while the wheelchair ramp is deployed or in operation.

ALTERNATIVE

Allow upward kneel actuation with ramp deployed.

ALTERNATIVE

Full right-side kneel capabilities.

ALTERNATIVE

Full four-wheel kneel capabilities.

TS 32. Wheels and Tires

TS 32.1 Wheels

All wheels shall be interchangeable except for the middle axle of an artic where a super single tire size is used and shall be removable without a puller. Wheels shall be compatible with tires in size and load-carrying capacity. Front wheels and tires shall be balanced as an assembly per SAE J1986.

DEFAULT

Painted Steel

Wheels and rims shall be hub-piloted with powder-coated steel (maximum 3.5 mil) and shall resist rim flange wear.

ALTERNATIVE

Brushed aluminum.

ALTERNATIVE

One-sided polished aluminum.

ALTERNATIVE

Two-sided polished aluminum rims.

DEFAULT

No tire-pressure monitoring system.

ALTERNATIVE

Tire-pressure monitoring system.

DEFAULT

Standard non-locking lug nut.

ALTERNATIVE

Three-piece captive locking lug nut.

TS 32.2 Tires

Tires shall 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 shall not exceed the tire supplier's rating.

DEFAULT

The tires shall be provided under a lease agreement between the Agency and the tire supplier and shall be the appropriate size and load range for the vehicle.

ALTERNATIVE

The tires shall be supplied by the Contractor.

ALTERNATIVE

Super single tire should be used. The Agency should designate preferences for the tire size.

TS 33. Steering

DEFAULT

Hydraulically assisted steering shall be provided. The steering gear shall be an integral type with the number and length of flexible lines minimized or eliminated. Engine-driven hydraulic pump shall be provided for power steering.

ALTERNATIVE

On battery-electric and hybrid coaches capable of supporting it, electrically driven hydraulic power steering may be used.

ALTERNATIVE

Electrically assisted steering shall be provided to reduce steering effort.

TS 33.1 Steering Axle (Transit Coach)

DEFAULT

Solid Beam Axle and Grease-Type Front Bearings and Seals

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

ALTERNATIVE

Oiled-Type Front Bearings

The front axle shall be non-driving with a load rating sufficient for the bus loaded to GVWR and shall be equipped with sealed, oiled-type front wheel bearings.

ALTERNATIVE

Independent Suspension Axle

The front axle shall be of an independent suspension design, non-driving, with a load rating sufficient for the bus loaded to GVWR and shall be equipped with sealed, oiled-type front wheel bearings.

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

The steering geometry of the outside (front lock) wheel shall be within 2 deg of true Ackerman up to 50 percent lock measured at the inside (back lock) wheel. The steering geometry shall be within 3 deg of true Ackerman for the remaining 100 percent lock measured at the inside (back lock) wheel.

TS 33.2 Steering and Tag Axles (Commuter Coach)

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

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

The steering geometry of the outside (front lock) wheel shall be within 2 deg of true Ackerman up to 50 percent lock measured at the inside (back lock) wheel. The steering geometry shall be within 3 deg of true Ackerman for the remaining 100 percent lock measured at the inside (back lock) wheel.

TS 33.3 Steering Wheel

TS 33.3.1 Turning Effort

Steering effort shall 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.

Under these conditions, the torque required to turn the steering wheel 10 deg shall be no less than 5 ft-lb and no more than 10 ft-lb. Steering torque may increase to 70 ft-lb when the wheels are approaching the steering stops, as the relief valve activates.

Power steering failure shall not result in loss of steering control. With the bus in operation, the steering effort shall not exceed 55 lb at the steering wheel rim, and perceived free play in the steering system shall not materially increase as a result of power assist failure. Gearing shall require no more than seven turns of the steering wheel lock-to-lock.

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.

TS 33.3.2 Steering Wheel, General

The steering wheel diameter shall be approximately 18 to 20 in.; the rim diameter shall be $\frac{7}{8}$ to $1\frac{1}{4}$ in. and shaped for firm grip with comfort for long periods of time.

Steering wheel spokes and wheel thickness shall ensure visibility of the dashboard so that vital instrumentation is clearly visible at center neutral position (within the range of a 95th-percentile male, as described in SAE 1050a, Sections 4.2.2 and 4.2.3). Placement of steering column must be as far forward as possible, but either in line with or behind the instrument cluster.

TS 33.3.3 Steering Column Tilt

The steering column shall have full tilt capability with an adjustment range of no less than 40 deg from the vertical and easily adjustable by the driver and shall be accessible by a 5th percentile female and 95th percentile male. Driver's knees shall not contact wheel spokes at any adjustment.

ALTERNATIVE

Steering Column Tilt

The steering column shall have two separate tilt locations, one near the top of the column and one at the universal joint below the floor where the column is connected to the right angle steering box; tilt and telescope are controlled by levers on the left side of the column.

TS 33.3.4 Steering Wheel Telescopic Adjustment

The steering wheel shall have full telescoping capability and have a minimum telescopic range of 2 in. and a minimum low-end adjustment of 29 in., measured from the top of the steering wheel rim in the horizontal position to the cab floor at the heel point.

TABLE 4

Steering Wheel Height¹ Relative to Angle of Slope

| At Minimum Telescopic Height Adjustment (29 in.) | | At Maximum Telescopic Height Adjustment (5 in.) | |
|--|----------|---|----------|
| Angle of Slope | Height | Angle of Slope | Height |
| 0 deg | 29 in. | 0 deg | 34 in. |
| 15 deg | 26.2 in. | 15 deg | 31.2 in. |
| 25 deg | 24.6 in. | 25 deg | 29.6 in. |
| 35 deg | 22.5 in. | 35 deg | 27.5 in. |

1. Measured from bottom portion closest to driver.

TS 34. Drive Axle

The bus shall be driven by a heavy-duty axle with a load rating sufficient for the bus loaded to GVWR. The drive axle shall have a design life to operate for not less than 300,000 miles on the design operating profile without replacement or major repairs. The lubricant drain plug shall be magnetic type. If a planetary gear design is employed, then the oil level in the planetary gears shall be easily checked through the plug or sight gauge. The axle and driveshaft components shall be rated for both propulsion and retardation modes with respect to duty cycle. If a planetary gear design is employed, then the planetary gear drain plugs shall also be magnetic.

NOTE: The retardation duty cycle can be more aggressive than propulsion.

The drive shaft shall be guarded to prevent hitting any critical systems, including brake lines, coach floor or the ground, in the event of a tube or universal joint failure.

TS 34.1 Non-Drive Axle

The non-drive axle is the drive axle without the drive gear with a load rating sufficient for the load to GVWR.

TS 35. Tag Axles (Commuter Coach)

A tag axle shall be located behind the drive axle. The tag axle shall 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 lb. With full passenger seating capacity, load on any axle shall not exceed 22,400 lb. Combined load capacity weight on the drive and tag axles shall not exceed 36,500 lb. 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.

ALTERNATIVE

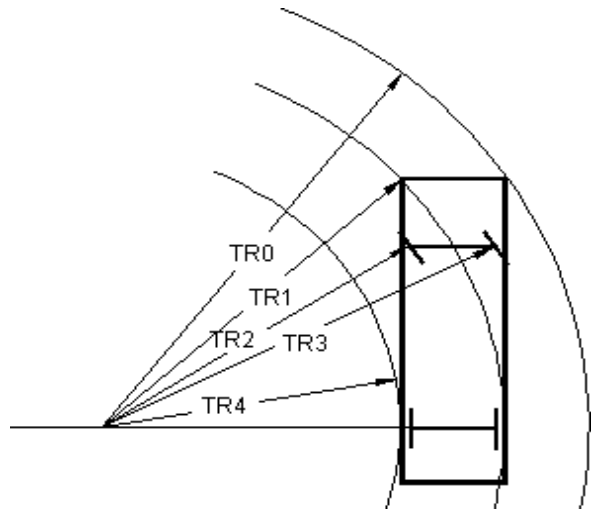
Steerable tag axle will be provided.

TS 36. Turning Radius

TABLE 5
 Maximum Turning Radius

| Bus Length (approximate) | Maximum Turning Radius (see Figure 3) | Agency Requirement |
|--------------------------|--|--------------------|
| 30 ft | 31 ft (TR0) | |
| 35 ft | 39 ft (TR0) | |
| 40 ft | 44 ft (TR0) | |
| 45 ft | 49 ft (TR0) | |
| 60 ft | 44.5 ft (outside front axle, TR0) 17 ft (inside rearmost axle, TR4) | |

FIGURE 3
 Turning Radius



TS 37. Brakes

TS 37.1 Service Brake

DEFAULT

Brakes shall be self-adjusting. Brake wear indicators (visible brake sensors) shall be provided on exposed push rods.

ALTERNATIVE

Visible stroke indicators may be combined with electronic brake monitoring system and vehicle brake warning system to notify driver and maintenance personnel of unsafe brake conditions.

TS 37.1.1 Regenerative Braking (Electric or Hybrid)

In addition to traditional mechanical friction service braking, the bus shall be equipped with regenerative braking designed to improve energy efficiency and extend brake lining service life. The application of regenerative braking shall cause a smooth blending of both regenerative and service brake function. Actuation of ABS and/or automatic traction control (ATC) shall override the operation of the regenerative brake. To protect the ESS system from over-charge, regenerative braking should be limited to above a certain SOC which is defined by the manufacturer; a written document and training should be provided to the Agency.

TS 37.2 Actuation

DEFAULT

Service brakes shall be controlled and actuated by a compressed air system. Force to activate the brake pedal control shall be an essentially linear function of the bus deceleration rate and shall not exceed 75 lb at a point 7 in. above the heel point of the pedal to achieve maximum braking. The heel point is the location of the driver's heel when his or her foot is rested flat on the pedal and the heel is touching the floor or heel pad of the pedal. The ECU for the ABS system shall be protected, yet in an accessible location to allow for ease of service.

The total braking effort shall be distributed among all wheels in such a ratio as to ensure equal friction material wear rate at all wheel locations. The manufacturer shall demonstrate compliance by providing a copy of a thermodynamic brake balance test upon request.

ALTERNATIVE

Air or hydraulic brakes.

DEFAULT

No automatic traction control.

ALTERNATIVE

Microprocessor-controlled ATC shall be provided.

ALTERNATIVE

The ABS/EBC controller must support EBC1 (PGN 61441) "Brake Pedal Position" (SPN 521) to support and enhance fuel savings technologies.

TS 37.3 Friction Material

The brake linings shall 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 a chamfer indicating the thickness at which replacement becomes necessary shall be provided on each brake lining. The complete brake lining wear indicator shall be clearly visible from the hoist or pit without removing backing plates.

DEFAULT

No remote brake wear indicator shall be required.

ALTERNATIVE

Remote brake wear indicator shall be provided.

TS 37.4 Hubs and Drums/Discs

Replaceable wheel bearing seals shall run on replaceable wear surfaces or be of an integral wear surface sealed design. Wheel bearing and hub seals and unitized hub assemblies shall not leak or weep lubricant when operating on the design operating profile for the duration of the initial manufacturer's warranty.

DEFAULT

Drum Brakes

The bus shall be equipped with brake drums. Brake drums shall allow machining for oversized linings per manufacturer's specifications.

ALTERNATIVE

Disc Brakes on Front Axle

The bus shall be equipped with brake drums on the rear axle and disc brakes on the front axle. The brake drums shall allow machining for oversize linings per manufacturer's specifications, and brake discs shall allow machining of each side of the disc to obtain smooth surfaces per manufacturer's specifications.

ALTERNATIVE

Disc Brakes on All Axles

The bus shall be equipped with disc brakes on all axles, and the brake discs shall allow machining of each side of the disc to obtain smooth surfaces per manufacturer's specifications.

The brake system material and design shall be selected to absorb and dissipate heat quickly so that the heat generated during braking operation does not glaze the brake linings.

TS 37.5 Hubs and Drums (Commuter Coach)

Replaceable wheel bearing seals shall run on replaceable wear surfaces or be of an integral wear surface sealed design. Wheel bearing and hub seals and unitized hub assemblies shall not leak or weep lubricant when operating on the design operating profile for the duration of the initial manufacturer's warranty.

The bus shall be equipped with disc brakes on all axles, and the brake discs shall allow machining of each side of the disc to obtain smooth surfaces per manufacturer's specifications.

TS 37.6 Parking/Emergency Brake

DEFAULT

Air Brakes

The parking brake shall 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.

ALTERNATIVE

Emergency Brake

An emergency brake release shall be provided to release the brakes in the event of automatic emergency brake application. The driver shall 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 driver releases the emergency brake release valve, the brakes shall engage to hold the bus in place. Air to the emergency brake release system shall be provided by a dedicated emergency air tank.

ALTERNATIVE

Hydraulic Brakes

If the bus is equipped with hydraulic brakes, then the braking system must comply with FMVSS 105, including both service and parking brake features.

TS 38. Interlocks

TS 38.1 Passenger Door Interlocks

To prevent opening mid and rear passenger doors while the bus is in motion, a speed sensor shall be integrated with the door controls to prevent the mid/rear doors from being enabled or opened unless the bus speed is less than 2 mph.

To preclude movement of the bus, an accelerator interlock shall lock the accelerator in the closed position, and a brake interlock shall engage the service brake system to stop movement of the bus when the driver's door control is moved to a mid/rear door enable or open position, or a mid or rear door panel is opened more than 3 in. from the fully closed position (as measured at the leading edge of the door panel). The interlock engagement shall bring the bus to a smooth stop and shall be capable of holding a fully loaded bus on a 6 percent grade with the transmission in gear until the interlocks are released. These interlock functions shall be active whenever the vehicle master run switch is in any run position.

All door systems employing brake and accelerator interlocks shall be supplied with supporting failure mode effects analysis (FEMA) documentation, which demonstrates that failure modes are of a failsafe type, thereby never allowing the possibility of release of interlock while an interlocked door is in an unsecured condition, unless the door master switch has been actuated to intentionally release the interlocks.

DEFAULT

Non-adjustable brake interlock regulator.

ALTERNATIVE

Braking effort adjustable with hand tools.

DEFAULT

No requirements for accelerator and brake interlocks whenever front doors are open.

ALTERNATIVE

Requiring Accelerator Interlock Whenever Front Doors Are Open

An accelerator interlock shall lock the accelerator in the closed position, and a brake interlock shall engage the service brake system to stop movement of the bus whenever front doors are open.

TS 39. Pneumatic System

TS 39.1 General

The bus air system shall operate the air-powered accessories and the braking system with reserve capacity. New buses shall not leak down more than 5 psi over a 15-minute period of time as indicated on the dash gauge.

Provision shall be made to apply shop air to the bus air systems. A quick disconnect fitting shall be easily accessible and located in the engine compartment and near the front bumper area for towing. Retained caps shall be installed to protect fitting against dirt and moisture when not in use. Air for the compressor shall be filtered. The air system shall be protected per FMVSS 121.

TS 39.2 Air Compressor

DEFAULT

The engine-driven air compressor shall be sized to charge the air system from 40 psi to the governor cut-off pressure in less than 4 minutes while not exceeding the fast idle speed setting of the engine.

ALTERNATIVE

The electrically driven air compressor shall be sized to charge the air system from 40 psi to the governor cut-off pressure in less than 4 minutes while not exceeding the fast idle speed setting of the engine.

TS 39.3 Air Lines and Fittings

Air lines, except necessary flexible lines, shall conform to the installation and material requirements of SAE J1149 for copper tubing with standard, brass, flared or ball sleeve fittings, or SAE J844 for nylon tubing if not subject to temperatures over 200 °F. The air on the delivery side of the compressor where it enters

nylon housing shall not be above the maximum limits as stated in SAE J844. Nylon tubing shall be installed in accordance with the following color-coding standards:

DEFAULT

- **Green:** Indicates primary brakes and supply.
- **Red:** Indicates secondary brakes.
- **Brown:** Indicates parking brake.
- **Yellow:** Indicates compressor governor signal.
- **Black:** Indicates accessories.

ALTERNATIVE

Contractor to designate color coding.

Line supports shall prevent movement, flexing, tension, strain and vibration. Copper lines shall 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 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 at no more than 5 ft intervals. Nylon lines may be grouped and shall be supported at 30 in. intervals or less.

The compressor discharge line between power plant and body-mounted equipment shall 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 shall be flexible Teflon hose with a braided stainless steel jacket. End fittings shall be standard SAE or JIC brass or steel, flanged, 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 bus except for the supporting grommets. Flexible lines shall be supported at 2 ft intervals or less.

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

TS 39.4 Air Reservoirs

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

TS 39.5 Air System Dryer

An air dryer shall prevent accumulation of moisture and oil in the air system. The air dryer system shall include one or more replaceable desiccant cartridges.

DEFAULT

No requirements for additional oil separator provision.

ALTERNATIVE

Requirement for Additional Oil Separator Provision

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

ALTERNATIVE

The air system shall be equipped with an air dryer located before the No. 1 air tank and as far from the compressor as possible to allow air to cool prior to entering the air dryer.

ELECTRICAL, ELECTRONIC AND DATA COMMUNICATION SYSTEMS

TS 40. Overview

The electrical system will consist of vehicle battery systems and components that generate, distribute and store power throughout the vehicle (e.g., generator, voltage regulator, wiring, relays and connectors).

Electronic devices are individual systems and components that process and store data, integrate electronic information or perform other specific functions.

The data communication system consists of the bidirectional communications networks that electronic devices use to share data with other electronic devices and systems. Communication networks are essential to integrating electronic functions, both onboard the vehicle and off.

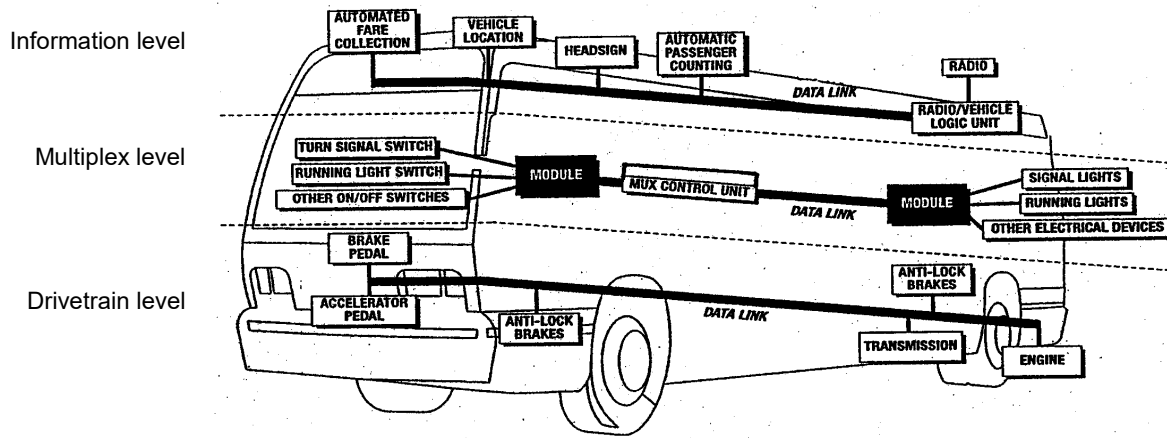
Information level systems that require vehicle information for their operations or provide information shall adhere to J1939 data standard.

Data communications systems are divided into three level store the use of multiple data networks (see **Figure 4**):

- **Powertrain level:** Components related to the powertrain, including the propulsion system components (engine, transmission and hybrid units) and anti-lock braking system (ABS), which may include traction control. At a minimum, powertrain components consisting of the engine, transmission, retarder, ASR and anti-lock braking systems shall be powered by a dedicated and isolated ignition supply voltage to ensure data communication between components exists when the vehicle ignition is switched to the “on” position.
- **Information level:** Components whose primary function is the collection, control or display of data that is not necessary to the safe drivability of the vehicle (i.e., the vehicle will continue to operate when those functions are inoperable). These components typically consist of those required for automatic vehicle location (AVL) systems, destination signs, fareboxes, passenger counters, radio systems, automated voice and signage systems, video surveillance and similar components.
- **Multiplex level:** Electrical or electronic devices controlled through input/output signals such as discrete, analog and serial data information (i.e., on/off switch inputs, relay or relay control outputs). Multiplexing is used to control components not typically found on the drivetrain or information levels, such as lights; wheelchair lifts; doors; heating, ventilation and air conditioning (HVAC) systems (if applicable); and gateway devices.

FIGURE 4

Data Communications Systems Levels



TS 40.1 Modular Design

Design of the electrical, electronic and data communication systems shall be modular so that each electronic device, apparatus panel or wiring bundle is easily separable from its interconnect by means of connectors.

TS 41. Environmental and Mounting Requirements

The electrical system and its electronic components shall be capable of operating in the area of the vehicle in which they will be installed, as recommended in SAE J1455.

Electrical and electronic equipment shall not be located in an environment that will reduce the performance or shorten the life of the component or electrical system when operating within the design operating profile.

The Agency shall follow recommendations from bus manufacturers and subsystem suppliers regarding methods to prevent damage from voltage spikes generated from welding, jump-starts, shorts, etc.

All electrical/electronic hardware mounted on the interior and exterior of the vehicle that is not designed to be installed in an exposed environment shall be protected.

All electrical/electronic hardware and its mounting shall comply with the shock and vibration requirements of published industry standards (SAE, ISO, etc.).

TS 42. General Electrical Requirements

TS 42.1 Low-Voltage (SLI) Batteries

Selected or specified batteries shall have a sufficient capacity to execute start after the as-delivered bus has been parked and off for a minimum of 48 hours.

TS 42.1.1 Low-Voltage Batteries (24 V)

DEFAULT

Four Group 31 Maintenance-Free Batteries

Four Group 31 Series deep-cycling maintenance-free battery units shall be provided. Each battery shall have a minimum of 700 cold-cranking amps. Each battery shall have a purchase date no more than one year from the date of release for shipment to the Agency.

ALTERNATIVE

Two 8D Battery Units

Two 8D battery units conforming to SAE J537 shall be provided. Each battery shall have a minimum of 1150 cold cranking amps. Each battery shall have a purchase date no more than 120 days from the date of release, and shall be fully maintained prior to shipment to the Agency. The battery compartment must be well-ventilated to prevent hydrogen buildup while protecting the compartment from road spray, water intrusion and deicing chemicals.

ALTERNATIVE

Two 8D Maintenance-Free Batteries

Each battery shall have a purchase date no more than 120 days from date of release and shall be fully maintained prior to shipment to the Agency. Battery compartment must be well-ventilated to prevent hydrogen build up while protecting the compartment from road spray, water intrusion and deicing chemicals.

DEFAULT

Same Size Terminal Ends

Positive and negative terminal ends shall be the same size.

ALTERNATIVE

Different Size Terminal Ends

Positive and negative terminal ends shall be different sizes.

ALTERNATIVE

Capacitor Start System

A capacitor start system will be provided to assist with starting the bus. This system will be isolated from the regular starting system to prevent the capacitors from draining during regular operation or long periods of downtime.

NOTE: Agency to specify post size if different sized terminal ends are use.

ALTERNATIVE

Four Group 31 AGM Batteries

Four Group 31 Series deep-cycling sealed nonspillable maintenance-free absorbed glass mat (AGM) batteries shall be provided. Each battery shall have a minimum of 1000 cold-cranking amps (CCA) at 0 °F. The batteries shall be designed and installed to withstand the operating environment. Each battery shall have a purchase date no more than one year from the date of release for shipment to the Agency.

ALTERNATIVE (BATTERY ELECTRIC VEHICLES)

Two Group 31 AGM Batteries

Two Group 31 Series deep-cycling sealed nonspillable maintenance-free absorbed glass mat (AGM) batteries shall be provided. Each battery shall have a minimum of 1000 cold cranking amps (CCA) at 0 °F. The batteries shall be designed and installed to withstand the operating environment. Each battery shall have a purchase date no more than one year from the date of release for shipment to the Agency.

ALTERNATIVE (BATTERY ELECTRIC VEHICLES)

Two Appropriately Sized Batteries

Two appropriately sized deep-cycling sealed nonspillable maintenance-free absorbed glass mat (AGM) batteries shall be provided. The batteries shall be designed and installed to withstand the operating environment. Each battery shall have a purchase date no more than one year from the date of release for shipment to the Agency.

ALTERNATIVE

Two Group 31 AGM Batteries with Ultracapacitors

Two Group 31 Series deep-cycling sealed nonspillable maintenance-free absorbed glass mat (AGM) batteries shall be provided. Each battery shall have a minimum of 1000 cold cranking amps (CCA) at 0 °F. Ultracapacitors (supercapacitors) shall be used in conjunction with the AGM batteries to provide effective power storage and to ensure successful engine starting. Ultracapacitor technology is to be used for cranking applications and then employing AGM battery technology to manage auxiliary loads. Ultracapacitors shall deliver their storage electrical energy at a high crank rate in a variety of extreme temperatures to provide reliable and consistent starting. The ultracapacitors shall be rated at a minimum of 120 kJ for cold climates and 75 kJ for warmer climates. The batteries and ultracapacitors shall be designed and installed to withstand the operating environment. Each battery shall have a purchase date no more than one year from the date of release for shipment to the Agency.

TS 42.1.2 Low-Voltage Battery Cables

The battery terminal ends and cable ends shall be color-coded with red for the primary positive, black for negative and another color for any intermediate voltage cables. Positive and negative battery cables shall not cross each other if at all possible, shall be flexible, shall be sufficiently long to reach the batteries with the tray in the extended position without stretching or pulling on any connection, and shall not lie directly on top of the batteries. Except as interrupted by the master battery switch, battery and starter wiring, where applicable, shall be continuous cables with connections secured by bolted terminals and shall conform to specification requirements of SAE J1127–Type SGR, SGT, SGX or GXL, and SAE J541 as applicable.

DEFAULT

No color code is for voltage is required.

ALTERNATIVE

Color-code each voltage.

TS 42.1.3 Jump-Start Connector

DEFAULT

No requirements for jump-start connector.

ALTERNATIVE

Jump-Start Connector

A jump-start connector, red for 24 V and blue for 12 V, shall be provided in the engine compartment, equipped with dust cap and adequately protected from moisture, dirt and debris.

ALTERNATIVE

Jump-Start Connector

A jump-start connector shall be located next to the battery disconnect switch.

TS 42.1.4 Battery Compartment

The battery compartment shall prevent accumulation of snow, ice and debris on top of the batteries and shall be vented and self-draining. It shall be accessible only from the outside of the vehicle. All components within the battery compartment, and the compartment itself, shall be protected from damage or corrosion from the electrolyte. The inside surface of the battery compartment's access door shall 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. The battery compartment temperature should not exceed manufacturer's specification.

The vehicle shall be equipped with one or more 12 VDC and 24 VDC quick disconnect switches. The battery compartment door shall conveniently accommodate operation of 12 VDC and 24 VDC quick disconnect switches.

The battery quick disconnect access door shall be identified with a decal. The decal size shall not be less than 3.5 × 5 in. (8.89 × 12.7 cm).

The door shall be flush-fitting and incorporate a spring tensioner or equal to retain the door in a closed position when not in use.

DEFAULT

Non-Locking Access Door

The access door shall not require any special locking devices to gain access to the switch, and it shall be accessible without removing or lifting the panel.

ALTERNATIVE

Locking Access Door

The access door shall require an Agency-specified locking device (e.g., square key) to gain access to the switch, and it shall be accessible without removing or lifting the panel.

The batteries shall be securely mounted on a stainless steel or equivalent tray that can accommodate the size and weight of the batteries. The battery tray, if applicable, shall pull out easily and properly support the batteries while they are being serviced. The tray shall allow each battery cell to be easily serviced. A locking device shall retain the battery tray to the stowed position.

If not located in the engine compartment, the same fire-resistant properties must apply to the battery compartment. No sparking devices should be located within the battery box.

TS 42.1.5 Auxiliary Electronic Power Supply

If required, gel-pack, or any form of sealed (non-venting) batteries used for auxiliary power are allowed to be mounted on the interior of the vehicle if they are contained in an enclosed, non-airtight compartment and accessible only to maintenance personnel. This compartment shall contain a warning label prohibiting the use of vented (flooded) lead-acid batteries.

TS 42.1.6 Master Battery Switch

The location of the master battery switch shall be clearly identified on the exterior access panel, be accessible in less than 10 seconds for deactivation, and prevent corrosion from fumes and battery acid when the batteries are washed off or are in normal service.

The master switch shall be capable of carrying and interrupting the total circuit load.

DEFAULT

Single Switch

The batteries shall be equipped with a single switch for disconnecting both 12 V and 24 V power.

ALTERNATIVE

Separate Switches

The batteries shall be equipped with separate switches for disconnecting 12 V and 24 V power.

ALTERNATIVE

Solenoid Battery Cutoff

A multiplex system activated battery cutoff solenoid to disconnect battery except critical items.

TS 42.1.7 Low-Voltage Generation and Distribution

The low-voltage generating systems shall maintain the charge on fully charged batteries, except in combustion engine cases, when the vehicle is at standard idle to allow-voltage generator load exceeding 70 percent of the low-voltage generator name plate rating.

Voltage monitoring and over-voltage output protection (recommended at 32 V) shall be provided. Charging profile shall be maintained within battery manufacturer's guidelines or specifications.

Dedicated power and ground shall be provided as specified by the component or system manufacturer. Cabling to the equipment must be sized to supply the current requirements with no greater than a 5 percent volt drop across the length of the cable.

TS 42.1.8 Circuit Protection

All branch circuits, except battery-to-starting-motor and battery-to-generator/alternator circuits, shall be protected by current-limiting devices such as circuit breakers, fuses or solid-state devices sized to the requirements of the circuit. The circuit breaker fuses shall be easily accessible for authorized personnel. Fuses shall be used only where it can be demonstrated that circuit breakers are not practicable. This requirement applies to inline fuses supplied by either the Contractor or a supplier. Fuse holders shall be constructed to be rugged and waterproof. All manual reset circuit breakers critical to the operation of the bus shall be mounted in a location convenient to the Agency mechanic with visible indication of open circuits. The Agency shall consider the application of automatic reset circuit breakers on a case-by-case basis. The Contractor shall show all in-line fuses in the final harness drawings. Any manually resettable circuit breakers shall provide a visible indication of open circuits.

Circuit breakers or fuses shall be sized to a minimum of 15 percent larger than the total circuit load. The current rating for the wire used for each circuit must exceed the size of the circuit protection being used.

TS 42.2 Grounds

The battery shall be grounded to the vehicle chassis/frame at one location only, as close to the batteries as possible. When using a chassis ground system, the chassis shall be grounded to the frame in multiple locations, evenly distributed throughout the vehicle to eliminate ground loops. No more than three ring terminal connections shall be made per ground stud with spacing between studs ensuring conductivity and serviceability. Electronic equipment requiring an isolated ground of the battery (i.e., electronic ground) shall not be grounded through the chassis.

TS 42.3 Low-Voltage and High-Voltage Wiring and Terminals

All power and ground wiring shall conform to specification requirements of SAE J1127, J1128 and J1292. All high-voltage power and ground wiring shall conform to specification requirements of SAE J1763, J1654 and J2910. In the case of conflicts with the requirements below, SAE standards shall apply. Double insulations shall be maintained as close to the junction box, electrical compartment or terminals as possible. The requirement for double insulations shall be met by wrapping the harness with plastic electrical tape or by sheathing all wires and harnesses with nonconductive, rigid or flexible conduit.

The bus shall be manufactured so that high-voltage systems and cabling do not interfere with the operation of low-voltage control systems. To this end, high-voltage cabling and low-voltage control wiring must be separated as far as practicable. Cabling and wiring must be installed damage-free. Additionally, parallel runs of high-voltage cabling and low-voltage control wiring shall be minimized.

Wiring shall be grouped, numbered and/or color-coded. Wiring harnesses shall not contain wires of different voltage classes unless all wires within the harness are insulated for the highest voltage presenting the harness. Kinking, grounding at multiple points, stretching, and exceeding minimum bend radius shall be prevented.

Strain-relief fittings shall be provided at all points where wiring enters electrical compartments. Grommets or other protective material shall be installed at points where wiring penetrates metal structures outside of electrical enclosures. Wiring supports shall be protective and nonconductive at areas of wire contact and shall not be damaged by heat, water, solvents or chafing.

To the extent practicable, wiring shall not be located in environmentally exposed locations under the vehicle. Wiring and electrical equipment necessarily located under the vehicle shall be insulated from water, heat, corrosion and mechanical damage. Where feasible, front-to-rear electrical harnesses should be installed above the window line of the vehicle.

All wiring harnesses over 5 ft long and containing at least five wires shall include 10 percent (minimum one wire) excess wires for spares. This requirement for spare wires does not apply to datalinks and communication cables. Wiring harness length shall allow end terminals to be replaced twice without pulling, stretching or replacing the wire. Terminals shall be crimped to the wiring according to the connector manufacturer's recommendations for techniques and tools. All cable connectors shall be locking type, keyed and sealed, unless enclosed in watertight cabinets or vehicle interior. Pins shall be removable, crimp contact type, of the correct size and rating for the wire being terminated. Unused pin positions shall be sealed with sealing plugs. Adjacent connectors shall use either different inserts or different insert orientations to prevent incorrect connections.

Terminals shall be crimped, corrosion-resistant and full ring type or interlocking lugs with insulating ferrules. When using pressure type screw terminal strips, only stranded wire shall be used. Insulation clearance shall ensure that wires have a minimum of "visible clearance" and a maximum of two times the conductor diameter or 1/16 in., whichever is less. When using shielded or coaxial cable, upon stripping of the insulation, the metallic braid shall be free from frayed strands that can penetrate the insulation of the inner wires.

Ultra-sonic and T-splices may be used with 8 AWG or smaller wire. When a T-splice is used, it shall meet these additional requirements:

- It shall include a mechanical clamp in addition to solder on the splice.
- The wire shall support no mechanical load in the area of the splice.
- The wire shall be supported to prevent flexing.

All splicing shall be staggered in the harness so that no two splices are positioned in the same location within the harness.

The instrument panel and wiring shall be easily accessible for service from the driver's seat or top of the panel. The instrument panel shall be separately removable and replaceable without damaging the instrument panel or gauges. Wiring shall have sufficient length and be routed to permit service without stretching or chafing the wires.

TS 42.4 Electrical Components

All electrical components, including switches, relays, flashers and circuit breakers, shall be heavy-duty designs with either a successful history of application in heavy-duty vehicles or design specifications for an equivalent environment.

All electric motors shall be heavy-duty brushless type where practical and have a continuous duty rating of no fewer than 40,000 hours (except cranking motors, washer pumps, auxiliary heater pumps, defroster and wiper motors). All electric motors shall be easily accessible for servicing.

TS 42.5 Electrical Compartments

All relays, controllers, flashers, circuit breakers and other electrical components shall be mounted in easily accessible electrical compartments. All compartments exposed to the outside environment shall be corrosion-resistant and sealed. The components and their functions in each electrical compartment shall be identified and their location permanently recorded on a drawing attached to the inside of the access panel or door. The drawing shall be protected from oil, grease, fuel and abrasion.

The front compartment shall be completely serviceable from the driver's seat, vestibule or from the outside. For vehicles with an internal combustion engine, "Rear start and run" controls shall be mounted in an accessible location in the engine compartment and shall be protected from the environment.

TS 43. General Electronic Requirements

If an electronic component has an internal real-time clock, it shall provide its own battery backup to monitor time when battery power is disconnected, and/or it may be updated by a network component. If an electronic component has an hour meter, it shall record accumulated service time without relying on battery backup.

All electronic component suppliers shall ensure that their equipment is self-protecting in the event of shorts in the cabling, and also in over-voltage (over 32 VDC on a 24 VDC nominal voltage rating with a maximum of 50 VDC) and reverse polarity conditions. If an electronic component is required to interface with other components, it shall not require external pull-up and/or pull-down resistors. Where this is not possible, the use of a pull-up or pull-down resistor shall be limited as much as possible and easily accessible and labeled.

TS 43.1 Wiring and Terminals

Kinking, grounding at multiple points, stretching and reducing the bend radius below the manufacturer's recommended minimum shall not be permitted.

TS 43.1.1 Discrete I/O (Inputs/Outputs)

All wiring to I/O devices, either at the harness level or individual wires, shall be labeled or color-coded in a fashion that allows unique identification at a spacing not exceeding 4 in. Wiring for each I/O device shall be bundled together. If the I/O terminals are the same voltages, then jumpers may be used to connect the common nodes of each I/O terminal.

TS 43.1.2 Shielding

All wiring that requires shielding shall meet the following minimum requirements. A shield shall be generated by connecting to a ground, which is sourced from a power distribution bus bar or chassis. A shield shall be connected at one location only, typically at one end of the cable. However, certain standards or special

requirements, such as SAE J1939 or RF applications, have separate shielding techniques that also shall be used as applicable.

NOTE: A shield grounded at both end forms a ground loop, which can cause intermittent loss of control or faults.

When using shielded or coaxial cable, upon stripping of the insulation, the metallic braid shall be free from frayed strands, which can penetrate the insulation of the inner wires. To prevent the introduction of noise, the shield shall not be connected to the common side of a logic circuit.

TS 43.1.3 Communications

The data network cabling shall be selected and installed according to the selected protocol requirements. The physical layer of all network communications systems shall not be used for any purpose other than communication among the system components, unless provided for in the network specifications.

Communications networks that use power line carriers (e.g., data modulated on a 24 V power line) shall meet the most stringent applicable wiring and terminal specifications.

TS 43.1.4 Radio Frequency (RF)

RF components, such as radios, video devices, cameras, global positioning systems (GPS), etc., shall use coaxial cable to carry the signal. All RF systems require special design consideration for losses along the cable. Connectors shall be minimized, since each connector and crimp has a loss that will contribute to attenuation of the signal. Cabling should allow for the removal of antennas or attached electronics without removing the installed cable between them. If this cannot be done, then a conduit of sufficient size shall be provided for ease of attachment of antenna and cable assembly. The corresponding component vendors shall be consulted for proper application of equipment, including installation of cables.

TS 43.1.5 Audio

Cabling used for microphone level and line level signals shall be 22 AWG minimum with shielded twisted pair. Cabling used for amplifier level signals shall be 18 AWG minimum.

TS 44. Multiplexing

TS 44.1 General

Versatility and future expansion shall be provided for by expandable system architecture. The multiplex system shall be capable of accepting new inputs and outputs through the addition of new modules and/or the utilization of existing spare inputs and outputs. All like components in the multiplex system shall be modular and interchangeable with self-diagnostic capabilities. The modules shall be easily accessible for troubleshooting electrical failures and performing system maintenance. Multiplex input/output modules shall use solid-state devices to provide extended service life and individual circuit protection.

DEFAULT

Ten percent of the total number of inputs and outputs, or at least one each for each voltage type utilized (0 V, 12 V, 24 V) at each module location shall be designated as spares.

ALTERNATIVE

No spares shall be designated.

TS 44.2 System Configuration

Multiplexing may either be distributed or centralized. A distributed system shall process information on multiple control modules within the network. A centralized system shall process the information on a single control module. Either system shall consist of several modules connected to form a control network.

TS 44.2.1 I/O Signals

The input/output for the multiplex system may contain four types of electrical signals: discrete, modulating, analogue, serial data.

Discrete signals shall reflect the on/off status of switches, levers, limit switches, lights, etc. Analog signals shall reflect numerical data as represented by a voltage signal (0–12 V, 10–24 V, etc.) or current signal (4 to 20 mA). Both types of analog signals shall represent the status of variable devices such as rheostats, potentiometers, temperature probes, etc. Serial data signals shall reflect ASCII or alphanumeric data used in the communication between other onboard components.

TS 45. Data Communications

TS 45.1 General

All data communication networks shall be either in accordance with a nationally recognized interface standard, such as those published by SAE, IEEE or ISO, or shall be published to the Agency with the following minimum information:

- Protocol requirements for all timing issues (bit, byte, packet, inter-packet timing, idle line timing, etc.) packet sizes, error checking and transport (bulk transfer of data to/from the device).
- Data definition requirements that ensure access to diagnostic information and performance characteristics.
- The capability and procedures for uploading new application or configuration data.
- Access to revision level of data, application software and firmware.
- The capability and procedures for uploading new firmware or application software.
- Evidence that applicable data shall be broadcast to the network in an efficient manner such that the overall network integrity is not compromised.

Any electronic vehicle components used on a network shall be conformance tested to the corresponding network standard.

TS 45.2 Drivetrain Level

Drivetrain components, consisting of the motor(s), motor inverter(s), engine, transmission, retarder, antilock braking system and all other related components, shall be integrated and communicate fully with respect to vehicle operation with data using SAE Recommended Communications Protocols such as J1939 and/or J1708/J1587, with forward and backward compatibilities or other open protocols. At a minimum, drivetrain components shall be powered by a dedicated and isolated ignition supply voltage to ensure that data communication among components exists when the vehicle ignition is switched to the “on” position.

TS 45.2.1 Diagnostics, Fault Detection and Data Access

Drivetrain performance, maintenance and diagnostic data, and other electronic messages shall be formatted and transmitted on the communications networks.

The drivetrain level shall have the ability to record abnormal events in memory and provide diagnostic codes and other information to service personnel. At a minimum, this network level shall provide live/fail status, current hardware serial number, software/data revisions and uninterrupted timing functions.

TS 45.2.2 Programmability (Software)

The drivetrain-level components shall be programmable by the Agency with limitations as specified by the subsystem Supplier.

TS 45.3 Multiplex Level

TS 45.3.1 Data Access

At a minimum, information shall be made available via a communication port on the multiplex system. The location of the communication port shall be easily accessible. A hardware gateway and/or wireless communications system are options if requested by the Agency. The communication port(s) shall be located as specified by the Agency.

TS 45.3.2 Diagnostics and Fault Detection

The multiplex system shall have a proven method of determining its status (system health and input/output status) and detecting either active (online) or inactive (offline) faults through the use of onboard visual/audible indicators.

In addition to the indicators, the system shall employ an advanced diagnostic and fault detection system, which shall be accessible via either a personal computer or a handheld unit. Either unit shall have the ability to check logic function.

DEFAULT

No requirement for mock-up board.

ALTERNATIVE

Provide Mock-Up Board

A mock-up board, where key components of the multiplexing system are replicated on a functional model, shall be provided as a tool for diagnostic, design verification and training purposes. If required, the mock-up board should be priced separately in the Pricing Schedule.

TS 45.3.3 Programmability (Software)

The multiplex system shall have security provisions to protect its software from unwanted changes. This shall be achieved through any or all of the following procedures:

- Password protection
- Limited distribution of the configuration software

- Limited access to the programming tools required to change the software
- Hardware protection that prevents undesired changes to the software

Provisions for programming the multiplex system shall be possible through a PC or laptop. The multiplex system shall have proper revision control to ensure that the hardware and software are identical on each vehicle equipped with the system. Revision control shall be provided by all of the following:

- Hardware component identification where labels are included on all multiplex hardware to identify components
- Hardware series identification where all multiplex hardware displays the current hardware serial number and firmware revision employed by the module
- Software revision identification where all copies of the software in service display the most recent revision number
- A method of determining which version of the software is currently in use in the multiplex system

DEFAULT

Revision control labels shall be electronic.

ALTERNATIVE

Revision control labels shall be physically located near the programming port.

TS 45.4 Electromagnetic Compatibility (EMC)

Electrical and electronic subsystems and components on all buses shall not emit electromagnetic radiation that will interfere with onboard systems, components or equipment, telephone service, radio or TV reception, or violate regulations of the Federal Communications Commission.

Electrical and electronic subsystems on the coaches shall not be affected by external sources of RFI/EMI. This includes, but is not limited to, radio and TV transmission, portable electronic devices including computers in the vicinity of or onboard the buses, AC or DC power lines, and RFI/EMI emissions from other vehicles.

As a recommendation, no vehicle component shall generate or be affected by RFI/EMI that can disturb the performance of electrical/electronic equipment as defined in CAN/CSA-CISPR 12-10, SAE J1113, SAE J1455 or UNECE Council Directive 95/54(R10).

DRIVER PROVISIONS, CONTROLS AND INSTRUMENTATION

TS 46. Driver's Area Controls

TS 46.1 General

In general, when designing the driver's area, it is recommended that SAE J833, "Human Physical Dimensions," be used.

Switches and controls shall be divided into basic groups and assigned to specific areas, in conformance with SAE J680, "Location and Operation of Instruments and Controls in Motor Truck Cabs," and be essentially within the hand reach envelope described in SAE J287, "Driver Hand Control Reach."

TS 46.2 Glare

The driver's work area shall be designed to minimize glare to the extent possible. Objects within and adjacent to this area shall 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 driver's area shall be avoided.

TS 46.3 Visors/Sun Shades

DEFAULT

Front and Side Sun Shade/Visor

Adjustable sun visor(s) shall be provided for the driver's windshield and the driver's side window. Visors shall be shaped to minimize light leakage between the visor and windshield pillars. Visors shall store out of the way and shall not obstruct airflow from the climate control system or interfere with other equipment, such as the radio handset or the destination control. Deployment of the visors shall not restrict vision of the rearview mirrors. Visor adjustments shall be made easily by hand with positive locking and releasing devices and shall not be subject to damage by over-tightening. Sun visor construction and materials shall be strong enough to resist breakage during adjustments. Visors may be transparent but shall not allow a visible light transmittance in excess of 10 percent. Visors, when deployed, shall be effective in the driver's field of view at angles more than 5 deg above the horizontal.

ALTERNATIVE

Driver's Window Sunscreens

An adjustable roller type sunscreen shall be provided over the driver's windshield and/or the driver's side window. The sunscreen shall be capable of being lowered to the midpoint of the driver's window. When deployed, the screen shall be secure, stable, and shall not rattle, sway or intrude into the driver's field of view due to the motion of the coach or as a result of air movement. Once lowered, the screen shall remain in the lowered position until returned to the stowed position by the driver. Sunscreen shall be shaped to minimize light leakage between the visor and windshield pillars to the extent possible.

TS 46.4 Driver's Controls

Frequently used controls must be in easily accessible locations. These include the door control, kneel control, windshield wiper/washer controls, ramp, and lift and run switch. Any switches and controls necessary for the safe operation of the bus shall be conveniently located and shall provide for ease of operation. They shall be identifiable by shape, touch and permanent markings. Controls also shall be located so that passengers may not easily tamper with control settings.

All panel-mounted switches and controls shall be marked with easily read identifiers. Graphic symbols shall conform to SAE J2402, "Road Vehicles – Symbols for Controls, Indicators, and Tell Tales," where available and applicable. Color of switches and controls shall be dark with contrasting typography or symbols.

Mechanical switches and controls shall be replaceable, and the wiring at these controls shall be serviceable from a convenient location. Switches, controls and instruments shall be dust- and water-resistant.

DEFAULT

All switches/controls in the driver’s control area shall be mounted in an angled panel steep enough to discourage drivers from using it as a personal storage area for items like food, drinks, cell phones, etc.

ALTERNATIVE

The transmission shift selector shall be mounted in an angled panel steep enough to discourage drivers from using it as a personal storage area for electronic devices such as cell phones, music players, navigation systems, etc.

TS 46.5 Normal Bus Operation Instrumentation and Controls

The following list identifies bus controls used to operate the bus. These controls are either frequently used or critical to the operation of the bus. They shall be located within easy reach of the operator. The operator shall not be required to stand or turn to view or actuate these controls unless specified otherwise.

Systems or components monitored by onboard diagnostics system shall be displayed in clear view of the operator and provide visual and/or audible indicators. The intensity of indicators shall permit easy determination of on/off status in bright sunlight but shall not cause a distraction or visibility problem at night. All indicators shall be illuminated using backlighting.

The indicator panel shall be located in Area 1 or Area 5, within easy view of the operator instrument panel. All indicators shall have a method of momentarily testing their operation. The audible alarm shall be tamper-resistant and shall have an outlet level between 80 and 83 dBA when measured at the location of the operator’s ear.

Onboard displays visible to the operator shall be limited to indicating the status of those functions described herein that are necessary for the operation of the bus. All other indicators needed for diagnostics and their related interface hardware shall be concealed and protected from unauthorized access. **Table 6** represents instruments and alarms. The intent of the overall physical layout of the indicators shall be in a logical grouping of systems and severity nature of the fault.

Consideration shall be provided for future additions of spare indicators as the capability of onboard diagnostic systems improves. Blank spaces shall contain LEDs.

TABLE 6 (Transit Coach)
 Transit Bus Instruments and Alarms

| Device | Description | Location | Function | Visual/Audible |
|---------------------|--|--------------------|---|----------------|
| Master run switch | Rotary, four-position detent | Side console | Master control for bus, off, day run, night run and clearance ID lights | |
| System start, front | Approved momentary switch | Side console | Activates vehicle systems | |
| System start, rear | Approved momentary switch (not required for vehicles without an ICE) | Engine compartment | Activates vehicle systems | |

TABLE 6 (Transit Coach)
 Transit Bus Instruments and Alarms

| Device | Description | Location | Function | Visual/Audible |
|------------------------------|---|--------------------------------------|--|--|
| System run, rear | Three-position toggle switch (not required for vehicles without an ICE) | Rear system compartment | Permits activating vehicle system from rear start, normal front run position and off | Amber light |
| Drive selector | Touch panel switch | Side console | Provides selection of propulsion: forward, reverse and neutral | Gear selection |
| HVAC | Switch or switches to control HVAC | Side console | Permits selection of passenger ventilation: off, cool, heat, low fan, high fan or full auto with on/off only | |
| Driver's ventilation | Switch or switches to control driver ventilation | Side console or dash left wing | Permits supplemental ventilation: fan off, low or high | |
| Defroster fan | Switch or switches to control defroster fan | Side console or dash left wing | Permits defroster: fan off, low, medium or high | |
| Defroster temperature | Variable position | Side console or dash left wing | Adjusts defroster water flow and temperature | |
| Windshield wiper | One-variable position switch operating both wipers | Dash left wing | Variable speed control of left and right windshield wipers | |
| Windshield washer | Push button | Dash left wing | Activates windshield washers | |
| Dash panel lights | Rotary rheostat or stepping switch | Side console or dash left wing | Provides adjustment for light intensity in night run position | |
| Interior lights | Three-position switch | Side console | Selects mode of passenger compartment lighting: off, on or reduced lighting | |
| WC ramp/kneel enable | Two-position switch ¹ | Side console or dash right wing | Permits operation of ramp and kneel operations at each door remote panel | Amber light |
| Front door ramp/kneel enable | Two-position keyed switch ¹ | Front door remote or dash right wing | Permits ramp and kneel activation from front door area, key required ¹ | Amber light |
| Front door ramp | Three-position momentary switch | Right side of steering wheel | Permits deploy and stow of front ramp | Red light |
| Front kneel | Three-position momentary switch | Front door remote | Permits kneeling activation and raise and normal at front door remote location | Amber or red dash indicator exterior alarm and amber light |
| Rear door ramp/kneel enable | Two-position keyed switch ¹ | Rear door remote | Permits ramp and kneel activation from rear door area; key required ¹ | Red light |
| Rear door ramp | Three-position momentary switch | Rear door remote | Permits deploy and stow of rear ramp | |
| Rear kneel | Three-position momentary switch | Rear door remote | Permits kneeling activation and raise and normal at rear door remote location | |

TABLE 6 (Transit Coach)
 Transit Bus Instruments and Alarms

| Device | Description | Location | Function | Visual/Audible |
|----------------------------|---|---------------------------------|---|--|
| Silent alarm | Recessed momentary push button | Side console | Activates emergency radio alarm at dispatch and permits covert microphone and/or enables destination sign emergency message | |
| Video system event switch | Momentary on/off switch with plastic guard | Side console | Triggers event equipment and event light on dash | Amber light |
| Left remote mirror | Four-position toggle type | Side console | Permits two-axis adjustment of left exterior mirror | |
| Right remote mirror | Four-position toggle type | Side console | Permits two-axis adjustment of right exterior mirror | |
| Mirror heater | Switch or temperature activated | Side console | Permits heating of outside mirrors when required | |
| Passenger door control | Five-position handle type detent or two momentary push buttons | Side console, forward | Permits open/close control of front and rear passenger doors | Red light |
| Rear door override | Two-position switch in approved location | Side console, forward | Allows driver to override activation of rear door passenger tape switches | |
| System shutdown override | Momentary switch with operation protection | Side console | Permits driver to override auto system shutdown | |
| Hazard flashers | Two-position switch | Side console or dash right wing | Activates emergency flashers | Two green lights |
| Fire suppression | Red push button with protective cover | Dash left wing or dash center | Permits driver to override and manually discharge fire suppression system | Red light |
| Mobile data terminal | Mobile data terminal coach operator interface panel | Above right dash wing | Facilitates driver interaction with communication system and master log-on | LCD display with visual status and text messages |
| Farebox interface | Farebox coach operator interface panel | Near farebox | Facilitates driver interaction with farebox system | LCD display |
| Destination sign interface | Destination sign interface panel | In approved location | Facilitates driver interaction with destination sign system, manual entry | LCD display |
| Turn signals | Momentary push button (two required) raised from other switches | Left foot panel | Activates left and right turn signals | Two green lights and optional audible indicator |
| PA manual | Momentary push button | In approved location | Permits driver to manually activate public address microphone | |
| Low-profile microphone | Low-profile discrete mounting | Steering column | Permits driver to make announcements with both hands on the wheel and focusing on road conditions | |

TABLE 6 (Transit Coach)
 Transit Bus Instruments and Alarms

| Device | Description | Location | Function | Visual/Audible |
|------------------------------------|---|---|--|-------------------------------|
| High beam | Push button | In approved location | Permits driver to toggle between low and high beam | Blue light |
| Parking brake | Pneumatic PPV | Side console or dash left wing | Permits driver to apply and release parking brake | Red light |
| Hill holder | Two-position momentary switch | Side console | Applies brakes to prevent bus from rolling | |
| Master door/interlock | Multi-pole toggle, detented | Out of operator's reach | Permits driver override to disable door and brake/throttle interlock | Red light |
| Warning interlocks deactivated | Red indicator light | Dash panel center | Illuminates to warn driver that interlocks have been deactivated | Red light |
| Retarder disable | Two-position switch | Within reach of operator or approved location | Permits driver override to disable brake retardation/regeneration | Red light |
| Alarm acknowledge | Push button momentary | Approved location | Permits driver to acknowledge alarm condition | |
| Rear door passenger sensor disable | Two-position switch | In sign compartment or driver's barrier compartment | Permits driver to override rear door passenger sensing system | |
| Indicator/ alarm test button | Momentary switch or programming ¹ | Dash center panel | Permits driver to activate test of sentry, indicators and audible alarms | All visuals and audibles |
| Auxiliary power | 110 V power receptacle | Approved location | Property to specify what function to supply | |
| Speedometer | Speedometer, odometer, and diagnostic capability, 5-mile increments | Dash center panel | Visual indication of speed and distance traveled, accumulated vehicle mileage, fault condition display | Visual |
| Air pressure gauge | Primary and secondary, 5 psi increments | Dash center panel | Visual indication of primary and secondary air systems | Red light and buzzer |
| Fire detection | Coach operator display | Property specific or dash center | Indication of fire detection activation by zone/location | Buzzer and red light |
| Door obstruction | Sensing of door obstruction | Dash center | Indication of rear door sensitive edge activation | Red light and buzzer |
| Door ajar | Door not properly closed | Property specific or dash center | Indication of rear door not properly closed | Buzzer or alarm and red light |
| Low system air pressure | Monitors primary and secondary air tank pressure | Dash center | Indication of low air system pressure | Buzzer and red light |

TABLE 6 (Transit Coach)
 Transit Bus Instruments and Alarms

| Device | Description | Location | Function | Visual/Audible |
|--|---|-----------------------|---|---|
| System coolant indicator | Low coolant indicator may be supplied as audible alert and visual and/or text message | Within driver's sight | Detects low coolant condition | Amber light |
| Hot system indicator | Temperature indicator may be supplied as audible alert and visual and/or text message | Within driver's sight | Detects system overheat condition and initiates time delay shutdown | Red light |
| ABS indicator | Detects system status | Dash center | Displays system failure | Amber light |
| HVAC indicator | Detects system status | Dash center | Displays system failure | Amber or red light |
| LV charging system indicator (12/24 V) | Detect charging system status | Dash center | Detects no-charge condition and optionally detects battery high, low, imbalance, no-charge condition, and initiates time-delayed shutdown | Red light flashing or solid based on condition |
| Bike rack deployed indicator | Detects bike rack position | Dash center | Indicates bike rack not being in fully stowed position | Amber or red light |
| HV charging system indicator (ESS) | Detects charging system status | Dash center | Indicates when bus is connected to off-board charger and ESS is accepting charge | Visual |
| State of charge indicator | Gauge, graduated based on SoC | Dash center | Indicates usable SoC of ESS | Visual |
| Regenerative braking indicator | Detects status | Dash center | Indicates when regenerative braking is being used | Visual |
| Turntable | Detects status | Dash center | Warning indication for hinge locking | Audible and amber warning and red light if locked |
| Turntable | Interlock momentary switch | Side console | Momentarily release interlock brakes due to overangled condition | |

1. Indicate area by drawing. Break up switch control from indicator lights.

TABLE 6 (ALTERNATIVE, Transit Coach)
 Transit Bus Instruments and Alarms

| Device | Description | Location | Function | Visual/ Audible |
|-------------------------|-------------|----------|----------|-----------------|
| [Contractor to provide] | | | | |

TS 46.6 Driver Foot Controls

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

TS 46.6.1 Pedal Angle

The vertical angle of the accelerator and brake pedals shall be determined from a horizontal plane regardless of the slope of the cab floor. The accelerator and brake pedals shall be positioned at an angle of 37 to 50 deg at the point of initiation of contact and extend downward to an angle of 10 to 18 deg at full throttle.

The location of the brake and accelerator pedals shall be determined by the manufacturer, based on space needs, visibility, lower edge of windshield and vertical H-point.

TS 46.6.2 Pedal Dimensions and Position

The floor-mounted accelerator pedal shall be 10 to 12 in. long and 3 to 4 in. wide. Clearance around the pedal must allow for no interference precluding operation.

The accelerator and brake pedals shall be positioned such that the spacing between them, measured at the heel of the pedals, is between 1 and 2 in. Both pedals should be located approximately on the same plane coincident to the surface of the pedals.

TS 46.7 Brake and Accelerator Pedals

DEFAULT

Brake Pedal

Non-adjustable brake pedal.

ALTERNATIVE

Adjustable Brake and Accelerator Pedals

Both pedals shall be adjustable forward and rearward a minimum of 3 in. The adjustment shall be made by use of a dash-mounted toggle or rocker switch. The switch shall be clearly labeled to identify it as pedal adjustment and shall be within easy reach of the driver. Pedal adjustment shall be enabled only when the bus is stationary and the parking brake engaged.

TS 46.8 Driver Foot Switches

Floor-Mounted Foot Control Platform

The angle of the turn signal platform shall be determined from a horizontal plane, regardless of the slope of the cab floor. The turn signal platform shall be angled at a minimum of 10 deg and a maximum of 37 deg. It shall be located no closer to the seat front than the heel point of the accelerator pedal.

DEFAULT

Turn Signal Controls

Turn signal controls shall be floor-mounted, foot-controlled, water-resistant, heavy-duty, momentary contact switches.

ALTERNATIVE

Turn Signal Controls

Adjustable turn signal platform.

DEFAULT

Foot Switch Control

The control switches for the turn signals shall be mounted on an inclined, floor-mounted stainless steel enclosure or metal plate mounted to an incline integrated into the driver's platform, located to the left of the steering column. The location and design of this enclosure shall be such that foot room for the operator is not impeded. The inclined mounting surface shall be skid-resistant. All other signals, including high beam and public address system, shall be in approved locations.

The foot switches shall be UL-listed, heavy-duty type, of a rugged, corrosion-resistant metal construction. The foot switches for the directional signals shall be momentary type, while those for the PA system and the high beam shall be latching type. The spacing of the switches shall be such that inadvertent simultaneous deflection of switches is prevented.

ALTERNATIVE

Other Floor-Mounted Controls

The following may be floor mounted, momentary or latching, as identified by the Agency:

- hazard
- silent alarm
- PA system

ALTERNATIVE

Steering wheel mounted (self-canceling)

TS 47. Driver's Amenities

TS 47.1 Coat Hanger

DEFAULT

Coat Hanger

A suitable hanger shall be installed in a convenient, approved location for the driver's coat.

ALTERNATIVE

Coat Hook

A hook and loop shall be provided to secure the driver's coat.

TS 47.2 Drink Holder

DEFAULT

No drink holder.

ALTERNATIVE

Drink Holder

A device shall be provided to securely hold the driver's drink container, which may vary widely in diameter. It must be mounted within easy reach of the driver and must have sufficient vertical clearance for easy removal of the container. When the container is in the device, the driver's view of the road must not be obstructed, and leakage from the container must not fall on any switches, gauges or controls.

TS 47.3 Storage Box

DEFAULT

Storage Box

An enclosed driver storage area shall be provided with a positive latching door and/or lock. The minimum size is 2750 cu in.

ALTERNATIVE

No storage box.

TS 48. Windshield Wipers and Washers

TS 48.1 Windshield Wipers

The bus shall be equipped with a windshield wiper for each half of the windshield. At 60 mph, no more than 10 percent of the wiped area shall be lost due to windshield wiper lift. For two-piece windshields, both wipers shall park along the center edges of the windshield glass. For single-piece windshields, wipers shall park along the bottom edge of the windshield. Windshield wiper motors and mechanisms shall be easily accessible for repairs or service. The fastener that secures the wiper arm to the drive mechanism shall be corrosion-resistant.

DEFAULT

Single-control, electric two-speed intermittent wiper.

ALTERNATIVE

Wiper Powered by Compressed Air

If powered by air, exhaust from the wiper motors shall be muffled or piped under the floor of the bus.

DEFAULT

Single control for air-operated system.

ALTERNATIVE

Dual controls for air-operated system.

ALTERNATIVE

Intermittent Wiper with Variable Control

A variable-speed feature shall be provided to allow adjustment of wiper speed for each side of the windshield between approximately five and 25 cycles per minute.

ALTERNATIVE

Multiple wiper systems and controls.

ALTERNATIVE

Non-Synchronized Wipers

For non-synchronized wipers, separate controls for each side shall be supplied.

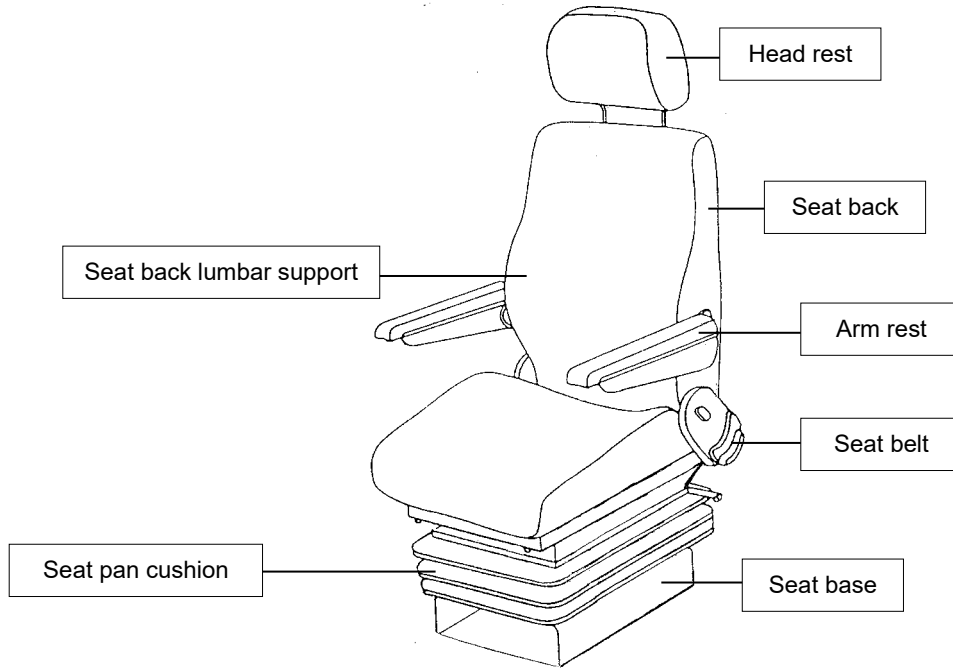
TS 48.2 Windshield Washers

The windshield washer system, when used with the wipers, shall deposit washing fluid evenly and completely wet the entire wiped area.

The windshield washer system shall have a minimum 3-gallon reservoir, located for easy refilling from outside the bus. Reservoir pumps, lines and fittings shall be corrosion-resistant and must include a means to determine fluid level.

TS 49. Driver's Seat

FIGURE 5
Driver's Seat



TS 49.1 Dimensions

The driver's seat shall be comfortable and adjustable so that people ranging in size from a 95th-percentile male to a 5th-percentile female may operate the bus.

TS 49.1.1 Seat Pan Cushion Length

Measurement shall be from the front edge of the seat pan to the rear at its intersection with the seat back. The adjustment of the seat pan length shall be no less than 16.5 in. at its minimum length and no more than 20.5 in. at its maximum length.

TS 49.1.2 Seat Pan Cushion Height

DEFAULT

Dimensions

Measurement shall be from the cab floor to the top of the level seat at its center midpoint. The seat shall adjust in height from a minimum of 14 in., with a minimum 6 in. vertical range of adjustment.

ALTERNATIVE

H-Point

The reference point for seat height shall be determined by establishing the H-point.

TS 49.1.3 Seat Pan Cushion Slope

Measurement is the slope of the plane created by connecting the two high points of the seat, one at the rear of the seat at its intersection with the seat back and the other at the front of the seat just before it waterfalls downward at the edge. The slope can be measured using an inclinometer and shall be stated in degrees of incline relative to the horizontal plane (0 deg). The seat pan shall adjust in its slope from no less than plus 12 deg (rearward “bucket seat” incline) to no less than minus 5 deg (forward slope).

TS 49.1.4 Seat Base Fore/Aft Adjustment

Measurement is the horizontal distance from the heel point to the front edge of the seat. The minimum and maximum distances shall be measured from the front edge of the seat when it is adjusted to its minimum seat pan depth (approximately 15 in.). On all low-floor buses, the seat base shall travel horizontally a minimum of 9 in. It shall adjust no closer to the heel point than 6 in. On all high-floor buses, the seat base shall travel a minimum of 9 in. and adjust no closer to the heel point than 6 in.

TS 49.1.5 Seat Pan Cushion Width

Measurement is the horizontal distance across the seat cushion. The seat pan cushion shall be 17 to 21 in. across at the front edge of the seat cushion and 20 to 23 in. across at the side bolsters.

TS 49.1.6 Seat Suspension

The driver’s seat shall be appropriately dampened to support a minimum weight of 380 lb. The suspension shall be capable of dampening adjustment in both directions.

Rubber bumpers shall be provided to prevent metal-to-metal contact.

TS 49.1.7 Seat Back

Width

Measurement is the distance between the outermost points of the front of the seat back, at or near its midpoint in height. The seat back width shall be no less than 19 in. Seat back will include dual recliner gears on both sides of the seat.

Height

Standard height seat back.

TS 49.1.8 Headrests

DEFAULT

Adjustable headrest.

ALTERNATIVE

No headrest.

TS 49.1.9 Seat Back Lumbar Support

Measurement is from the bottom of the seat back at its intersection with the seat pan to the top of the lumbar cushioning. The seat back shall provide adjustable-depth lumbar back support with three individual operating lumbar cells within a minimum range of 7 to 11 in.

TS 49.1.10 Seat Back Angle Adjustment

The seat back angle shall be measured relative to a level seat pan, where 90 deg is the upright position and 90 deg-plus represents the amount of recline.

The seat back shall adjust in angle from a minimum of no more than 90 deg (upright) to at least 105 deg (reclined), with infinite adjustment in between.

TS 49.2 Seat Belt

The belt assembly should be an auto-locking retractor (ALR). All seat belts should be stored in automatic retractors. The belts shall be mounted to the seat frame so that the driver may adjust the seat without resetting the seat belt.

The seat and seatbelt assemblies as installed in the bus shall withstand static horizontal forces as required in FMVSS 207 and 210.

DEFAULT

Lap seat belt only.

DEFAULT

Seatbelt webbing shall be black in color.

ALTERNATIVE

Lap and Shoulder (Three-Point) Seat Belt

Seat belts shall be provided across the driver's lap and diagonally across the driver's chest. The driver shall be able to use both belts by connecting a single buckle on the right side of the seat cushion. Three-point seatbelts must be emergency locking retractor (ELR) in design.

ALTERNATIVE

Adjustable-height D-ring.

ALTERNATIVE

All seatbelt assemblies shall come equipped with a warning switch device to remind operators to buckle up.

ALTERNATIVE

Orange three-point seatbelt webbing.

Lap Belt Length

DEFAULT

72 in.

The lap belt assembly shall be a minimum of 72 in. in length.

ALTERNATIVE

72 in. with Extension

The lap belt assembly shall be 72 in. in length with an 8 in. extension

TS 49.3 Adjustable Armrest

DEFAULT

No armrests.

ALTERNATIVE

One armrest, right side.

ALTERNATIVE

One armrest, left side.

ALTERNATIVE

Two armrests.

TS 49.4 Seat Control Locations

While seated, the driver shall be able to make seat adjustments by hand without complexity, excessive effort or being pinched. Adjustment mechanisms shall hold the adjustments and shall not be subject to inadvertent changes.

TS 49.5 Seat Structure and Materials

Cushions

Cushions shall be fully padded with at least 3 in. of materials in the seating areas at the bottom and back.

Cushion Materials

DEFAULT

Open-cell polyurethane (FMVSS 302).

ALTERNATIVE

Foam and fabric that meets FTA Docket 90A.

TS 49.6 Pedestal

DEFAULT

Powder-coated steel.

ALTERNATIVE

Stainless steel.

TS 49.7 Seat Options

Choose among the following:

- heated seat
- seat alarm
- fabric options
- seat air vent
- side bolsters adjustments
- silicone seat cushion

TS 49.8 Mirrors

TS 49.8.1 Exterior Mirrors

The bus shall be equipped with corrosion-resistant, outside rearview mirrors mounted with stable supports to minimize vibration. Mirrors shall be firmly attached to the bus to minimize vibration and to prevent loss of adjustment with a breakaway mounting system. Mirrors shall permit the driver to view the roadway along the sides of the bus, including the rear wheels. Mirrors should be positioned to prevent blind spots.

Mirrors shall retract or fold sufficiently to allow bus washing operations but avoid contact with windshield.

DEFAULT

Exterior mirrors shall be installed without a breakaway mounting system.

ALTERNATIVE

Exterior mirrors shall be installed with a breakaway mounting system.

ALTERNATIVE

Spring-loaded mirror heads auto return.

DEFAULT

Flat Mirrors on Both Sides

The bus shall be equipped with two flat outside mirrors, each with not less than 50 sq in. of reflective surface. The mirrors shall be located so as to provide the driver a view to the rear along both sides of the bus and shall be adjustable both in the horizontal and vertical directions to view the rearward scene. The roadside rearview mirror shall be positioned so that the driver's line of sight is not obstructed.

ALTERNATIVE

Combination of flat and convex mirrors referred to as transit-specific.

ALTERNATIVE

Combination of Mirrors and CCTV Cameras

The bus shall be equipped with a combination of mirrors and CCTV cameras. The configuration will be Agency specific.

Curbside Mirrors

The curbside rearview mirror shall be mounted so that its lower edge is no less than 76 in. above the street surface. A lower mount may be required due to mirror configuration requests.

DEFAULT

Remote Adjustment of Curbside Mirror

The driver shall be able to adjust the curbside mirror remotely while seated in the driving position. The control for remote positioning of the mirror shall be a single switch or device.

ALTERNATIVE

Standard mirror, not heated, no remote adjustment.

ALTERNATIVE

Heated and Remote Mirrors

The heaters shall be energized whenever the driver's heater and/or defroster is activated or activated independently.

Street-Side Mirrors

DEFAULT

Standard mirror, not heated, no remote adjustment.

ALTERNATIVE

Remote Adjustment of Street-Side Mirror

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

ALTERNATIVE

Heated Street-Side Mirrors

The street-side mirrors shall have heaters that energize whenever the driver's heater and/or defroster is activated, or can be activated independently.

ALTERNATIVE

Mirrors with integrated turn signal, one side.

ALTERNATIVE

Mirrors with external mounted turn signal, one side.

ALTERNATIVE

Mirrors with integrated turn signal, both sides.

ALTERNATIVE

Mirrors with external mounted turn signal, one side.

ALTERNATIVE

Mirrors with external mounted turn signal, both sides.

TS 49.8.2 Interior Mirrors

Mirrors shall be provided for the driver to observe passengers throughout the bus without leaving the seat and without shoulder movement. The driver shall be able to observe passengers in the front/entrance and rear/exit areas (if applicable), anywhere in the aisle, and in the rear seats.

WINDOWS

TS 50. General

Use with 30 ft length: A minimum of 6000 sq in. of window area, including operator and door windows, shall be required on each side of the standard configuration bus.

Use with 35 ft length: A minimum of 8000 sq in. of window area, including operator and door windows, shall be required on each side of the standard configuration bus.

Use with 40 ft length: A minimum of 10,000 sq in. of window area, including operator and door windows, shall be required on each side of the standard configuration bus.

Use with 45 ft length: A minimum of 12,000 sq in. of window area, including operator and door windows, shall be required on each side of the standard configuration bus.

Use with 60 ft length: A minimum of 16,000 sq in. of window area, including operator and door windows, shall be required on each side of the standard configuration bus.

TS 51. Windshield

The windshield shall permit an operator's field of view as referenced in SAE J1050. The vertically upward view shall be a minimum of 14 deg, measured above the horizontal and excluding any shaded band. The vertically downward view shall permit detection of an object 3½ ft high no more than 2 ft in front of the bus. The horizontal view shall be a minimum of 90 deg above the line of sight. Any binocular obscuration due to a center divider may be ignored when determining the 90 deg requirement, provided that the divider does not exceed a 3 deg angle in the operator's field of view. Windshield pillars shall not exceed 10 deg of binocular obscuration. The windshield shall be designed and installed to minimize external glare as well as reflections from inside the bus.

The windshield shall be easily replaceable by removing zip-locks from the windshield retaining moldings. Bonded-in-place windshields shall not be used. Winglets may be bonded.

TS 51.1 Glazing

The windshield glazing material shall have a ¼ in. nominal thickness laminated safety glass conforming to the requirements of ANSI Z26.1 Test Grouping AS-1 and the recommended practices defined in SAE J673.

DEFAULT

Shaded Band

The upper portion of the windshield above the driver's field of view shall have a dark, shaded band and marked AS-3, with a minimum luminous transmittance of 5 percent when tested in accordance to ASTM D1003.

ALTERNATIVE

Partial band required to allow view for camera and mirror viewing.

ALTERNATIVE

No band required.

DEFAULT

Two-piece windshield.

ALTERNATIVE

One-piece windshield.

TS 52. Driver's Side Window

The driver's side window shall be the sliding type, requiring only the rear half of the sash to latch upon closing, and shall open sufficiently to permit the seated operator to easily adjust the street-side outside rearview mirror. When in an open position, the window shall not rattle or close during braking. This window section shall slide in tracks or channels designed to last the service life of the bus. The operator's side window shall not be bonded in place and shall be easily replaceable. The glazing material shall have a single-density tint.

The driver's view, perpendicular through the operator's side window glazing, should extend a minimum of 33 in. (840 mm) to the rear of the heel point on the accelerator, and in any case must accommodate a 95th percentile male operator. The view through the glazing at the front of the assembly should begin not more than 26 in. (560 mm) above the operator's floor to ensure visibility of an under-mounted convex mirror. Driver's window construction shall maximize ability for full opening of the window.

DEFAULT

The driver's side window glazing material shall have a ¼ in. nominal thickness laminated safety glass conforming to the requirements of ANSI Z26.1-1996 Test Grouping AS-2 and the recommended practices defined in SAE J673.

ALTERNATIVE

The driver's side window glazing material shall have a ¼ in. nominal thickness tempered safety glass conforming to the requirements of ANSI Z26.1-1996 Test Grouping AS-2 and the recommended practices defined in SAE J673.

The design shall prevent sections from freezing closed in the winter. Light transmittance shall be 75 percent on the glass area below 53 in. from the operator platform floor. On the top-fixed-over-bottom-slider configuration, the top fixed area above 53 in. may have a maximum 5 percent light transmittance.

DEFAULT

Standard Driver's Side Window, Traditional Frame

Agency to choose from the following options:

- full slider
 - egress
 - non-egress
- top fixed over bottom slider
 - egress
 - non-egress

ALTERNATIVE

Hidden Frame (Flush "Euro-Look") Driver's Side Window

Agency to choose from the following options:

- full slider
 - egress
 - non-egress
- top fixed over bottom slider
 - egress
 - non-egress

ALTERNATIVE

Quick Change Operator's Side Window

Glazing in the window assembly shall be replaced without removing the window from its installed position on the bus or manipulation of the rubber molding surrounding the glazing. The glazing shall be held in place mechanically by a formed metal extruded ring constructed to last the life of the vehicle.

ALTERNATIVE

Standard Driver's Side Window, Traditional Frame

Agency to choose from the following options:

- full slider
 - egress
 - non-egress
- top fixed over bottom slider
 - egress
 - non-egress

TS 53. Side Windows

TS 53.1 Configuration

Side windows shall not be bonded in place, but shall be easily replaceable without disturbing adjacent windows and shall be mounted so that flexing or vibration from engine operation or normal road excitation is not apparent. All aluminum and steel material will be treated to prevent corrosion.

TS 53.2 Emergency Exit (Egress) Configuration

DEFAULT

Minimum Egress

All side windows shall be fixed in position, except as necessary to meet the emergency escape requirements.

ALTERNATIVE

Maximum Egress

Every window shall be capable of being made an egress window.

DEFAULT

Standard Passenger Side Window Configurations

Agency to choose from the following options:

- traditional frame
 - full fixed
 - openable windows with inward-opening transom panels
 - openable windows with sliding transom panels
 - openable windows with a fixed transom panel and sliding lower panels
 - openable windows with full-height sliding panels
- hidden frame (flush "Euro-look")
 - full fixed
 - openable windows with inward-opening transom panels.

ALTERNATIVE

Quick Change Passenger Side Windows

Glazing in the window assembly shall be replaced without removing the window from its installed position on the bus or manipulation of the rubber molding surrounding the glazing. The glazing shall be held in place mechanically by a formed metal extruded ring constructed to last the life of the vehicle.

DEFAULT

Traditional Frame

Agency to choose from the following options:

- full fixed
- openable windows with inward-opening transom panels
- openable windows with sliding transom panels
- openable windows with a fixed transom panel and sliding lower panels
- openable windows with full-height sliding panels

ALTERNATIVE

Hidden Frame (Seamless)

Agency to choose from the following options:

- full fixed
- openable windows with inward-opening transom panels

TS 53.3 Configuration

DEFAULT

Fixed Side Windows

All side windows shall be fixed in position, except as necessary to meet the emergency escape requirements.

ALTERNATIVE

Operable Side Window Configurations

All side windows, except windows in passenger doors and those smaller than 500 sq in., shall have window panels that are operable by passengers. Operable window panels shall be equipped with latches that secure the window in the fully open and fully closed positions.

ALTERNATIVE

Operable Windows with Inward-Opening Transom Panels (Fixed Bottom, Tip-In Top)

Each operable side window shall incorporate an upper transom portion. The transom shall be between 25 and 35 percent of the total window area. The lower portion of the window shall be fixed. The transom portion shall be hinged along the lower edge and open inward.

ALTERNATIVE

Operable Windows with Sliding Transom Panels

Each operable side window shall incorporate an upper transom portion. The transom shall be between 25 and 35 percent of the total window area. The lower portion of the window shall be fixed. The transom portion shall consist of two horizontally sliding panels.

ALTERNATIVE

Operable Windows with a Fixed Transom Panel and Sliding Lower Panels (Top Fixed, Bottom Slide)

Each operable side window shall incorporate an upper transom side. The transom shall be between 25 and 35 percent of the total window area. The transom portion of the window shall be fixed. The lower portion shall consist of two horizontally sliding panels.

ALTERNATIVE

Operable Windows with Operable Transom Panel and Sliding Lower Panels

Each operable side window shall incorporate an upper transom portion. The transom shall be between 25 and 35 percent of the total window area. The transom portion of the window shall be hinged at the lower edge and open inward. The lower portion shall consist of two horizontally sliding panels.

ALTERNATIVE

Operable Windows with Full-Height Sliding Panels

Each operable side window shall consist of two full-height horizontally sliding panels. All side windows shall be easily replaceable without disturbing adjacent windows and shall be mounted so that flexing or vibration from engine operation or normal road excitation is not apparent. The windows shall be designed and constructed to enable a mechanic to remove and replace one window in less than 15 minutes.

TS 53.4 Materials

DEFAULT

Safety Glass Glazing Panels

Side windows glazing material shall have a minimum of 3/16 in. nominal thickness tempered safety glass. The material shall conform to the requirements of ANSI Z26.1-1996 Test Grouping 2 and the recommended practices defined in SAE J673.

ALTERNATIVE

Polycarbonate Glazing Panels

Side window glazing material shall have a minimum 3/16 in. nominal thickness. The material shall conform with the requirements of ANSI Z26.1-1996, "Standard for Type AS-5 Safety Glazing Materials," except for Test Number 17, which shall subject the specimens to 100 cycles with less than 4 percent hazing and 500 cycles with less than 12 percent hazing. Windows shall be polycarbonate sheet with an abrasion-resistant coating on both sides of the window.

ALTERNATIVE

Acrylic Glazing Panels

Side window glazing material shall have a minimum of 3/16 in. nominal thickness. The material shall conform with the requirements of ANSI Z26.1-1996, "Standard for Type AS-5 Safety Glazing Materials," except for Test Number 17, which shall subject the specimens to 100 cycles with less than 4 percent hazing and 500 cycles with less than 12 percent hazing. Windows shall be cell cast acrylic sheet with an abrasion-resistant coating on both sides of the window.

ALTERNATIVE

Laminated Glazing Panels; Not Available on Hidden Frame (Seamless) Windows

Side windows glazing material shall have a minimum of 3/16 in. nominal thickness laminated safety glass. The material shall conform to applicable requirements of ANSI Z26.1-1996 and the recommended practices defined in SAE J673.

ALTERNATIVE

Laminated and Tempered Safety Glazing with Anti-Vandalism Polyester Sacrificial Film

All glazing material that is aft of the standee line shall be equipped with 6 mm laminated polyester film. Material shall be easily installed and removed without the use of specialized tools. Polyester film shall adhere to the window and be resistant to peeling, curling and discoloration by ultraviolet rays. The film shall withstand normal cleaning operations.

ALTERNATIVE

Anti-Vandalism Sacrificial Liner ("Quick Change")

All glazing material aft of the standee line shall be equipped with necessary bracketry, fasteners and clear acrylic liner that shall be easily removable in the event of vandalism. The acrylic liner shall be clear and shall have minimal effect on the transmittance of the underlying glazing. This material shall not be adversely affected by ultraviolet rays and shall withstand normal cleaning practices. The installation of the liner shall prevent clouding or fogging. This acrylic sacrificial liner must be replaced without removing the window from its installed position on the bus, without removing the tempered glazing from the sash, and without the removal or manipulation of the window assembly's rubber molding.

DEFAULT

Windows on the bus sides and in the rear door shall be tinted a neutral color, complementary to the bus exterior. The maximum solar energy transmittance shall not exceed 37 percent, as measured by ASTM E424. Luminous transmittance shall be measured by ASTM D1003. Windows over the destination signs shall not be tinted.

ALTERNATIVE

All side and door windows shall be heat-rejecting glass with a solar heat gain coefficient (SHGC) of no greater than 40 percent and a visible light transmission of no less than 75 percent. Lower light transmission may be considered if SHGC values of less than 40 percent can be attained.

DEFAULT (LIGHT)

55 percent luminous transmittance.

ALTERNATIVE (LIGHT)

75 percent luminous transmittance.

DEFAULT (DARK)

27 percent luminous transmittance.

ALTERNATIVE

Property to specify, but no less than 12 percent.

DEFAULT

Safety Glass Glazing Panels

Side windows glazing material shall have a minimum of 3/16 in. nominal thickness tempered safety glass. The material shall conform to the requirements of ANSI Z26.1 Test Grouping 2 and the recommended practices defined in SAE J673.

ALTERNATIVE

Polycarbonate Glazing Panels

Side window glazing material shall have a minimum of 3/16 in. nominal thickness. The material shall conform to the requirements of ANSI Z26.1-1977, "Standard for Type AS-5 Safety Glazing Materials," except for Test Number 17, which shall subject the specimens to 1000 cycles, and the arithmetic mean of the percentages of light scattered shall not exceed 5 percent. Windows shall be polycarbonate sheet with an abrasion-resistant coating on both sides of the window.

ALTERNATIVE

Acrylic Glazing Panels

Side window glazing material shall have a minimum of 3/16 in. nominal thickness. The material shall conform to the requirements of ANSI Z26.1-1977, "Standard for Type AS-5 Safety Glazing Materials," except for Test Number 17, which shall subject the specimens to 1000 cycles and the arithmetic mean of the percentages of light scattered shall not exceed 5 percent. Windows shall be cell cast acrylic sheet with an abrasion-resistant coating on both sides of the window.

ALTERNATIVE

Laminated Glazing Panels

Side windows glazing material shall have a minimum of 3/16 in. nominal thickness laminated safety glass. The material shall conform to applicable requirements of ANSI Z26.1 and the recommended practices defined in SAE J673.

ALTERNATIVE

Anti-Vandalism Polyester Sacrificial Film

All glazing material that is aft of the standee line shall be equipped with 6 mm laminated polyester film. This material shall be easily installed and removed without the use of specialized tools. Polyester film shall adhere to the window and be resistant to peeling, curling and discoloration by ultraviolet rays. The film shall withstand normal cleaning operations.

ALTERNATIVE

Anti-Vandalism Sacrificial Liner (“Storm Window Type”)

All glazing material aft of the standee line shall be equipped with necessary bracketry, fasteners and clear acrylic liner that shall be easily removable in the event of vandalism. The acrylic material shall be clear and shall have minimal effect on the transmittance of the underlying glazing. This material shall not be adversely affected by ultraviolet rays and shall withstand normal cleaning practices. The installation of the liner shall prevent clouding or fogging. A mechanic shall be able to easily remove and replace the acrylic liner without the use of any specialized tools in 5 minutes or less.

NOTE: All glass treatments must be permanent, within the glass and/or in the center membrane. Surface films are not permitted.

SHGC and light transmission performance shall be defined by the National Fenestration Rating Council.

TS 53.5 Rear Window

DEFAULT

No requirement for rear window.

NOTE: A requirement for a rear-mounted HVAC unit will preclude a rear window.

ALTERNATIVE

Rear Window Requirement

A rear window shall be provided. The rear window shall be glazed with the same material (including anti-vandalism provision if required) and tint as side windows. The glazing shall be set in rubber channels or be push-out type to meet FMVSS 217. If push-out type, it shall be one-piece, rugged sash design, meeting specifications for side windows.

HEATING, VENTILATING AND AIR CONDITIONING

TS 54. Capacity and Performance

The HVAC climate control system shall be capable of controlling the temperature and maintaining the humidity levels of the interior of the bus as defined in the following paragraphs.

DEFAULT

HVAC equipped. See below for configuration.

ALTERNATIVE

No Requirements for Cooling

All requirements relevant to the HVAC cooling mode contained in this section, as well as throughout this specification, need not apply. All other requirements for heating and ventilation still apply.

DEFAULT

Allow Either Roof- or Rear-Mounted HVAC Unit

The HVAC unit may either be roof or rear-mounted. Note that a rear-mounted unit will preclude a rear window and that the term “roof-mounted unit” includes units mounted on top of or beneath the roof surface.

ALTERNATIVE (TC)

Require Roof-Mounted HVAC Unit

The HVAC unit shall be roof-mounted.

NOTE: This includes units mounted on top of or beneath the roof surface.

ALTERNATIVE

Require Rear-Mounted HVAC Unit

The HVAC unit shall be rear-mounted.

ALTERNATIVE

Require Underfloor HVAC Unit

The HVAC unit shall be mounted under the floor.

ALTERNATIVE (ARTIC)

Require roof- and rear-mounted HVAC unit (articulated buses).

ALTERNATIVE (ARTIC)

Require roof- mounted HVAC units in both bus sections (articulated buses).

ALTERNATIVE (HYBRID OR ELECTRIC BUSES)

AC or DC electrically driven A/C system with hermetic compressor(s), condenser fan and evaporator blower motors.

ALTERNATIVE (DIESEL OR CNG BUSES)

AC or DC electrically driven A/C system with hermetic compressor(s), condenser fan, evaporator blower motors and brushless AC generators.

ALTERNATIVE

AC Shore Power Connection

Accessibility and serviceability of preventative maintenance components shall be provided, minimizing the maintenance personnel needed to work 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 shall control the average passenger compartment temperature within arrange between 65 and 80 °F, while maintaining the relative humidity to a value of 50 percent or less. The system shall maintain these conditions while subjected to any outside ambient temperatures within a range of 10 to 95 °F and at any ambient relative humidity levels between 5 and 50 percent. Demonstrate this requirement after first reaching a stabilized interior temperature of 70 ±3 °F with full passenger and solar load.

When the bus is operated in outside ambient temperatures of 95 to 115 °F, the interior temperature of the bus shall be permitted to rise 0.5 °F for each degree of exterior temperature in excess of 95 °F.

When the bus is operated in outside ambient temperatures in the range of –10 to 10 °F, the interior temperature of the bus shall not fall below 55 °F while the bus is running on the design operating profile.

NOTE: 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 the immediate path of an air duct outlet. In general, the locations are intended to accurately represent the interior passenger area.

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

DEFAULT (DIESEL AND CNG)

Capacity and Performance Requirements

The air-conditioning portion of the HVAC system shall be capable of reducing the passenger compartment temperature from 115 to 95 °F in less than 20 minutes after engine startup. Engine temperature shall be within the normal operating range at the time of startup of the cooldown test, and the engine speed shall be limited to fast idle, which may be activated by a driver-controlled device. During the cooldown period, the refrigerant pressure shall not exceed safe high-side pressures, and the condenser discharge air temperature, measured 6 in. from the surface of the coil, shall be less than 45 °F above the condenser inlet air temperature.

ALTERNATIVE (TROLLEY BUS/BATTERY ELECTRIC BUS/FUEL CELL BUS)

Capacity and Performance Requirements

The air conditioning portion of the HVAC system shall be capable of reducing the passenger compartment temperature from 110 to 90 °F in less than 20 minutes after system startup in a 100 °F ambient temperature. During the cooldown period, the refrigerant pressure shall not exceed safe high-side pressures, and the condenser discharge air temperature, measured 6 in. from the surface of the coil, shall be less than 45 °F above the condenser inlet air temperature. The appropriate solar load as recommended in the APTA “Recommended Instrumentation and Performance Testing for Transit Bus Air Conditioning System,” representing 4 p.m. on Aug. 21, shall be used. There shall be no passengers on board, and the doors, windows and fresh air opening shall be closed.

ALTERNATIVE

Hotter Ambient Conditions

The air conditioning portion of the HVAC system shall be capable of reducing the passenger compartment temperature from 110 to 70 °F ±3 °F in less than 30 minutes after system engagement for 30, 35 and 40 ft buses. Engine temperature shall be within the normal operating range at the time of startup of the cooldown test, and the engine speed shall be limited to fast idle at three-quarters max governed speed that may be activated by a driver-controlled device. During the cooldown period, the refrigerant pressure shall not exceed safe high-side pressures, and the condenser discharge air temperature, measured 6 in. from the surface of the coil, shall be less than 45 °F above the condenser inlet air temperature. No simulated solar load shall be used. There shall be no passengers on board, and the doors and windows shall be closed.

ALTERNATIVE

Colder Ambient Conditions

The pull-up requirements for the heating system shall be in accordance with Section 11.1 of APTA’s *recommended practice* “Transit Bus HVAC System Instrumentation and Performance Testing.” With ambient temperature at -20 °F, and vehicle cold soaked at that temperature, the bus heating system shall warm the interior passenger compartment to an average temperature of 70 °F ±2 °F within 70 minutes.

ALTERNATIVE

R134a

The air conditioning system shall meet these performance requirements using R134a.

ALTERNATIVE

R407C

The air conditioning system shall meet these performance requirements using R407C.

ALTERNATIVE

Other

Agency to specify how the air conditioning system shall meet these performance requirements using [specify refrigerant].

NOTE: Selection of this refrigerant may impact pull-down performance.

TS 55. Controls and Temperature Uniformity

The HVAC system excluding the driver's heater/defroster shall be centrally controlled with an advanced electronic/diagnostic control system with provisions for extracting/reading data. The system shall be compliant with J1939 Communication Protocol for receiving and broadcasting of data.

HVACs that use coolant pumps for driver's defroster/heat shall be sized for the required flow and be brushless, having a minimum maintenance-free service life for both the brushless motor and the pump of at least 40,000 hours at full power.

DEFAULT

Manual Mode Selection of Climate Control System

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

ALTERNATIVE

Fully Automatic Climate Control System

The climate control system shall be fully automatic and control the interior average temperature to within ± 2 °F of specified temperature control setpoint.

DEFAULT

Single Control Setpoint at 70 °F

The temperature control setpoint for the system shall be 70 °F.

ALTERNATIVE

Dual-Temperature Control Setpoint

The temperature control setpoint for the system shall be [insert temperature] °F in the cooling mode and [insert temperature] °F in the heating mode.

ALTERNATIVE (BATTERY ELECTRIC BUS/FUEL CELL BUS)

Reduced Energy Consumption Setpoint

The HVAC system must be able to accommodate both fixed setpoints and the following sliding scale temperature control set points. The temperature control setpoint for the system shall be 70 °F when the ambient temperature is between 40 and 80 °F. The temperature control setpoint in the cooling mode shall be allowed to rise by 0.9 °F for each degree of exterior temperature in excess of 80 °F, with a maximum allowed setpoint of 78 °F. The temperature control setpoint in the heating mode shall be allowed to decrease by 0.667 °F for each degree of exterior temperature below 40 °F, with a minimum allowed setpoint of 60 °F.

The sliding scale temperature control provides additional energy savings by adjusting the temperature setpoint based upon ambient temperature. The fixed setpoint allows temperature controls independent of ambient temperature. Having both control options allows the operator to apply the most appropriate control method for its operation.

ALTERNATIVE

Manually Adjustable Temperature Control Setpoint

The climate control system shall have the provision to allow the driver to adjust the temperature control setpoint at a minimum of between 68 and 72 °F. From then on, all interior climate control system requirements shall be attained automatically, unless readjusted by the driver.

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

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

TS 55.1 Auxiliary Heater

DEFAULT

No auxiliary heater.

ALTERNATIVE

Auxiliary Heater

An auxiliary heater may be provided to supplement the heating system.

ALTERNATIVE (TROLLEY BUS/BATTERY ELECTRIC BUS/FUEL CELL BUS)

Electric Grid Type Heaters

The heating system will consist of electric grid type heaters.

ALTERNATIVE (BATTERY ELECTRIC BUS/FUEL CELL BUS)

Optional Heating System for Low Ambient Temperatures

The optional heating system will consist of one or more liquid heat exchangers, which will use heated coolant from a fuel fired coolant heater to supplement or replace heat provided by the electric grid heater. This reduces battery consumption for passenger compartment heating in low ambient conditions.

TS 55.2 Load Shedding and Derating

DEFAULT (DIESEL AND CNG)

No Load Shedding or Derating

No provisions shall be made in the HVAC system for load shedding. Proposer will provide information on load shedding based on geographic location.

ALTERNATIVE (DIESEL AND CNG)

Default Load Shedding or Derating

Default provisions shall be made in the HVAC system for full on/full off load shedding.

ALTERNATIVE (BATTERY ELECTRIC BUS/FUEL CELL BUS)

Optional Multistage Load Shedding or Derating

HVAC control must include a method to provide multistage load shedding when required to conserve battery power. The HVAC system may be operated with reduced performance to allow the bus to operate when the high-voltage batteries are below critical levels.

TS 56. Air Flow

TS 56.1 Passenger Area

The cooling mode of the interior climate control system shall 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 shall be evenly distributed throughout the bus, with air velocity not exceeding 100 ft per minute on any passenger. The ventilating mode shall 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 shall not activate until the heating element has warmed sufficiently to ensure at least 70 °F air outlet temperature. The heating air outlet temperature shall not exceed 120 °F under any normal operating conditions.

The climate control blower motors and fan shall be designed such that their operation complies with the interior noise level requirements.

DEFAULT

No “Fresh Air” Requirements

To be used by agencies with an operating profile where the door opening cycle results in effectively providing an adequate “fresh air” mixture.

ALTERNATIVE

Requirement for 10 Percent “Fresh Air” Mixture

The air shall be composed of no less than 10 percent outside air.

ALTERNATIVE

Air purification system.

ALTERNATIVE

Ionization system.

ALTERNATIVE

Ultraviolet system.

TS 56.2 Driver’s Area

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

TS 56.3 Controls for the Climate Control System (CCS)

The controls for the driver’s compartment for heating, ventilation and cooling systems shall be integrated and shall meet the following requirements:

- The heat/defrost system fan shall be controlled by a separate switch that has an “off” position and at least two positions for speed control. All switches and controls shall preclude the possibility of clothing becoming entangled, and shields shall be provided, if required. If the fans are approved by the Agency, an “on/off” switch shall be located to the right of or near the main defroster switch.
- A manually operated control valve shall control the coolant flow through the heater core.
- If a cable-operated manual control valve is used, then the cable length shall be kept to a minimum to reduce cable seizing. Heater water control valves shall be “positive” type, closed or open. The method of operating remote valves shall require the concurrence of the Agency project manager.

TS 56.4 Driver's Compartment Requirements

A separate heating, ventilation and defroster system for the driver's area shall be provided and shall be controlled by the driver. The system shall meet the following requirements:

- The heater and defroster system shall provide heating for the driver and heated air to completely defrost and defog the windshield, driver's side window and the front door glasses in all operating conditions. Fan(s) shall be able to draw air from the bus body interior and/or exterior through a control device and pass it through the heater core to the defroster system and over the driver's feet. A minimum capacity of 100 cfm shall be provided. The driver shall have complete control of the heat and fresh airflow for the driver's area.
- The defroster supply outlets shall be located at the lower edge of the windshield. These outlets shall be durable and shall be free of sharp edges that can catch clothes during normal daily cleaning. The system shall be such that foreign objects such as coins or tickets cannot fall into the defroster air outlets. Adjustable ball vents or louvers shall be provided at the left of the driver's position to allow direction of air onto the side windows.

A ventilation system shall be provided to ensure driver comfort and shall be capable of providing fresh air in both the foot and head areas. Vents shall be controllable by the driver from the normal driving position. Decals shall be provided, indicating "operating instructions" and "open" and "closed" positions. When closed, vents shall be sealed to prevent the migration of water or air into the bus.

TS 56.5 Driver's Cooling

DEFAULT

No dedicated evaporator.

ALTERNATIVE

Separate Dedicated Evaporator

Using a separate, dedicated evaporator, the climate control system shall be designed to maintain the driver's compartment temperatures within the range specified for the passenger compartment. The unit shall operate when the climate control switch is in the "Cool" position. It shall have a separate thermostatic control.

ALTERNATIVE

A separate fan unit shall provide 100 cfm of air to the driver's area through directionally adjustable nozzles and an infinitely variable fan control, both of which shall be located above and ahead of the driver.

ALTERNATIVE

Air from the evaporator shall be provided to the driver's area through vents located on the dash in front of the driver.

ALTERNATIVE

Driver's booster blower.

TS 57. Air Filtration

Air shall be filtered before entering the AC system and being discharged into the passenger compartment. The filter shall meet the ANSI/ASHRAE 52.1 requirement for 5 percent or better atmospheric dust spot efficiency, 50 percent weight arrestance, and a minimum dust holding capacity of 120 g per 1000 cfm cell. Air filters shall be easily removable for service.

DEFAULT

Cleanable Filters

Air filters shall be cleanable.

ALTERNATIVE

Disposable Type Filters

Air filters shall be of disposable type.

ALTERNATIVE

Other Type Filters

Air filters shall be [insert type].

TS 58. Roof Ventilators

Each ventilator shall be easily opened and closed manually. When open with the bus in motion, this ventilator shall provide fresh air inside the bus. The ventilator shall cover an opening area no less than 425 sq in. and shall be capable of being positioned as a scoop with either the leading or trailing edge open no less than 4 in., or with all four edges raised simultaneously to a height of no less than 3½ in. An escape hatch shall be incorporated into the roof ventilator. Roof ventilator(s) shall be sealed to prevent entry of water when closed.

DEFAULT

One Roof Ventilator

One ventilator shall be provided in the roof of the bus.

ALTERNATIVE

Two Roof Ventilators

Two roof ventilators shall 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.

ALTERNATIVE

Three Roof Ventilators

(Used in articulated buses.)

ALTERNATIVE

An electronically controlled hatch shall be installed.

ALTERNATIVE

A tool shall be provided to manually open and close the hatch.

TS 59. Maintainability

Manually controlled shutoff valves in the refrigerant lines shall allow isolation of the compressor and dehydrator filter for service. To the extent practicable, self-sealing couplings using O-ring seals shall be used to break and seal the refrigerant lines during removal of major components, such as the refrigerant compressor. Shutoff valves may be provided in lieu of self-sealing couplings. The condenser shall be located to efficiently transfer heat to the atmosphere and shall 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 shall preclude its obstruction by wheel splash, road dirt or debris. HVAC components located within 6 in. of floor level shall be constructed to resist damage and corrosion.

DEFAULT

High and low refrigerant pressure electronic gauges to be located in the return air area.

ALTERNATIVE

High and low refrigerant pressure analog gauges to be located in the return air area.

NOTE: The Agency may include the following sections if an alternative for colder ambient performance is specified above.

TS 60. Entrance/Exit Area Heating

DEFAULT

No requirements for entrance/exit area heating.

ALTERNATIVE

Entrance/Exit Area Heating

Heat shall be supplied to the entrance and exit areas to maintain a tread surface temperature no less than 35 °F in an ambient temperature of -10 °F to prevent accumulation of snow, ice or slush with the bus operating under design operating profile and corresponding door opening cycle.

TS 61. Floor-Level Heating

TS 61.1 Transit Coach

DEFAULT

No requirements for floor-level heating.

ALTERNATIVE

Floor-Level Heating

Sufficient floor-level heaters shall be provided. Control of the floor-level heating shall be through the main heating system.

ALTERNATIVE

Warm Wall Heating

Sufficient heaters shall be provided with ducting to blow warm air upward through a cavity in the wall and discharge the warm air at the base of the windows. Control of the warm wall heating should be through the main heating system electronic control.

TS 61.2 Commuter Coach

Sufficient heaters shall be provided with ducting to blow warm air upward through a cavity in the wall and discharge the warm air at the base of the windows. Control of the warm wall heating shall be through the main heating system electronic control.

EXTERIOR PANELS, FINISHES AND EXTERIOR LIGHTING

TS 62. Design

The bus shall have a clean, smooth, simple design, primarily derived from bus performance requirements and passenger service criteria. The exterior and body features, including grilles and louvers, shall be shaped to facilitate cleaning by automatic bus washers without snagging washer brushes. Water and dirt shall 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 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 bus.

Exterior panels shall be sufficiently stiff to minimize vibration, drumming or flexing while the bus is in service. When panels are lapped, the upper and forward panels shall act as a watershed. However, if entry of moisture into the interior of the vehicle is prevented by other means, then rear cap panels may be lapped otherwise. The windows, hatches and doors shall be able to be sealed. Accumulation of spray and splash generated by the bus's wheels shall be minimized on windows and mirrors.

TS 62.1 Materials

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

DEFAULT

No requirement for protection against graffiti/vandalism for body material surfaces.

ALTERNATIVE

Requirements for protection against graffiti/vandalism for body material surfaces.

TS 62.2 Roof-Mounted Equipment (Transit Coach)

A nonskid, clearly marked walkway or steps shall be incorporated on the roof to provide access to equipment without damaging any system or bus paneling.

TS 63. Pedestrian Safety

Exterior protrusions along the side and front of the bus greater than ½ in. and within 80 in. of the ground shall have a radius no less than the amount of the protrusion. The exterior rearview mirrors, cameras and required lights and reflectors are exempt from the protrusion requirement. Advertising frames shall protrude no more than ⅞ in. from the body surface. Grilles, doors, bumpers and other features on the sides and rear of the bus shall be designed to minimize toeholds or handholds.

Exterior protrusions shall not cause a line-of-sight blockage for the driver.

TS 64. Repair and Replacement

TS 64.1 Side Body Panels (Transit Coach)

Structural elements supporting exterior body panels shall allow side body panels below the windows to be repaired in lengths not greater than 12.5 ft.

DEFAULT

Standard attachment of side body panels.

ALTERNATIVE

Easily Replaceable Lower Side Body Panels

The lower section (approximately 17.5 in.) of the side body panels (low-floor buses) or skirt panels (high-floor buses) shall be made of impact-resistant material and shall be easily and quickly replaceable.

ALTERNATIVE

Easily Replaceable Full-Height Side Body Panels

Full-height side body panels between the window and floor shall be easily and quickly replaceable in sections.

TS 64.2 Side Body Panels (Commuter Coach)

Structural elements supporting exterior body panels shall allow side body panels below the windows to be repaired.

TS 65. Rain Gutters

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

TS 66. License Plate Provisions

Provisions shall be made to mount standard-size U.S./Canada license plates per SAE J686 on the front and rear of the bus. These provisions shall direct-mount or recess the license plates so that they can be cleaned by automatic bus-washing equipment without being caught by the brushes. The rear license plate provision shall be illuminated per SAE J587.

DEFAULT

No plate or holder provision is required.

ALTERNATIVE

Front Plate or Holder Required

Location to be provided to OEM.

TS 66.1 Rub rails

DEFAULT

No requirement for rub rails.

ALTERNATIVE

Requirement for Rub Rails

Rub rails composed of flexible, resilient material shall be provided to protect both sides of the bus body from damage caused by minor sideswipe accidents with automobiles. Rub rails shall have vertical dimensions of no less than 2 in. (50 mm) with the centerline no higher than 35 in. above the ground between the wheel wells. The rub rails shall withstand impacts of 200 ft-lb of energy from a steel-faced spherical missile no less than 9 in. in diameter and of a 500 lb load applied anywhere along their length by a rigid plate 1 ft in length, wider than the rub rail, and with a ¼ in. end radii, with no visible damage to the rub rail, retainer or supporting structure.

The rub rail may be discontinued at doorways, wheel wells and articulated joints if applicable. A damaged portion of the rub rail shall be replaceable without requiring removal or replacement of the entire rub rail.

NOTE: Installation of rub rails may preclude the installation and/or size of exterior advertising signs or racks.

TS 67. Fender Skirts

DEFAULT

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

ALTERNATIVE

No fender skirts required.

TS 68. Wheel Covers (Transit Coach)

DEFAULT

Wheel covers not required.

ALTERNATIVE

Wheel covers required.

TS 68.1 Splash Aprons

DEFAULT

Standard Splash Aprons

Splash aprons, composed of ¼ in. minimum composition or rubberized fabric, shall be installed behind and/or in front of wheels as needed to reduce road splash and to protect underfloor components. The splash aprons shall extend downward to within 6 in. off the road surface at static conditions. Apron widths shall be no less than tire widths. Splash aprons shall be bolted to the bus understructure. Splash aprons and their attachments shall be inherently weaker than the structure to which they are attached. The flexible portions of the splash aprons shall not be included in the road clearance measurements. Splash apron shall be installed as necessary to protect the wheelchair loading device from road splash. Other splash aprons shall be installed where necessary to protect bus equipment.

ALTERNATIVE (TRANSIT COACH)

Full-width rear splash apron.

ALTERNATIVE

Other Locations Required

Splash apron in front of either or both front wheels to reduce splashing on ramp/lift and left mirror.

TS 69. Service Compartments and Access Doors

TS 69.1 Access Doors (Transit 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 maintain mechanical integrity and function under normal operations throughout the service life of the bus. They shall close flush with the body surface. All 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 bus washing operations. All access doors shall be retained in the open position by props or counterbalancing with overcenter or gas-filled springs with safety props and shall be easily operable by one person. Springs and hinges shall be corrosion resistant. Latch handles shall be flush with, or recessed behind, the body contour and shall be sized to provide an adequate grip for opening. Access doors, when opened, shall not restrict access for servicing other components or systems.

If precluded by design, the manufacturer shall provide door design information specifying how the requirements are met.

TS 69.2 Access Doors (Commuter Coach)

Conventional 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 and transmission fluid. 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 maintain mechanical integrity and function under normal operations throughout the service life of the bus. They shall close flush with the body surface. All 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 bus washing operations. All access doors shall be retained in the open position. Latch handles shall be flush with, or recessed behind, the body contour and shall be sized to provide an adequate grip for opening. Access doors, when opened, shall not restrict access for servicing other components or systems.

If precluded by design, the manufacturer shall provide door design information specifying how the requirements are met.

TS 69.3 Access Door Latch/Locks

DEFAULT

Requirement for Latches on Access Doors

Access doors larger than 100 sq in. in area shall be equipped with corrosion-resistant flush-mounted latches or locks except for coolant and fuel fill access doors. All such access doors that require a tool to open shall be standardized throughout the vehicle and will require a nominal 5/16 in. square male tool to open or lock.

ALTERNATIVE

Other Locks and Latches

Agency may define any required locks or latches for access doors.

TS 70. Bumpers

TS 70.1 Location

Bumpers shall provide impact protection for the front and rear of the bus with the top of the bumper being 27 in., ± 2 in., above the ground. Bumper height shall be such that when one bus is parked behind another, a portion of the bumper faces will contact each other.

TS 70.2 Front Bumper

No part of the bus, including the bumper, shall 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's longitudinal centerline. The bumper shall return to its pre-impact shape within 10 minutes of the impact. The bumper shall 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 4000 lb parallel to the longitudinal centerline of the bus. It shall protect the bus from damage as a result of 5.5 mph impacts into the corners at a 30 deg angle to the longitudinal centerline of the bus. The energy absorption system of the bumper shall be independent of every power system of the bus and shall not require service or maintenance in normal operation during the service life of the bus. The bumper may increase the overall bus length specified by no more than 7 in.

DEFAULT

Standard bumper.

ALTERNATIVE

Integrated Design with Recessed Middle Portion

The bumper shall be an integrated design with the coach styling and be recessed in the middle portion to provide for mounting of a bike rack if necessary.

DEFAULT

No provisions for installing a bike rack shall be made.

ALTERNATIVE

Mounting provisions for integrated bike rack.

TS 70.3 Rear Bumper

No part of the bus, including the bumper, shall 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 shall return to its pre-impact shape within 10 minutes of the impact. When using a yard tug with a smooth, flat plate bumper 2 ft wide contacting the horizontal centerline of the rear bumper, the bumper shall provide protection at speeds up to 5 mph, over pavement discontinuities up to 1 in. high, and at accelerations up to 2 mph per second. The rear bumper shall 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 4000 lb, at 4 mph parallel to or up to a 30 deg angle to the longitudinal centerline of the bus. The rear bumper shall be shaped to prevent unauthorized riders standing on the bumper. The bumper shall not require service or maintenance in normal operation during the service life of the bus. The bumper may increase the overall bus length specified by no more than 7 in.

TS 70.4 Bumper Material

Bumper material shall be corrosion-resistant and shall withstand repeated impacts of the specified loads without sustaining damage. These bumper qualities shall be sustained throughout the service life of the bus.

TS 71. Finish and Color

TS 71.1 Appearance

All exterior surfaces shall be smooth and free of wrinkles and dents. Exterior surfaces to be painted shall be properly prepared as required by the paint system Supplier prior to application of paint to ensure 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 shall be made prior to cleaning, priming and painting, where possible, to prevent corrosion. The bus shall be painted prior to installation of exterior lights, windows, mirrors and other items that 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 shall be applied smoothly and evenly with the finished surface free of visible dirt and the following other imperfections:

- blisters or bubbles appearing in the topcoat film
- chips, scratches or gouges of the surface finish
- cracks in the paint film
- craters where paint failed to cover due to surface contamination
- overspray
- peeling
- runs or sags from excessive flow and failure to adhere uniformly to the surface
- chemical stains and water spots
- dry patches due to incorrect mixing of paint activators
- buffing swirls

All exterior finished surfaces shall be impervious to diesel fuel, gasoline and commercial cleaning agents. Finished surfaces shall resist damage by controlled applications of commonly used graffiti-removing chemicals.

Proper adhesion between the basic surface and successive coats of the original paint shall be measured using an Elcometer adhesion tester as outlined in ASTM D4541-85. Adhesion shall be a minimum 300 ft-lb. The bus manufacturer shall supply test samples of the exterior surface for each step of the painting process that may be subject to adhesion testing per ASTM G4541-87 and ASTM D4145-85. ASTM D4541-93 may be used for inspection testing during assembly of the vehicle.

DEFAULT

Standard Contractor exterior paint finish quality.

ALTERNATIVE

High Gloss External Paint Finish Quality

Painted surfaces shall have a minimum 95 gloss and an orange peel rating of 7 or more on the Advanced Coating Technologies Inc., orange peel standard panels set #APR 14941 or Agency-accepted wave scan equipment. Paint shall last a minimum of six years with a minimum gloss of 90 as measured in ASTM E97-92, "Standard Test Method For Directional Reflectance."

DEFAULT

Base coat/clear coat paint system.

ALTERNATIVE

Standard OEM exterior paint system.

ALTERNATIVE

Maintenance-Free Exterior Finish, Color Impregnated Panels or Unpainted Panels

Except for periodic cleaning, exterior surfaces of the bus shall be maintenance free, permanently colored and not require refinish/repaint for the life of the vehicle. In general, the exterior surfaces shall be white. Durable, peel-resistant, pressure-sensitive appliques shall be used for any striping and coloring required.

NOTE: The Agency should insert approved paints, color scheme and graphics.

TS 72. Decals, Numbering and Signing

Energy storage and delivery systems shall be identified in accordance with federal, state and local requirements, codes and standards.

ALTERNATIVE

Agency-Specified

Monograms, numbers and other special signing shall be applied to the inside and outside of the bus as required. Signs shall be durable and fade-, chip- and peel-resistant. They may be painted signs, decals or pressure-sensitive appliques. All decals shall be installed per the decal Supplier recommendations. Signs shall be provided in compliance with the ADA requirements defined in 49 CFR Part 38, Subpart B, 38.27.

NOTE: The Agency should supply a list of interior and exterior decals including size and location.

TS 72.1 Passenger Information

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

Requirements for a public information system in accordance with 49 CFR shall be provided.

TS 73. Exterior Lighting

All exterior lights shall be designed to prevent entry and accumulation of moisture or dust. Lamps, lenses and fixtures shall be interchangeable to the extent practicable. Two hazard lamps at the rear of the bus shall be visible from behind when the engine service doors are opened. Light lenses shall be designed and located to prevent damage when running the vehicle through an automatic bus washer.

DEFAULT

Commercially available LED-type lamps shall be used at all exterior lamp locations.

ALTERNATIVE

Contractor to provide details of exterior lighting system.

DEFAULT

Standard Lamps

All LED lamps shall be standard installation of the OEM. The entire assembly shall be specifically coated to protect the light from chemical and abrasion degradation.

ALTERNATIVE

Potted Lamps

LED lamps shall be potted type and designed to last the life of the bus.

DEFAULT

Standard Size

Size of LED lamps used for tail, brake and turn signal lamps shall be standard installation of OEM.

ALTERNATIVE

Larger Size

LED lamps used for tail, brake and turn signal lamps shall be a minimum of sq 7 in.

ALTERNATIVE

Front marker (clearance) lights along with lights located on the roof and sides of the bus shall have protective shields or be of the flush mount type to protect the lens against minor impacts.

TS 73.1 Backup Light/Alarm

Visible and audible warnings shall inform following vehicles or pedestrians of reverse operation. Visible reverse operation warning shall conform to SAE J593. Audible reverse operation warning shall conform to SAE J994 Type C or D.

TS 73.2 Doorway Lighting

Lamps at the front and rear passenger doorways (if applicable) shall comply with ADA requirements and shall activate only when the doors open. These lamps shall illuminate the street surface to a level of no less than 1 footcandle (fc) for a distance of 3 ft 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 shall be shielded to protect passengers' eyes from glare.

TS 73.3 Turn Signals

DEFAULT

Standard Turn Signals

Turn-signal lights shall be provided on the front, rear, curb and street sides of the bus in accordance with federal regulations.

ALTERNATIVE

Wraparound Front Turn Signals

Front turn signals shall be of wraparound design or shall be designed to be visible from the front and the near side of the bus.

TS 73.4 Headlamps

Headlamps shall be designed for ease of replacement.

DEFAULT

Standard Installation

Standard OEM headlamp installation shall be provided in accordance with federal regulations.

ALTERNATIVE

Daytime Running Lights

Headlamps shall incorporate a daytime running light feature.

ALTERNATIVE

LED

Headlamps shall be LED/halogen, sealed beam.

ALTERNATIVE

Specify Design Life

Headlamps' design life to be specified in units of hours by the Agency.

TS 73.5 Brake Lamps

TS 73.5.1 Transit Coach

Brake lamps shall be provided in accordance with federal regulations.

DEFAULT

No High/Center Mount Brake Lamp or Deceleration Warning Lamps

Bus shall not include a high/center mount brake lamp and/or deceleration warning indicator lamps.

ALTERNATIVE

High and Center Mount Red Brake Lamp

Bus shall include red, high and center mount brake lamp(s) along the backside of the bus in addition to the lower brake lamps required under FMVSS. The high and center mount brake lamp(s) shall illuminate steadily with brake application. Agency to specify the size of the high and center mount brake lamp(s).

ALTERNATIVE

High and Center Mount Amber Lamp

Bus shall include amber high and center mount lamp(s) along the backside of the bus that illuminate steadily when the transmission is in forward mode and when the throttle is completely released (0 percent engagement). The amber lamps shall automatically extinguish, regardless of transmission and throttle condition, with brake application. Operation of the amber lamps shall be programmable with the multiplex system. Agency to specify the size of the high and center mount amber lamp(s).

TS 73.5.2 Commuter Coach

Brake lamps shall be provided in accordance with federal regulations.

Bus shall include red, high and center mount brake lamp(s) along the back side of the bus in addition to the lower brake lamps required under FMVSS. The high and center mount brake lamp(s) shall illuminate steadily with brake application.

TS 73.6 Service Area Lighting (Interior and Exterior)

LED lamps shall 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. These service areas shall include, but not be limited to, the engine compartment, the communication box, junction/apparatus panels and passenger door operator compartments. Lighting shall be adequate to light the space of the service areas to levels needed to complete typical emergency repairs and adjustments. The service area lamps shall be suitable for the environment in which they are mounted.

Engine compartment lamps shall be controlled by a switch mounted near the rear start controls or in an approved location. All other service area lamps shall be controlled by switches mounted on or convenient to the lamp assemblies. Power to the service area lighting shall be programmable. Power shall latch on with activation of the switch and shall be automatically discontinued (timed out) after 30 minutes to prevent damage caused by inadvertently leaving the service area lighting switch in the “on” position after repairs are made.

INTERIOR PANELS AND FINISHES

TS 74. General Requirements

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

Interior surfaces more than 10 in. 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. Any components and other electrical components within close proximity to these surfaces shall also be resistant to this cleaning method.

DEFAULT

No requirement for anti-graffiti/vandalism surface treatments.

ALTERNATIVE

Requirements for additional anti-graffiti/vandalism treatments for interior surfaces.

ALTERNATIVE

Internal surfaces, as possible, to be stainless steel or other resistant material.

NOTE: Any additional weight added to a battery bus will reduce vehicle range.

TS 75. Interior Panels

Panels shall be easily replaceable and tamper-resistant. They shall be reinforced, as necessary, to resist vandalism and other rigors of transit bus service. Individual trim panels and parts shall be interchangeable to the extent practicable.

DEFAULT

Interior panel required to meet FMVSS 302.

ALTERNATIVE

Fire Resistance

Materials shall comply with the Recommended Fire Safety Practices defined in FTA Docket 90-A, dated Oct. 20,1993.

ALTERNATIVE

Textured stainless steel.

NOTE: Any additional weight added to a battery bus will reduce vehicle range.

ALTERNATIVE

Anodized or powder-coated aluminum.

ALTERNATIVE

Composite.

ALTERNATIVE

Scratch-resistant plastic.

ALTERNATIVE

Melamine-type material.

ALTERNATIVE

Carpeting or fabric.

TS 75.1 Driver Area Barrier

TS 75.1.1 Transit Coach

A barrier or bulkhead between the driver and the street-side front passenger seat shall be provided. The barrier shall minimize glare and reflections in the windshield directly in front of the barrier from interior lighting during night operation. Location and shape must permit full seat travel and reclining possibilities that can accommodate the shoulders of a 95th-percentile male. The partition shall have a side return and stanchion to prevent passengers from reaching the driver by standing behind the driver's seat. The lower area between the seat and panel must be accessible to the driver. The partition must be strong enough in conjunction with the entire partition assembly for mounting of such equipment as flare kits, fire extinguishers (1.2 kg), microcomputer, public address amplifier, etc. The panel should be properly attached to minimize noise and rattles.

DEFAULT (TRANSIT COACH)

Wheel-Well-to-Ceiling Configuration of Driver's Barrier

The driver's barrier shall extend from the top of the wheel well to the ceiling the level of the seated driver and shall fit close to the bus-side windows and wall to prevent passengers from reaching the driver or the driver's personal effects.

ALTERNATIVE

Full-Height (Floor-to-Ceiling) Configuration of Driver's Barrier

The driver's barrier shall extend continuously from the floor area to the ceiling and from the bus wall to the first stanchion immediately behind the driver to provide security to the driver and to limit passenger conversation.

ALTERNATIVE

Driver enclosure or door.

TS 75.1.2 Commuter Coach

A barrier or bulkhead between the driver and the street-side front passenger seat shall be provided. The barrier shall minimize glare and reflections in the windshield directly in front of the barrier from interior lighting during night operation. Location and shape must permit full seat travel and reclining possibilities that can accommodate the shoulders of a 95th-percentile male. The partition shall have a side return and stanchion to prevent passengers from reaching the driver by standing behind the driver's seat. The lower area between the seat and panel must be accessible to the driver. The partition must be strong enough in conjunction with the entire partition assembly for mounting of such equipment as flare kits, fire extinguishers (1.2 kg), microcomputer, public address amplifier, etc. The panel should be properly attached to minimize noise and rattles.

The driver's barrier shall extend from the floor area to the ceiling and from the bus wall to the first stanchion immediately behind the driver to provide security to the driver and to limit passenger conversation.

TS 75.2 Modesty Panels

Sturdy divider panels constructed of durable, unpainted, corrosion-resistant material complementing the interior shall be provided to act as both a physical and visual barrier for seated passengers.

Design and installation of modesty panels located in front of forward-facing seats shall include a handhold or grab handle along their top edge. These dividers shall be mounted on the sidewall and shall project toward the aisle no farther than passenger knee projection in longitudinal seats or the aisle side of the transverse seats. Modesty panels shall extend from at least the window opening of the side windows, and those forward of transverse seats shall extend downward to 1 and 1½ in. above the floor. Panels forward of longitudinal seats shall extend to below the level of the seat cushion. Dividers positioned at the doorways, where applicable, shall provide no less than a 2½ in. clearance between the modesty panel and a fully open, inward opening door, or the path of a deploying flip-out ramp to protect passengers from being pinched. Modesty panels installed at doorways shall be equipped with grab rails if passenger assists are not provided by other means.

The modesty panel and its mounting shall withstand a static force of 250 lb applied to a 4 × 4 in. area in the center of the panel without permanent visible deformation.

DEFAULT

Modesty panels shall be installed as stated.

ALTERNATIVE

Additional floor clearances for cleaning, toe clearance.

ALTERNATIVE

Clear non-glass panel from above the modesty panel to the top of the daylight opening and attached to the stanchion.

TS 75.3 Front End

The entire front end of the bus shall be sealed to prevent debris accumulation behind the dash and to prevent the driver's feet from kicking or fouling wiring and other equipment. The front end shall be free of protrusions that are hazardous to passengers standing at the front of the standee line area of the bus during rapid decelerations. Paneling across the front of the bus and any trim around the driver's compartment shall be formed metal or composite material. Composite dash panels shall be reinforced as necessary, vandal-resistant and replaceable. All colored, painted and plated parts forward of the driver's barrier shall be finished with a surface that reduces glare. Any mounted equipment must have provision to support the weight of equipment.

TS 75.4 Rear Bulkhead

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

The rear bulkhead paneling shall be contoured to fit the ceiling, sidewalls and seat backs so that any litter or trash will tend to fall to the floor or seating surface when the bus is on a level surface. Any air vents in this

area shall be louvered to reduce airflow noise and to reduce the probability of trash or liter being thrown or drawn through the grille. If it is necessary to remove the panel to service components located on the rear bulkhead, then the panel shall be hinged or shall be able to be easily removed and replaced. Grilles where access to or adjustment of equipment is required shall be heavy duty and designed to minimize damage and limit unauthorized access.

TS 75.5 Headlining

Ceiling panels shall be made of durable, corrosion resistant, easily cleanable material. 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 members. Moldings and trim strips, as required to make the edges tamperproof, shall be stainless steel, aluminum or plastic, colored to complement the ceiling material. Headlining panels covering operational equipment that is mounted above the ceiling shall be on hinges for ease of service but retained to prevent inadvertent opening.

TS 75.6 Fastening

Interior panels shall be attached so that there are no exposed unfinished, rough edges or rough surfaces. Fasteners should be corrosion resistant. Panels and fasteners shall not be easily removable by passengers. Exposed interior fasteners should be minimized, and where required shall be tamper-resistant.

TS 75.7 Insulation

Any insulation material used between the inner and outer panels shall minimize the entry and/or retention of moisture. Insulation properties shall be unimpaired during the service life of the bus. Any insulation material used inside the engine compartment shall not absorb or retain oils or water and shall be designed to prevent casual damage that may occur during maintenance operations.

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

DEFAULT

FTA Docket 90-A

All insulation materials shall comply with the Recommended Fire Safety Practices defined in FTA Docket 90-A, dated Oct. 20, 1993.

ALTERNATIVE

FMVSS 302

Insulation shall meet the requirements of FMVSS 302.

TS 75.8 Floor Covering

The floor covering shall have a nonskid walking surface that remains effective in all weather conditions. The floor covering, as well as transitions of flooring material to the main floor and to the entrance and exit area, shall be smooth and present no tripping hazards. Seams shall be sealed/welded per manufacturer's specifications. The color and pattern shall be consistent throughout the floor covering. The standee line shall

be approximately 2 in. wide and shall extend across the bus aisle and contrast with the rest of the floor covering.

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

The floor shall be easily cleaned and shall be arranged to minimize debris accumulation.

A one-piece center strip shall 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 the center strip shall 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 shall extend from the center strip to the outboard edge of the rear/exit area.

The floor under the seats shall be covered with smooth surface flooring material. The floor covering shall closely fit the sidewall in a fully sealed butt joint or extend to the top of the cove.

TS 75.9 Interior Lighting

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

The lens material shall be translucent polycarbonate. Lenses shall be designed to effectively “mask” the light source. Lenses shall be sealed to inhibit incursion of dust and insects yet be easily removable for service. Access panels shall be provided to allow servicing of components located behind light panels. If necessary, the entire light fixture shall be hinged.

TS 75.10 Passenger Area Lighting

DEFAULT

First Row Lights

The first light on each side (behind the driver and the front door) is normally turned on only when the front door is opened, in “night run” and “night park.” As soon as the door closes, these lights shall go out. These lights shall be turned on at any time if the switch is in the “on” position.

ALTERNATIVE

Dimming Second Row Lights

To help eliminate windshield reflection on suburban roads where street lighting is at a low level, the second light on each side, when “night run” or “night park” is selected, shall be controlled by the switch; off in “off” and on in “normal.” These lights shall be turned on at any time if the switch is in the “on” position.

All interior lighting shall be turned off whenever the vehicle is in reverse and the engine run switch is in the “on” position.

The interior lighting design shall require the approval of the Agency.

DEFAULT

LED lights.

ALTERNATIVE

Fluorescent Lights

Fluorescent tubes shall be a maximum 6 ft in length, single-pin, T-12 type (with exceptions granted for extinguishing or dimming fixtures, as noted below).

Individual ballast units shall be provided for each light fixture. Ballast shall have a fire-resistant housing, minimum operating frequency of above audible range, reverse polarity protection and integrated circuit breaker/automatic thermal protection.

ALTERNATIVE

Enhanced design ballast that minimizes arcing and carries a type and CC UL935 certification.

DEFAULT

First Light Modules Dim/Extinguish When Front Door Is Closed

When the master switch is in the “run” or “night/run” mode, the first light module on each side of the coach shall automatically extinguish or dim when the front door is in the closed position and illuminate when the door is opened.

ALTERNATIVE

No Dimming/Extinguishing of First Light Modules When Front Door Is Closed

No dimming/extinguishing feature of first light modules shall be provided.

TS 75.11 Driver’s Area Lighting

The driver’s area shall have a light to provide general illumination, and it shall illuminate the half of the steering wheel nearest the driver to a level of 5 to 10 fc.

TS 75.12 Seating Area Lighting (Transit Coach)

The interior lighting system shall provide a minimum 15 fc illumination on a 1 sq ft plane at an angle of 45 deg from horizontal, centered 33 in. above the floor and 24 in. in front of the seat back at each seat position. Allowable average light level for the rear bench seats shall be 7 fc.

TS 75.13 Seating Area Lighting (Commuter Coach)

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. 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 in. (432 mm). Interior window post caps shall be ABS, 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 in. (1016 mm) apart. Total capacity shall be a minimum 109 cu ft (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; an exit signal push button, red in color; and individual air distribution outlets. These outlets shall be adjustable from fully closed to fully open position. A minimum of 26 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 using 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.

ALTERNATIVE

Parcel rack air conditioning will be provided.

TS 75.14 Vestibules/Doors Lighting (Transit Coach)

Floor surface in the aisles shall be a minimum of 10 fc, and the vestibule area a minimum of 4 fc with the front doors open and a minimum of 2 fc with the front doors closed. The front entrance area and curb lights shall illuminate when the front door is open and the master run switch is in the “lights” or “night run” position. Rear exit area and curb lights shall illuminate when the rear door is unlocked.

TS 75.15 Vestibules/Doors Lighting (Commuter Coach)

Floor surface in the aisles shall be a minimum of 2 fc, and the vestibule area in accordance with ADA requirements.

TS 75.16 Step Lighting

Step lighting for the intermediate steps between lower and upper floor levels shall be a minimum of 4 fc and shall illuminate in all vehicle run positions. The step lighting shall be low profile to minimize tripping and snagging hazards for passengers and shall be shielded as necessary to protect passengers’ eyes from glare.

TS 75.17 Ramp Lighting (Transit Coach)

Exterior and interior ramp lighting shall comply with federal regulations.

TS 75.18 Turntable Lighting (Articulated Coach)

Lighting in the turntable can be reduced to 7 fc.

TS 75.19 Farebox/Card Reader Lighting

TS 75.19.1 Transit Coach

DEFAULT (TRANSIT COACH)

Farebox Light

A light fixture shall be mounted in the ceiling above the farebox location. The fixture shall 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.

ALTERNATIVE (TRANSIT COACH)

No farebox light.

ALTERNATIVE (TRANSIT COACH)

Card Reader Light

A light fixture shall be mounted in the ceiling above the card reader location. The fixture shall be capable of projecting a concentrated beam of light on the card reader. 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.

ALTERNATIVE (TRANSIT COACH)

Provide a farebox and card reader light.

TS 75.19.2 Commuter Coach

DEFAULT (COMMUTER COACH)

No farebox light.

ALTERNATIVE (COMMUTER COACH)

Farebox Light

A light fixture shall be mounted in the ceiling above the farebox location. The fixture shall 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.

TS 76. Fare Collection

Space and structural provisions shall be made for installation of currently available fare collection devices, which shall be as far forward as practicable. Location of the fare collection device shall not restrict traffic in the vestibule, including wheelchairs if a front door loading device is used, and shall allow the driver to easily reach the farebox controls and to view the fare register. The farebox shall not restrict access to the driver’s area, shall not restrict operation of driver controls, and shall not—either by itself or in combination with stanchions, transfer mounting, cutting and punching equipment, or route destination signs—restrict the driver’s field of view per SAE J1050. The location and mounting of the fare collection device shall allow use, without restriction, by passengers. The farebox location shall permit accessibility to the vault for easy manual removal or attachment of suction devices. Meters and counters on the farebox shall be readable on a daily

basis. The floor under the farebox shall be reinforced as necessary to provide a sturdy mounting platform and to prevent shaking of the farebox.

Contractor shall provide fare collection installation layout to the Agency for approval.

Transfer mounting, cutting and punching equipment shall be located in a position convenient to the driver.

DEFAULT

Agency will install its own farebox/card reader.

ALTERNATIVE

Agency will specify a farebox/card reader for Contractor to install.

TS 77. Interior Access Panels and Doors (Transit Coach)

Access for maintenance and replacement of equipment shall be provided by panels and doors that appear to be an integral part of the interior. Access doors shall be hinged with gas props or overcenter springs, where practical, to hold the doors out of the mechanic's way. Panels shall prevent entry of mechanism lubricant into the bus interior. All fasteners that retain access panels shall be captive in the cover.

DEFAULT

Access Doors That Do Not Require Tools or Keys to Open

Access doors shall be secured with hand screws or latches. All fasteners that retain access panels shall be captive in the cover.

ALTERNATIVE

Access Doors with Locks

Access doors shall be secured with locks. The locks shall be standardized so that only one tool is required to open access doors on the bus.

TS 77.1 Floor Panels

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

The number of special fastener tools required for panel and access door fasteners shall be minimized.

PASSENGER ACCOMMODATIONS

TS 78. Passenger Seating

TS 78.1 Arrangements and Seat Style (Transit Coach)

The passenger seating arrangement in the bus shall be such that seating capacity is maximized and in compliance to the following requirements.

NOTE: The Agency recognizes that ramp location, foot room, hip-to-knee room, doorway type, width, seat construction, floor level type, seat spacing requirements, ramp or lift, number of wheelchair positions, etc. ultimately affect seating capacity and layout.

DEFAULT

Forward-Facing Seat Configuration

Passenger seats shall be arranged in a transverse, forward-facing configuration, except at the wheel housings and turntable, if applicable, 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).

ALTERNATIVE

Reclining seats.

ALTERNATIVE

Perimeter Seating Arrangement

Passenger seats shall be arranged in longitudinal rows facing the centerline of the bus. One row of transverse, forward-facing seats shall be provided at the rear of the bus. Each seat shall have a minimum width of 17 in., not including any armrest. Seating capacity with this arrangement shall be no fewer than [insert number] seated passengers, not including the driver, with the specified seating arrangement.

ALTERNATIVE

Combination Forward-Facing and Perimeter Seating Arrangement

Passenger seats shall be arranged in a transverse, two-position forward-facing configuration at the front section of the bus, and in longitudinal rows facing the centerline of the bus with one row of transverse, forward-facing seats provided at the rear of the bus. Each seat shall have a minimum width of 17 in., not including any armrest. Seating capacity with this arrangement shall be no fewer than [insert number] seated passengers, not including the driver, with the specified seating arrangement.

TS 78.2 Rearward Facing Seats (Transit Coach)

DEFAULT

Rearward facing seats not allowed.

ALTERNATIVE

Allow rearward facing seats.

TS 78.3 Turntable Seating (Articulated Coach)

DEFAULT

Handholds or leaning rail.

ALTERNATIVE

Seats.

TS 78.4 Padded Inserts/Cushioned Seats (Transit Coach)

DEFAULT

Non-Padded Inserts, Unupholstered

The passenger seats shall be equipped with unupholstered inserts throughout the bus.

ALTERNATIVE

Non-Padded Inserts, Upholstered

The seats shall be equipped with upholstered vandal-resistant inserts throughout the bus.

ALTERNATIVE

Padded Inserts

The passenger seats shall be equipped with padded inserts throughout the bus (measure to uncompressed surface).

ALTERNATIVE

Fully Cushioned Seats

The passenger seats shall be fully cushioned throughout the bus (measure to compressed surface, 150-lb person).

ALTERNATIVE

Combination Insert Seating Padded Inserts and Fully Cushioned

The passenger seats in the front section shall be equipped with inserts of choice and those in the rear (aft of the rear/exit door) shall be equipped with inserts of choice.

TS 78.5 Seat Back Configuration

DEFAULT

Back Insert Seat Configuration

The seat back insert thickness shall not exceed 1 in. in the knee room area.

ALTERNATIVE

Cushioned backs

Seating and interior trim shall have features to improve passenger comfort. The seat cushion and back shall be padded with a cellular foam product and be no less than ½ in. thick in areas contacted and loaded by passengers in the normal seated position and shall be covered with vinyl and/or fabric material.

Seats, back cushions and other pads shall be securely attached and shall be detachable by means of a simple release mechanism so that they are easily removable by the maintenance staff but not by passengers. To the extent practicable, seat cushions and pads shall be interchangeable throughout the bus. Materials shall have high resistance to tearing, flexing and wetting.

ALTERNATIVE

Cushioned Seat Configuration

Seating and interior trim shall have features to maximize passenger comfort. The seat cushion shall be supported by springs. The seat cushion and back shall be padded with a cellular foam product and be no less than 2 in. thick in areas contacted and loaded by passengers in the normal seated position and shall be upholstered with vinyl and/or fabric materials.

Seats, back cushions and other pads shall be securely attached and shall be detachable by means of a simple release mechanism so that they are easily removable by maintenance personnel but not by passengers. To the extent practicable, seat cushions and pads shall be interchangeable throughout the bus. Materials shall have high resistance to tearing, flexing and wetting.

ALTERNATIVE

Combination of Inserts

The passenger seats in the front section shall be equipped with [insert type] inserts, and those in the rear (aft of the rear/exit door) shall be equipped with [insert type] inserts.

TS 78.6 Drain Hole in Seats

DEFAULT

No requirements for drain hole provision in seat inserts.

ALTERNATIVE

Requirement for Drain Hole Provision in Seat Inserts

Provision, such as a small grommeted hole, to allow drainage shall be incorporated into seat insert. (Drain through hole, ¼ in. through hole, bottom seat only, one per seat.)

TS 78.7 Arrangements and Seat Style (Commuter Coach)

DEFAULT

Forward-Facing Seat Configuration

Passenger seats shall be arranged in forward-facing configuration with a minimum of 55 reclining and cushioned passenger seats. Contractor to provide seat layout to the Agency once the Agency has provided the seat manufacturer and model number.

ALTERNATIVE

Agency to specify options such as cup holder, head rests, foot rests, etc.

TS 78.8 Hip-to-Knee Room

Hip-to-knee room measured from the center of the seating position, from the front of one seat back horizontally across the highest part of the seat to a vertical surface immediately in front, shall be a minimum of 26 in. At all seating positions in paired transverse seats immediately behind other seating positions, hip-to-knee room shall be no less than 27 in.

TS 78.9 Foot Room

Foot room, measured at the floor forward from a point vertically below the front of the seat cushion, shall be no less than 14 in. Seats immediately behind the wheel housings and modesty panels may have foot room reduced (Agency will approve acceptable dimensions).

TS 78.10 Aisles (Transit Coach)

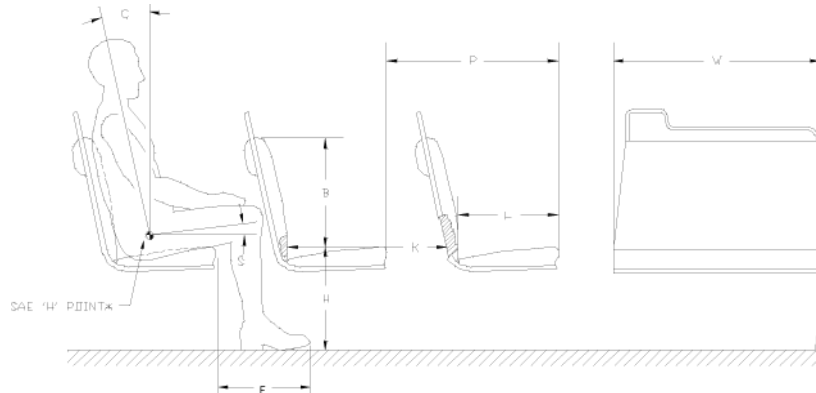
The aisle between the seats shall be no less than 22 in. wide at seated passenger hip height. Seat backs shall be shaped to increase this dimension to no less than 24 in. at 32 in. above the floor (standing passenger hip height).

TS 78.11 Aisles (Commuter Coach)

The aisle between the seats shall be no less than 14 in. wide at seated passenger hip height.

TS 78.12 Dimensions (Transit Coach)

FIGURE 6
Seating Dimensions and Standard Configuration



DEFAULT

Seat dimensions for the various seating arrangements shall have the dimensions as follows (refer to **Figure 6**):

- The width, W, of the two-passenger transverse seat shall be a minimum 35 in.
- The length, L, shall be 17 in., ± 1 in.
- The seat back height, B, shall be a minimum of 15 in.
- The seat height, H, shall be 17 in., ± 1 in. For the rear lounge (or settee) and longitudinal seats, and seats located above raised areas for storage of underfloor components, a cushion height of up to 18 in., ± 2 in., will be allowed. This shall also be allowed for limited transverse seats, but only with the express approval of the Agency.
- Foot room = F.
- The seat cushion slope, S, shall be between 5 and 11 deg.
- The seat back slope, C, shall be between 8 and 17 deg.
- Hip to knee room = K.
- The pitch, P, is shown as reference only.

ALTERNATIVE

Agency to specify seat dimensions.

TS 78.13 Structure and Design (Transit Coach)

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

Seats, structures and restraints around the securement area should not infringe into the mobility device envelope or maneuverability.

The transverse seat structure shall be fully cantilevered from the sidewall with sufficient strength for the intended service. The lowest part of the seat assembly that is within 12 in. of the aisle shall be at least 10 in. above the floor.

In locations at which cantilevered installation is precluded by design and/or structure, other seat mounting may be allowed.

All transverse objects—including seat backs, modesty panels and longitudinal seats—in front of forward-facing seats shall not impart a compressive load in excess of 1000 lb onto the femur of passengers ranging in size from a 5th-percentile female to a 95th-percentile male during a 10g deceleration of the bus. This deceleration shall peak at 0.05 to 0.015 seconds from initiation. Permanent deformation of the seat resulting from two 95th-percentile males striking the seat back during this 10g deceleration shall not exceed 2 in., measured at the aisle side of the seat frame at height H. The seat back should not deflect more than 14 in., 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 shall not introduce a laceration hazard.

The seat assembly shall withstand static vertical forces of 500 lb applied to the top of the seat cushion in each seating position with less than ¼ in. permanent deformation in the seat or its mountings. The seat assembly shall withstand static horizontal forces of 500 lb evenly distributed along the top of the seat back with less than ¼ in. permanent deformation in the seat or its mountings. The seat backs at the aisle position and at the window position shall withstand repeated impacts of two 40 lb sandbags without visible deterioration. One sandbag shall strike the front 40,000 times and the other sandbag shall strike the rear 40,000 times. Each sandbag shall be suspended on a 36 in. pendulum and shall strike the seat back 10,000 times each from distances of 6, 8, 10 and 12 in. Seats at both seating positions shall withstand 4000 vertical drops of a 40 lb sandbag without visible deterioration. The sandbag shall be dropped 1000 times each from heights of 6, 8, 10 and 12 in. Seat cushions shall withstand 100,000 randomly positioned 3½ in. drops of a squirming, 150 lb, smooth-surfaced, buttocks-shaped 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 shall incorporate a handhold no less than 7⁄8 in. in diameter for standees and seat access/egress. The handhold shall not be a safety hazard during severe decelerations. The handhold shall extend above the seat back near the aisle so that standees shall have a convenient vertical assist, no less than 4 in. long, that may be grasped with the full hand. This handhold shall not cause a standee using this assist to interfere with a seated 50th-percentile male passenger. The handhold shall 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 shall be padded and/or constructed of energy-absorbing materials. During a 10g deceleration of the bus, the HIC number (as defined by SAE J211a) shall 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 a vertical assist is provided.

Longitudinal seats shall be the same general design as transverse seats but without seat back handholds. Longitudinal seats may be mounted on the wheelhouses. Armrests shall 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 driver's barrier or a modesty panel, when 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 3½ in. of the end of the seat cushion. Armrests shall be located from 7 to 9 in. above the seat cushion surface. The area between the armrest and the seat cushion shall be closed by a barrier or panel. The top and sides of the armrests shall have a minimum width of 1 in. and shall be free from sharp protrusions that form a safety hazard.

Seat back handhold and armrests shall withstand static horizontal and vertical forces of 250 lb applied anywhere along their length with less than ¼ in. permanent deformation. Seat back handhold and armrests shall withstand 25,000 impacts in each direction of a horizontal force of 125 lb with less than ¼ in. permanent deformation and without visible deterioration.

TS 78.14 Structure and Design (Commuter Coach)

Passenger seats shall be arranged in a transverse, forward-facing configuration.

No more than 10 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.

Seats shall be commuter coach reclining seats. Seat frames shall be constructed of high-strength, fatigue-resistant, welded steel with a durable powder-coated, corrosion-resistant colored finish that 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 a minimum of 1 in. to a maximum of 5 in. (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 a minimum of 36 in. and a maximum of 40.50 in. (1029 mm). Aisle shall not be less than 14 in. (356 mm) wide.

TS 78.15 Construction and Materials (Transit Coach)

Selected materials shall minimize damage from vandalism and shall reduce cleaning time. The seats shall be attached to the frame with tamper-resistant fasteners. Coloring shall be consistent throughout the seat material, with no visually exposed portion painted. Any exposed metal touching the sides or the floor of the bus shall be stainless steel. The seat, pads and cushions shall be contoured for individuality, lateral support and maximum comfort and shall fit the framework to reduce exposed edges.

The minimum radius of any part of the seat back, handhold or modesty panel in the head or chest impact zone shall be a nominal ¼ in. The seat back and seat back handhold immediately forward of transverse seats shall be constructed of energy-absorbing materials to provide passenger protection and, in a severe crash, to allow the passenger to deform the seating materials in the impact areas. Complete seat assemblies shall be interchangeable to the extent practicable.

TS 78.16 Construction and Materials (Commuter Coach)

Seat cushions shall be supported by steel serpentine springs. Seat covering shall be high-quality wool fabric or vinyl. Wool fabric shall be tested to a minimum of 60,000 rubs per the Wyzendeek test method.

Seat foam padding shall be polyurethane. Seat upholstery shall be able to be removed with ease for cleaning/replacement purposes.

DEFAULT

Agency to select seat fabric.

ALTERNATIVE

Contractor will select seat fabric on the basis of durability, ease of maintenance and pleasing texture and appearance.

TS 79. Passenger Assists (Transit Coach)

Passenger assists in the form of full grip, vertical stanchions or handholds shall be provided for the safety of standees and for ingress/egress. Passenger assists shall be convenient in location, shape and size for both the 5th-percentile female standee and the 95th-percentile male standee. Starting from the entrance door and moving anywhere in the bus and out the exit door, a vertical assist shall be provided either as the vertical portion of the 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 then the other without losing support. All handholds and stanchions at the front doorway, around the farebox, and at interior steps for bi-level designs shall be powder-coated in a high-contrast yellow color.

ALTERNATIVE

The forward-most vertical stanchions on either side of the aisle immediately behind the driver's area shall be powder-coated black.

ALTERNATIVE

The forward-most vertical stanchions on either side of the aisle immediately behind the driver's area shall be powder-coated yellow.

ALTERNATIVE

The forward-most vertical stanchions on either side of the aisle immediately behind the driver's area shall be a stainless steel finish.

TS 79.1 Assists (Transit Coach)

Excluding those mounted on the seats and doors, the assists shall have a cross-sectional diameter between 1¼ and 1½ in. or shall provide an equivalent gripping surface with no corner radii less than ¼ in. All passenger assists shall permit a full hand grip with no less than 1½ in. of knuckle clearance around the assist. Passenger assists shall be designed to minimize catching or snagging of clothes or personal items and shall be capable of passing the NHTSA Drawstring Test.

Any joints in the assist structure shall be underneath supporting brackets and securely clamped to prevent passengers from moving or twisting the assists. Seat handholds may be of the same construction and finish as the seat frame. Door-mounted passenger assists shall be of anodized aluminum, stainless steel or powder-coated metal. Connecting tees and angles may be powder-coated metal castings. Assists shall withstand a force of 300 lb applied over a 12 in. 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, shall be designed to eliminate pinching, snagging and cutting hazards and shall be free from burrs or rough edges.

TS 79.2 Front Doorway

Front doors, or the entry area, shall be fitted with ADA-compliant assists. Assists shall be as far outward as practicable, but shall be located no farther inboard than 6 in. from the outside edge of the entrance step 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, the vertical assist and the assists on the wheel housing or on the front modesty panel.

TS 79.3 Vestibule (Transit Coach)

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

A horizontal passenger assist shall be located across the front of the bus and shall 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 shall provide support for a boarding passenger from the front door through the fare collection procedure. The assist shall be no less than 36 in. above the floor. The assists at the front of the bus shall 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 driver's barrier, wheel housings or front modesty panel.

TS 79.4 Rear Doorway(s) (Transit Coach)

Vertical assists that are functionally continuous with the overhead assist shall 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 shall be provided on modesty panels that are functionally continuous with the rear door assists. Rear doors, or the exit area, shall be fitted with assists having a cross-sectional diameter between 1¼ and 1½ in. or providing an equivalent gripping surface with no corner radii less than ¼ in., and shall provide at least 1½ in. of knuckle clearance between the assists and their mounting. The assists shall be designed to permit a 5th-percentile female to easily move from one assist to another during the entire exiting process. The assists shall be located no farther inboard than 6 in. from the outside edge of the rear doorway step.

NOTE: For an articulated bus, passenger assists will be provided to aid in the transition between the front and rear sections of the bus.

TS 79.5 Overhead (Transit Coach)

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

DEFAULT

No requirements for overhead grab straps/extensions.

ALTERNATIVE

Grab straps or other extensions as necessary shall be provided for sections where vertical assists are not available and for use by passengers who cannot reach to 70 in.

DEFAULT

Grab straps shall be stainless steel.

ALTERNATIVE

Grab straps shall be fabric.

ALTERNATIVE

Grab straps shall be flip-up/non-flip.

ALTERNATIVE

Grab straps shall be leather.

ALTERNATIVE

Grab straps shall be plastic.

Overhead assists shall simultaneously support 150 lb on any 12 in. length. No more than 5 percent of the full grip feature shall be lost due to assist supports.

TS 79.6 Longitudinal Seat Assists (Transit Coach)

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

TS 79.7 Wheel Housing Barriers/Assists (Transit Coach)

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

TS 80. Passenger Doors

TS 80.1 Transit Coach

Doorways will be provided in locations and styles as follows. Passenger doors and doorways shall comply with ADA requirements.

TS 80.1.1 Front door

DEFAULT

Door shall be forward of the front wheels and under direct observation of the driver.

TS 80.1.2 Rear Door(s)

ALTERNATIVE

Curbside doorway centerline located rearward of the point midway between the front door centerline and the rearmost seat back.

ALTERNATIVE

Curbside doorway located behind the rear axle.

ALTERNATIVE

Street-side rearward of the point midway between the front door centerline and the rearmost seat back.

ALTERNATIVE

Street-side located behind the rear axle.

ALTERNATIVE (ARTICULATED BUS)

Curbside located forward of the rear axle of the trailer section.

ALTERNATIVE (ARTICULATED BUS)

Street-side located forward of the rear axle of the trailer section.

ALTERNATIVE (ARTICULATED BUS)

Curbside, located forward of the center axle.

In cases where street-side and curbside doors are chosen, provisions shall be made for operating the front door, curbside rear door(s) and street-side rear door(s) independently or in the combinations shown in **Table 7** while providing positive tactile feedback to the operator identifying the door control selection.

TABLE 7
 Door Operating Combinations

| Front | Curbside Rear | Street-Side Rear |
|--------|---------------|------------------|
| Closed | Closed | Closed |
| Open | Closed | Closed |
| Open | Open | Closed |
| Open | Closed | Open |
| Open | Open | Open |
| Closed | Open | Closed |
| Closed | Closed | Open |
| Closed | Open | Open |

DEFAULT

If air-powered, the door system shall operate per specification at air pressures between 90 and 130 psi.

ALTERNATIVE

Electric-powered doors.

TS 80.2 Commuter Coach

TS 80.2.1 Front door

DEFAULT

Forward of the front wheels and under direct observation of the driver.

TS 80.3 Materials and Construction

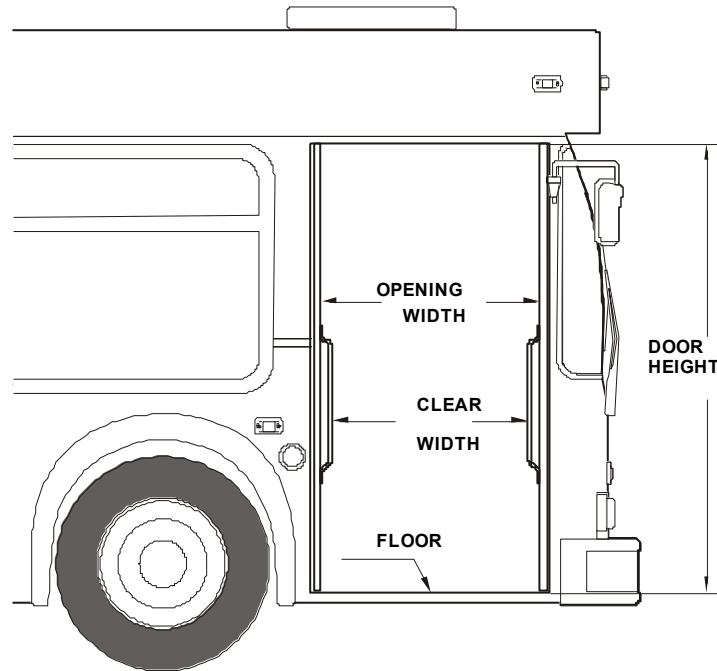
Structure of the doors, their attachments, inside and outside trim panels and any mechanism exposed to the elements shall be corrosion resistant. Door panel construction shall be of corrosion-resistant metal or reinforced non-metallic composite materials. When fully opened, the doors shall provide a firm support and shall not be damaged if used as an assist by passengers during ingress or egress. Door edges shall be sealed to prevent infiltration of exterior moisture, noise, dirt and air elements from entering the passenger compartment, to the maximum extent possible based on door types.

The closing edge of each door panel shall have no less than 2 in. of soft weather stripping. The doors, when closed, shall be effectively sealed, and the hard surfaces of the doors shall be at least 4 in. apart (not applicable to single doors). The combined weather seal and window glazing elements of the front door shall not exceed 10 deg of binocular obstruction of the driver’s view through the closed door.

TS 80.4 Dimensions

TS 80.4.1 Transit Coach

FIGURE 7
Transit Bus Minimum Door Opening



TRANSIT BUS MINIMUM DOOR OPENING

When open, the doors shall leave an opening no less than 75 in. in height.

DEFAULT

31¾ in. Minimum Doorway Clear Width

Front door clear width shall be a minimum of 31¾ in. with the doors fully opened. Rear door opening clear width shall be a minimum of 24 in. with the doors fully opened. If a rear door ramp or lift is provided, then the clear door opening width shall be a minimum of 31¾ in. with door fully opened.

ALTERNATIVE

Doorway Clear Width Greater than 31¾ in.

The front door clear width shall be a minimum of [insert number] in. with the doors fully opened. The rear door clear width shall be a minimum of [insert number] in. with the doors fully opened.

If the Agency requires a minimum rear door clear width of 31¾ in. or greater and an outward opening (swing) door is specified, then the maximum outboard excursion of 13 in. may be exceeded.

TS 80.4.2 Commuter Coach

Minimum doorway width per ADA requirements.

TS 80.5 Door Glazing

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

Door glazing shall be easily replaceable.

DEFAULT

Zip type glazing rubber.

ALTERNATIVE

Quick change glazing exterior frame.

ALTERNATIVE

Full exterior glass quick change glazing hidden frame (tempered glass only).

ALTERNATIVE

Bonded or adhesive.

DEFAULT

The front door panel glazing material shall have a nominal ¼ in. thick laminated safety glass conforming with the requirements of ANSI Z26.1 Test Grouping 2 and the recommended practices defined in SAE J673.

ALTERNATIVE

The front door panel glazing material shall have a nominal ¼ in. thick tempered glass conforming with 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 shall be defined by the Agency.

TS 80.6 Door Projection (Transit Coach)

TS 80.6.1 Exterior

The exterior projection of the front doors beyond the side of the bus shall be minimized and shall not block the line of sight of the rear exit door via the curbside mirror when the doors are fully open. The exterior projection of both doors shall be minimized and shall not exceed 14 in. during the opening or closing cycles or when doors are fully opened.

TS 80.6.2 Interior

Projection inside the bus shall not cause an obstruction of the rear door mirror or cause a hazard for standees.

TS 80.7 Door Height Above Pavement

It shall be possible to open and close either passenger door when the bus, loaded to gross vehicle weight rating, is not knelt and parked with the tires touching an 8 in. high curb on a street sloping toward the curb so that the street-side wheels are 5 in. higher than the right-side wheels.

TS 80.8 Closing Force

Closing door edge speed shall not exceed 12 in. per second, and opening door speed shall not exceed 19 in. per second. Power doors shall not slam closed under any circumstance, even if the door is obstructed during the closing cycle. If a door is obstructed during the closing cycle, the pressure exerted on the obstruction shall not increase once initial contact has been made.

Doors closed by a return spring or counterweight-type device shall be equipped with an obstruction-sensing device that, at a minimum, alerts the driver if an obstruction is detected between the closing doors. Doors closed by a return spring or counterweight type device, when unlocked, shall be capable of being pushed to the point where the door starts to open with a force not to exceed 25 lb applied to the center edge of the forward door panel.

Whether or not the obstruction-sensing system is present or functional, it shall be possible to withdraw a 1½ in. diameter cylinder from between the center edges of a closed and locked door with an outward force not greater than 35 lb.

TS 80.8.1 Rear Door Closing Force (Transit Coach)

Power-close rear doors shall be equipped with an obstruction-sensing system such that if an obstruction is within the path of the closing doors, the doors will stop and/or reverse direction prior to imparting a 10 lb force on 1 sq in. of that obstruction. If a contactless obstruction sensing system is employed, then it shall be capable of discriminating between the normal doorway environment and passengers or other obstructions within the doorway, and of altering the zones of detection based upon the operating state of the door system.

TS 80.9 Actuators

Doors shall open or close completely in not more than 3.5 seconds from the time of control actuation and shall be subject to the closing force requirements.

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

Door actuators and associated linkages shall maximize door holding forces in the fully open and fully closed positions to provide firm, non-rattling, non-fluttering door panels while minimizing the force exerted by the doors on an obstruction midway between the fully open and closed positions.

DEFAULT

The rear door actuator(s) shall be under the complete control of the vehicle operator and shall open and close in response to the position of the driver's door control.

ALTERNATIVE

The rear doors shall be passenger-controlled. The vehicle operator shall unlock and enable the opening mechanism, which shall be annunciated by illumination of a green light near the door. After enabling and unlocking, the doors shall be opened by either the passenger manually pushing the door open, or by a powered mechanism actuated by passenger activation of a touch bar or touch switch, or by passenger activation of a contactless sensing system. A switch located within reach of the seated operator shall, when actuated, restore rear door function to complete operator control, as described in the Default.

Doors that employ a “swing” or pantograph geometry and/or are closed by a return spring or counterweight-type device shall be equipped with a positive mechanical holding device that automatically engages and prevents the actuation mechanism from being back-driven from the fully closed position. The holding device shall be overcome only when the driver’s door control is moved to an “Exit Door Enable” position and the vehicle is moving at a speed of less than 2 mph, or in the event of actuation of the emergency door release.

Locked doors shall require a force of more than 300 lb to open manually. When the locked doors are manually forced to open, damage shall be limited to the bending of minor door linkage with no resulting damage to the doors, actuators or complex mechanism.

TS 80.9.1 Actuator (Commuter Coach)

The nominal door opening and closing speed shall be in the 3 to 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.

TS 80.10 Emergency Operation

In the event of an emergency, it shall be possible to manually open doors designated as emergency exits from inside the bus using a force of no more than 25 lb after actuating an unlocking device. The unlocking device shall be clearly marked as an emergency-only device and shall require two distinct actions to actuate. The respective door emergency unlocking device shall be accessible from the doorway area. The unlocking device shall be easily reset by the operator without special tools or opening the door mechanism enclosure. Doors that are required to be classified as “emergency exits” shall meet the requirements of FMVSS 217.

TS 80.11 Door Control

The door control shall be located in the operator’s area within the hand reach envelope described in SAE J287, “Driver Hand Control Reach.” The driver’s door control shall provide tactile feedback to indicate commanded door position and resist inadvertent door actuation.

DEFAULT

Door control located on street side.

ALTERNATIVE

Location as specified by Agency.

DEFAULT

The front door shall remain in commanded state position even if power is removed or lost.

ALTERNATIVE

As specified by Agency.

TS 80.12 Door Controller

TS 80.12.1 Transit Coach

DEFAULT

Five-Position Driver's Door Controller

The control device shall be protected from moisture. Mounting and location of the door control device handle shall be designed so that it is within comfortable, easy arm's reach of the seated driver. The door control device handle shall be free from interference by other equipment and have adequate clearance so as not to create a pinching hazard.

Position of the door control handle shall result in the following operation of the front and rear doors:

- **Center position:** Front door closed, rear door(s) closed or set to lock.
- **First position forward:** Front door open, rear door(s) closed or set to lock.
- **Second position forward:** Front door open, rear door(s) open or set to open.
- **First position back:** Front door closed, rear door(s) open or set to open.
- **Second position back:** Front door open, rear door(s) open or set to open.

ALTERNATIVE

Push-Button Door Controls

Doors shall be operated by push-button controls, conveniently located and operable within the driver's reach. The push buttons shall be labeled. There shall be a separate set of push-button controls for the front and rear door(s), as needed.

ALTERNATIVE

Two-position switch for front door only.

TS 80.12.2 Commuter Coach

Doors shall be operated by push-button controls, conveniently located and operable within the driver's reach. The push buttons shall be labeled.

TS 80.13 Door Open/Close

ALTERNATIVE

Operator-Controlled Front and Rear Doors (if Applicable)

Operation of, and power to, the passenger doors shall be completely controlled by the operator.

ALTERNATIVE (TRANSIT COACH)

Operator-Controlled Front and Passenger-Controlled Rear Doors

Operation of, and power to, the front passenger doors shall be completely controlled by the operator. Power to rear doors shall be controlled by the operator. After enabling, the rear doors shall be opened by the passenger.

ALTERNATIVE (TRANSIT COACH)

Operator-Controlled Front and Passenger-Controlled Rear Doors with Provision for Driver Override

Operation of, and power to, the front passenger doors shall be completely controlled by the operator. Power to rear doors shall be controlled by the operator. After enabling, the rear doors shall be opened by the passenger. A switch shall be provided to enable the driver to obtain full control of the rear doors.

DEFAULT

A control or valve in the operator's compartment shall 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 shall close the rear/center doors (if applicable), deactivate the door control system, release the interlocks and permit only manual operation of the rear/center doors.

ALTERNATIVE

An exterior door control switch shall be installed. An air dump valve shall be accessible from the exterior of the bus.

TS 81. Accessibility Provisions

Space and body structural provisions shall be provided at the front or rear door of the bus to accommodate a wheelchair loading system.

TS 81.1 Loading Systems

There are three options:

- high-floor lift
- low-floor ramp
- platform (boarding bridge plate) level boarding

TS 81.2 Lift/ramp

The wheelchair lift control system must be capable of receiving multiplex commands from vehicle interlocks.

An automatically controlled, power-operated wheelchair lift system compliant to requirements defined in 49 CFR 571.403 (FMVSS 403) shall 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.

DEFAULT

Wheelchair lift or ramp mounted in front step well.

ALTERNATIVE

Wheelchair lift or ramp mounted in rear center door location.

ALTERNATIVE

Folding Ramp

When the system is not in use, the passageway shall appear normal. In the stored position of the ramp, no tripping hazards shall be present, and any resulting gaps shall be minimized. The controls shall be simple to operate with no complex phasing operations required, and the loading system operation shall be under the surveillance and complete control of the driver. If the loading system and controls are at the rear doors, then a keyed switch shall be provided in the driver's area to disable the loading system. The bus shall be prevented from moving during the loading or unloading cycle by a throttle and brake interlock system. The loading system shall be inhibited from stowing/deploying when a passenger is on the ramp/platform. A passenger departing or boarding via the ramp shall be able to easily obtain support by grasping the passenger assist located on the doors or other assists provided for this purpose. The platform shall be designed to protect the ramp from damage and people on the sidewalk from injury during the extension/retraction or lowering/raising phases of operation.

The loading platform shall be covered with a replaceable or renewable nonskid material and shall be fitted with devices to prevent the wheelchair from rolling off the sides during loading or unloading.

Deployment or storage of the ramp shall require no more than 15 seconds. The device shall function without failure or adjustment for 500 cycles or 5000 miles in all weather conditions on the design operating profile when activated once during the idle phase. A manual override system shall permit unloading a wheelchair and storing the device in the event of a primary power failure. The manual operation of the ramp shall not require more than 35 lb of force.

ALTERNATIVE

Heavy-Duty Ramp System

Power units must meet other spec requirements (hydraulic or electric).

TS 81.3 Loading System for 30 to 60 ft Low-Floor Bus

An automatically controlled, power-operated ramp system compliant to requirements defined in 49 CFR Part 38, Subpart B, §38.23c shall 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.

DEFAULT

Front Door Location of Loading System, Flip-Out Design Ramp with 6:1 Slope

The wheelchair loading system shall be located at the front door, with the ramp being of a simple hinged, flip-out type design being capable of deploying to the ground at a maximum 6:1 slope.

ALTERNATIVE

Rear/Center Door Location of Loading System, Flip-Out Design Ramp with 4:1 Slope

The wheelchair loading system shall be located at the rear/center door, with the ramp being of a simple hinged, flip-out type design being capable of deploying to the ground at a maximum 4:1 slope.

ALTERNATIVE

Front Door Location of Loading System, Flip-Out Design Ramp with 6:1 Slope

The wheelchair loading system shall be located at the rear door, with the ramp being a flip-out type design being capable of deploying to the ground at a maximum 6:1 slope.

ALTERNATIVE

Rear/Center Door Location of Loading System, Flip-Out Design Ramp with 6:1 Slope

The wheelchair loading system shall be located at the rear/center door, with the ramp being a flip-out type design being capable of deploying to the ground at a maximum 6:1 slope.

TS 81.4 Loading System for Level Boarding on a 45 to 60 ft Low-Floor BRT

For level-entry boarding in applications such as BRT, where the vertical transition from the vehicle floor and the boarding and alighting surface is no more than 3 in., a bridge plate shall be used. Bridge plates 30 in. or longer shall support a load of 600 lb, placed at the centroid of the ramp or bridge plate distributed over an area of 26 × 26 in., with a safety factor of at least 3, based on the ultimate strength of the material. Bridge plates shorter than 30 in. shall support a load of 300 lb. When deployed to boarding and alighting surface, the slope of the bridge plate shall not exceed 6:1.

DEFAULT

Front Door Location of Bridge Plate Loading System

The bridge plate loading system shall be located at the front door.

ALTERNATIVE

Rear Door Location of Bridge Plate Loading System

The bridge plate loading system shall be located at the rear/center door.

TS 81.5 Wheelchair Accommodations

All passenger securement devices must be stowed off the floor and out of the way when not in use.

NOTE: Agency will approve acceptable securement system.

DEFAULT

Two Forward-Facing Wheelchair Securement Locations

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

ALTERNATIVE

Additional (Beyond Two) Number of Wheelchair Securement Locations

[insert number] forward-facing location(s), as close to the wheelchair loading system as practical, shall provide parking space and securement system compliant with ADA requirements for a passenger in a wheelchair.

ALTERNATIVE

Non-Forward Facing

All passenger securement devices must be stowed off the floor and out of the way when not in use.

TS 81.6 Interior Circulation

Maneuvering room inside the bus shall be compliant with 49 CFR Part 38, Subpart B, §38.29 and accommodate easy travel for a passenger in a wheelchair from the loading device and from the designated securement area. It shall be designed so that no portion of the wheelchair protrudes into the aisle of the bus when parked in the designated parking space(s). When the positions are fully utilized, an aisle space of no less than 22 in. shall be maintained. As a guide, no width dimension should be less than 34 in. Areas requiring 90 deg turns of wheelchairs should have a clearance arc dimension no less than 45 in., and in the parking area where 180 deg turns are expected, space should be clear in a full 60 in. diameter circle. A vertical clearance of 12 in. above the floor surface should be provided on the outside of turning areas for wheelchair footrests.

TS 82. Wheelchair Lifts (Commuter Coach)

TS 82.1 Lift

A travel lift and two forward-facing mobility device securement areas 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 to 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/propulsion system 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 handheld pendant.

The lift shall include a hinged platform to bridge the coach floor to the lift platform. The bridge shall be hinged and locked in an upward position to act as a barrier when the lift is in use. The bridge shall also allow lift passenger 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 ensure 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 push-button switch on the controller to immediately stop 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 luggage bay door. The handle shall be stored adjacent to the pump to allow immediate usage.

TS 82.2 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 vehicle 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 vehicle 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.

The lift storage door shall not block the visual observation to the lift assembly while using 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 luggage door is a preferred design.

TS 82.3 Lift Width

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 an 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 wheelchair securement positions.

Each coach shall have adequate information decals installed that detail the proper lift operation in both the normal and manual modes of operation.

TS 82.4 Lighting Requirements

Lighting for the lift areas shall be designed to meet Title 13 and 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 6 candlepower a distance of 3 ft beyond the external dimensions of the lift platform once deployed and lowered. Additional lighting shall be provided to ensure illumination of the instruction placard and the manual override pump when it is in use.

TS 82.5 Securement System

The vehicle interior shall permit the securement of two forward-facing wheelchair passengers in which the primary position shall be on the street side of the coach directly across from the lift. Securement areas shall be a minimum 30 × 48 in. as required by the ADA.

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. A minimum 10.5 in. high barrier shall also be provided at the rear of the lift area for additional passenger protection.

TS 82.6 Roof Ventilation/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.

ALTERNATIVE

A rear egress window can replace a rooftop escape hatch.

ALTERNATIVE

A single rooftop escape hatch.

SIGNAGE AND COMMUNICATION

TS 83. Destination Signs

DEFAULT

A destination sign system shall be furnished on the front, on the right side near the front door.

ALTERNATIVE

Route sign on the rear of the vehicle.

ALTERNATIVE

Street and Curbside Route Sign

The sign located near the front door shall not block the driver's critical horizontal line of sight. Display areas of destination signs shall be clearly visible in direct sunlight and/or at night. Parts shall be commercially available.

All signs shall be controlled via a single human-machine interface (HMI). In the absence of a single mobile data terminal (MDT), the HMI shall be conveniently located for the bus driver within reach of the seated driver.

DEFAULT

The driver shall be able to access the sign while seated.

ALTERNATIVE

The sign shall not be located within reach of the seated driver.

DEFAULT

The destination sign compartments shall meet the following minimum requirements:

- Compartments shall be designed to prevent condensation and entry of moisture and dirt.
- Compartments shall be designed to prevent fogging of both compartment window and glazing on the unit itself.
- Access shall be provided to allow cleaning of inside compartment window and unit glazing.
- The front window shall have an exterior display area of no less than 8.5 in. high by 56 in. wide.

ALTERNATIVE

No active defogging required.

ALTERNATIVE

Run number sign shall be installed.

TS 84. Passenger Information and Advertising (Transit Coach)

TS 84.1 Interior Displays

Provisions shall be made on the rear of the driver's barrier or equipment box located on the wheel well for a frame to retain information such as routes and schedules.

Advertising media 11 in. high and 0.09 in. thick shall be retained near the juncture of the bus ceiling and sidewall. The retainers may be concave and shall support the media without adhesives. The media shall be illuminated by the interior light system.

TS 84.2 Exterior Displays

Provisions shall be made to integrate advertising into the exterior design of the bus. Advertising media, frames or supporting structures shall not detract from the readability of destination signs and signal lights, and shall not compromise passenger visibility. Advertising provisions shall not cause pedestrian hazards or foul automatic bus washing equipment, and shall not cover or interfere with doors, air passages, vehicle fittings or in any other manner restrict the operation or serviceability of the bus.

TS 85. Passenger Stop Request/Exit Signal

TS 85.1 Transit Coach

DEFAULT

Touch Tape Passenger Signal

A passenger “stop requested” signal system that complies with applicable ADA requirements defined in 49 CFR, Part 38.37, shall be provided. The system shall consist of a touch tape, chime and interior sign message. The touch tape shall be accessible to all seated passengers, with provisions for standees. It shall be easily accessible to all passengers, seated or standing. Vertical touch tape shall be provided at each window mullion and adjacent to each wheelchair parking position and in priority seating positions.

ALTERNATIVE

Pull Cord Passenger Signal

A passenger “stop requested” signal system that complies with applicable ADA requirements defined in 49 CFR, Part 38.37, shall be provided. The system shall consist of a heavy-duty pull cable, chime and interior sign message. The pull cable shall 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, then the height of the pull cable shall approximate this transom level and shall be no greater than 63 in. as measured from the floor surface. It shall be easily accessible to all passengers, seated or standing. Pull cable(s) shall activate one or more solid state or magnetic proximity switches. At each wheelchair passenger position and at priority seating positions, additional provisions shall be included to allow a passenger in a mobility aid to easily activate the “stop requested” signal.

An auxiliary passenger “stop requested” signal shall be installed at the rear door to provide passengers standing in the rear door/exit area a convenient means of activating the signal system. The signal shall be a heavy-duty push button type located in the rear door vicinity. Button shall be clearly identified as “passenger signal.”

DEFAULT

No requirements for additional “stop request” button on rear door stanchion.

ALTERNATIVE

Additional “Stop Request” Button on Rear Door Stanchion

A heavy-duty “stop request” signal button shall be installed on the modesty panel stanchion immediately forward of the rear door and clearly identified as “STOP.”

ALTERNATIVE

“Stop request” signal buttons shall be available at intervals to be determined by the Agency.

TS 85.2 Commuter Coach

A heavy-duty “stop request” signal button shall be installed at every seat location except the rear cross seat.

TS 85.3 Signal Chime

DEFAULT (TRANSIT COACH)

A single “stop requested” chime shall sound when the system is first activated. A double chime shall sound anytime the system is activated from wheelchair passenger areas.

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

ALTERNATIVE (TRANSIT COACH)

Passenger signal system shall be arranged with push-button switches accessible by each seated passenger and on stanchions and at rear door locations for standees.

DEFAULT (COMMUTER COACH)

A single “stop requested” chime shall sound when the system is first activated. A double chime shall sound anytime the system is activated from wheelchair passenger areas.

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

ALTERNATIVE (COMMUTER COACH)

Agency to specify the stop request system for wheelchair seating area

TS 86. Communications

TS 86.1 Camera Surveillance System

DEFAULT

No surveillance system provisions required.

ALTERNATIVE

Provide all wiring and mounting locations for a multi-camera surveillance system for the later provision of and installation of cameras, recorder, microphone, etc. Agency to specify the camera system cable to be installed, the locations for pre-wiring and the quantity.

ALTERNATIVE

Provide all wiring and mounting locations for a multi-camera surveillance system, including the installation of cameras, recorder, microphone, etc.

TS 86.2 Public Address System

A public address system shall be provided on each bus for facilitating radio system and driver-originated announcements to passengers.

TS 86.2.1 Speakers

DEFAULT

[insert number] interior loudspeakers shall be provided, semi-flush mounted, on alternate sides of the bus passenger compartment, installed with proper phasing. Total impedance seen at the input connecting end shall be 8 ohms. Mounting shall be accomplished with riv-nuts and machine screws.

ALTERNATIVE

The speaker cable shall terminate at the instrument panel area on the curb side with a minimum of 3 ft of extra speaker cable. An end connector shall be supplied so a lead can be connected from the radio control head in order to make announcements directly from the transit control center to passengers through the PA system.

TS 86.3 Automatic Passenger Counter (APC)

DEFAULT

No APC system shall be installed.

ALTERNATIVE

An infrared APC system shall be installed. Agency to provide details of APC system, including installation locations and number of buses to be equipped.

TS 86.4 Radio Handset and Control System

TS 86.4.1 Driver's Speaker

Each bus shall have a recessed speaker in the ceiling panel above the driver. This speaker shall be the same component used for the speakers in the passenger compartment. It shall have 8 ohms of impedance.

TS 86.4.2 Handset

Contractor will install a handset for driver use.

TS 86.4.3 Driver Display Unit (DDU)

Contractor shall install a driver display unit as close to the driver's instrument panel as possible.

TS 86.4.4 Emergency Alarm

Contractor shall install an emergency alarm that is accessible to the driver but hidden from view.

TS 87. Event Data Recorder (EDR)

DEFAULT

No EDR shall be installed.

ALTERNATIVE

EDRs shall be installed on the bus, one at the front and the other at the rear. These units are to be installed as low as possible. The EDRs shall be able to communicate over the J1939 CAN line and shall each be equipped with three-axis accelerometers. Settings are to be finalized with the Agency during pre-production. EDRs shall broadcast via the J1939 data communication link severe impact events to the vehicle monitoring system and also trigger an event in the camera system. The EDR shall also tag an event from a signal received over the J1939 CAN line from the silent alarm switch signal and the camera event button and in turn broadcast these events to the vehicle monitoring system. The EDR shall also record the following operational data: headlights on or off, turn signals and hazard lights on or off, ignition on or off, low air pressure warning, whether moving in forward or reverse or idling, and whether parking brake is on or off.

TS 88. Approved Equals

Table 8 lists products that have been approved for the bus procurement. The list contains products that are of interest to the Agency and is not intended to be a comprehensive listing of every product required for the manufacture of the subject buses. Product categories not listed are left to the discretion of the Contractor so long as the product complies with the specifications. Product specification information is for reference only and may not reflect the latest or future improvements by manufacturers. Any change, revision or substitution of specified products requires approval of the agency. To add to or revise this list, Contractor must submit a written request per the Specification by the due date found in the RFP for approved equals.

NOTE: Transit agencies are encouraged to list as many suppliers as possible.

TABLE 8
Approved Equals Products

| Product | Manufacturer | Product Specification |
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SECTION 7: WARRANTY REQUIREMENTS

WR 1. Basic Provisions

WR 1.1 Warranty Requirements

WR 1.1.1 Contractor Warranty

Warranties in this document are in addition to any statutory remedies or warranties imposed on the Contractor. Consistent with this requirement, the Contractor warrants and guarantees to the original Agency each complete bus and specific subsystems and components as follows. Performance requirements based on design criteria shall not be deemed a warranty item.

WR 1.1.2 Complete Bus (Diesel, CNG, Hybrid)

The complete bus, propulsion system, components, major subsystems and body and chassis structure are warranted to be free from Defects and Related Defects for one year or 50,000 miles, whichever comes first, beginning on the date of revenue service but not longer than 15 days after acceptance under “Inspection, Testing and Acceptance.” The warranty is based on regular operation of the bus under the operating conditions prevailing in the Agency’s locale.

WR 1.1.3 Complete Bus (All Electric)

DEFAULT

The complete bus, propulsion system, components, major subsystems and body and chassis structure are warranted to be free from Defects and Related Defects for one year or 50,000 miles, whichever comes first, beginning on the date of revenue service but not longer than 15 days after acceptance under “Inspection, Testing and Acceptance.” The warranty is based on regular operation of the bus under the operating conditions prevailing in the Agency’s locale.

ALTERNATIVE

The complete bus, propulsion system, components, major subsystems and body and chassis structure are warranted to be free from Defects and Related Defects for two years or 100,000 miles, whichever comes first, beginning on the date of revenue service but not longer than 15 days after acceptance under “Inspection, Testing and Acceptance.” The warranty is based on regular operation of the bus under the operating conditions prevailing in the Agency’s locale.

WR 1.1.4 Body and Chassis Structure

Body, body structure, structural elements of the suspension and engine cradle are warranted to be free from Defects and Related Defects for three years or 150,000 miles, whichever comes first.

Primary load-carrying members of the bus structure, including structural elements of the suspension, are warranted against corrosion failure and/or Fatigue Failure sufficient to cause a Class 1 or Class 2 Failure for a period of 12 years or 500,000 miles, whichever comes first.

WR 1.1.5 Propulsion System (Diesel, CNG, Hybrid)

Propulsion system components, including the engine, transmission or drive motors, and generators (for hybrid technology) and drive and non-drive axles shall be warranted to be free from Defects and Related Defects for the standard two years or 100,000 miles, whichever comes first. An Extended Warranty to a maximum of five

years or 300,000 miles, whichever comes first, may be purchased at an additional cost. The propulsion system manufacturer's standard warranty, delineating items excluded from the Extended Warranty, should be submitted in accordance with the Request for Pre-Offer Change or Approved Equal or with the Form for Proposal Deviation.

WR 1.1.6 Propulsion System (All Electric)

ALTERNATIVE

Propulsion system components, including the traction motor(s), traction motor controller(s), transmission, drive motors, drive and non-drive axles, and any other propulsion system-related line replacement components, shall be warranted to be free from Defects and Related Defects for the standard 12 years or 500,000 miles, whichever comes first. The propulsion system manufacturer's standard warranty, delineating items excluded from the Extended Warranty, should be submitted in accordance with the Request for Pre-Offer Change or Approved Equal or with the Form for Proposal Deviation.

ALTERNATIVE

Propulsion system components, including the traction motor(s), traction motor controller(s), transmission, drive motors, drive and non-drive axles, and any other propulsion system-related line replacement components, shall be warranted to be free from Defects and Related Defects for the standard six years or 300,000 miles, whichever comes first. An optional Extended Warranty of 12 years or 500,000 miles, whichever comes first, shall be submitted with the proposal. The propulsion system manufacturer's standard warranty, delineating items excluded from the Extended Warranty, should be submitted in accordance with the Request for Pre-Offer Change or Approved Equal or with the Form for Proposal Deviation.

ALTERNATIVE

OEM shall provide information on standard warranties and available extended warranty options

WR 1.1.7 Energy Storage System (All Electric or Hybrid)

ALTERNATIVE

The energy storage system (ESS), including the traction battery, battery management system and any other ESS-related line replacement component, shall be warranted to be free from Defects and Related Defects for 12 years or 500,000 miles, whichever comes first, beginning on the date of bus acceptance under "Inspection, Testing and Acceptance," per this RFP. The ESS shall also be warranted for 12 years or 500,000 miles, whichever comes first, to remain within warrantable end of life. The ESS original specified energy storage capacity and Warrantable End of Life (see definition of Warrantable End of Life in section TS.2), as a percentage of the original specified energy capacity, shall be clearly defined by the Proposer. Acceptable methods for measuring or obtaining ESS storage capacity with respect to its original specified capacity shall be clearly identified by the Manufacturer. The Manufacturer will propose the test method and certify that the results are true and accurate. The test will be performed according to a documented test procedure. The Agency is allowed to engage third parties for capacity testing. If applicable, the proposal shall include a comprehensive statement of any additional warranty terms relating to the ESS, including explanation of all disclaimers within the warranty.

ALTERNATIVE

The energy storage system (ESS), including the traction battery, battery management system and any other ESS-related line replacement component, shall be warranted to be free from Defects and Related Defects for six years or 300,000 miles, whichever comes first, beginning on the date of bus acceptance under “Inspection, Testing and Acceptance,” per this RFP. The ESS shall also be warranted for six years or 300,000 miles, whichever comes first, to remain within warrantable end of life. An optional Extended Warranty of 12 years or 500,000 miles shall be submitted with the proposal. The ESS original specified energy storage capacity and Warrantable End of Life (see definition of Warrantable End of Life in section TS.2), as a percentage of the original specified energy capacity, shall be clearly defined by the Proposer. Acceptable methods for measuring or obtaining ESS storage capacity with respect to its original specified capacity shall be clearly identified by the Manufacturer. The Manufacturer will propose the test method and certify that the results are true and accurate. The test will be performed according to a documented test procedure. The Agency is allowed to engage third parties for capacity testing. If applicable, the proposal shall include a comprehensive statement of any additional warranty terms relating to the ESS, including explanation of all disclaimers within the warranty.

ALTERNATIVE

The Energy Storage System (ESS) shall be leased. The Energy Storage System (ESS), including the traction battery, Battery Management System, and any other ESS-related line replacement component, shall be warranted to be free from Defects and Related Defects for the term of the ESS lease. The ESS shall also be warranted for the term of the lease to remain within Warrantable End Of Life (see definition of Warrantable End of Life in section TS.2). The ESS original specified energy storage capacity and Warrantable End of Life, as a percentage of the original specified energy capacity, shall be clearly defined by the Proposer. Acceptable methods for measuring or obtaining ESS storage capacity with respect to its original specified capacity shall be clearly identified by the manufacturer. The manufacturer will propose the test method, and certify the results are true and accurate. The test will be performed according to a documented test procedure. The Agency is allowed to engage third-parties for capacity testing. If applicable, the proposal shall include a comprehensive statement of any additional warranty terms relating to the ESS, including explanation of all disclaimers within the warranty.

WR 1.1.8 Emission Control System (ECS)

The Contractor warrants the emission control system for five years or 100,000 miles, whichever comes first. The ECS shall include, but is not limited to, the following components:

- complete exhaust system, including catalytic converter (if required)
- after treatment device
- components identified as emission control devices

WR 1.1.9 Subsystems

The following subsystems shall be warranted to be free from Defects and Related Defects for two years or 100,000 miles, whichever comes first:

- Brake system: Foundation brake components, including advancing mechanisms, as supplied with the axles, excluding friction surfaces

- Destination signs: All destination sign equipment for the front, side and rear signs, power modules and operator control
- Heating, ventilating: Roof and/or rear main unit only, excluding floor heaters and front defroster
- AC unit and compressor: Roof and/or rear main unit only, excluding floor heaters and front defroster
- Door systems: Door operating actuators and linkages
- Air compressor
- Air dryer
- Wheelchair lift and ramp system: Lift and/or ramp parts and mechanical only
- Starter
- Alternator: Alternator only; does not include the drive system.
- Charge air cooler: Charge air cooler including core, tanks and including related surrounding framework and fittings
- Fire suppression: Fire suppression system including tank and extinguishing agent dispensing system
- Hydraulic systems: Including radiator fan drive and power steering as applicable
- Propulsion system cooling systems: Radiator including core, tanks and related framework, including surge tank and transmission cooler
- Power electronics: DC/DC converters, inverters, if supplied
- Passenger seating excluding upholstery
- Fuel storage and delivery system
- Surveillance system including cameras and video recorders

The following subsystems shall be warranted to be free from Defects and Related Defects for 12 years or 500,000 miles, whichever comes first:

- Low-voltage and high-voltage electrical wiring and harnesses (12 years)

WR 1.1.10 Extended Warranty

The Agency requires the following additional subsystems to be warranted to be free from Defects and Related Defects for two years or 100,000 miles, whichever comes first.

[Insert as appropriate]

WR 1.1.11 Serial Numbers

Upon delivery of each bus, the Contractor shall provide a complete electronic list of serialized units installed on each bus to facilitate warranty tracking. If supplied with the bus, the list shall include but is not limited to the following:

- Engine or traction motor(s)
- Propulsion system controller/inverter(s)
- Energy storage pack(s) or module(s)
- Power electronics: DC/DC converters, inverters
- Transmission
- Alternator
- Starter
- HVAC system and major components
- Drive axle
- Power steering unit
- Fuel cylinders (if applicable)

- Air compressor
- Wheelchair ramp (if applicable)

The Contractor shall provide updated serial numbers resulting from warranty campaigns. The format of the list shall be approved by the Agency prior to delivery of the first production bus.

WR 1.1.12 Extension of Warranty

If, during the warranty period, repairs or modifications on any bus are made necessary by defective design, materials or workmanship but are not completed due to lack of material or inability to provide the proper repair for thirty (30) calendar days, then the applicable warranty period shall be extended by the number of days equal to the delay period.

WR 1.2 Voiding of Warranty

The warranty shall not apply to the failure of any part or component of the bus that directly results from misuse, negligence, accident or repairs not conducted in accordance with the Contractor-provided maintenance manuals and with workmanship performed by adequately trained personnel in accordance with recognized standards of the industry. The warranty also shall be void if the Agency fails to conduct normal inspections and scheduled preventive maintenance procedures as recommended in the Contractor's maintenance manuals and if that omission caused the part or component failure. The Agency shall maintain documentation, auditable by the Contractor, verifying service activities in conformance with the Contractor's maintenance manuals.

WR 1.3 Exceptions and Additions to Warranty

The warranty shall not apply to the following items:

- scheduled maintenance items
- normal wear-out items
- items furnished by the Agency

Should the Agency require the use of a specific product and has rejected the Contractor's request for an alternate product, then the standard Supplier warranty for that product shall be the only warranty provided to the Agency. This product will not be eligible under "Fleet Defects," below.

The Contractor shall not be required to provide warranty information for any warranty that is less than or equal to the warranty periods listed.

WR 1.3.1 Pass-Through Warranty

Should the Contractor elect to not administer warranty claims on certain components and wish to transfer this responsibility to the sub-suppliers, or to others, the Contractor shall request this waiver.

Contractor shall state in writing that the Agency's warranty reimbursements will not be impacted. The Contractor also shall state in writing any exceptions and reimbursement including all costs incurred in transport of vehicles and/or components. At any time during the warranty period, the Contractor may request approval from the Agency to assign its warranty obligations to others, but only on a case-by-case basis approved in writing by the Agency. Otherwise, the Contractor shall be solely responsible for the administration of the warranty as specified. Warranty administration by others does not eliminate the warranty liability and responsibility of the Contractor.

WR 1.3.2 Superior Warranty

The Contractor shall pass on to the Agency any warranty offered by a component Supplier that is superior to that required herein. The Contractor shall provide a list to the Agency noting the conditions and limitations of the Superior Warranty not later than the start of production. The Superior Warranty shall not be administered by the Contractor.

WR 1.4 Fleet Defects

WR 1.4.1 Occurrence and Remedy

A Fleet Defect is defined as cumulative failures of twenty-five (25) percent of the same components in the same or similar application in a minimum fleet size of twelve (12) or more buses where such items are covered by warranty. A Fleet Defect shall apply only to the base warranty period in sections entitled “Complete Bus,” “Propulsion System” and “Major Subsystems.” When a Fleet Defect is declared, the remaining warranty on that item/component stops. The warranty period does not restart until the Fleet Defect is corrected.

For the purpose of Fleet Defects, each option order shall be treated as a separate bus fleet. In addition, should there be a change in a major component within either the base order or an option order, the buses containing the new major component shall become a separate bus fleet for the purposes of Fleet Defects.

The Contractor shall correct a Fleet Defect under the warranty provisions defined in “Repair Procedures.” After correcting the Defect, the Agency and the Contractor shall mutually agree to and the Contractor shall promptly undertake and complete a work program reasonably designed to prevent the occurrence of the same Defect in all other buses and spare parts purchased under this Contract. Where the specific Defect can be solely attributed to particular identifiable part(s), the work program shall include redesign and/or replacement of only the defectively designed and/or manufactured part(s). In all other cases, the work program shall include inspection and/or correction of all the buses in the fleet via a mutually agreed-to arrangement. The Contractor shall update, as necessary, technical support information (parts, service and operator’s manuals) due to changes resulting from warranty repairs. The Agency may immediately declare a Defect in design resulting in a safety hazard to be a Fleet Defect. The Contractor shall be responsible to furnish, install and replace all defective units.

WR 1.4.2 Exceptions to Fleet Defect Provisions

The Fleet Defect warranty provisions shall not apply to Agency-supplied items, such as radios, fare collection equipment, communication systems and tires. In addition, Fleet Defects shall not apply to interior and exterior finishes, hoses, fittings and fabric.

WR 2. Repair Procedures

WR 2.1 Repair Performance

The Contractor is responsible for all warranty-covered repair Work. To the extent practicable, the Agency will allow the Contractor or its designated representative to perform such Work. At its discretion, the Agency may perform such Work if it determines it needs to do so based on transit service or other requirements. Such Work shall be reimbursed by the Contractor.

WR 2.2 Repairs by the Contractor

If the Agency detects a Defect within the warranty periods defined in this section, it shall, within thirty (30) days, notify the Contractor’s designated representative. The Contractor or its designated representative shall,

if requested, begin Work on warranty-covered repairs within five calendar days after receiving notification of a Defect from the Agency. The Agency shall make the bus available to complete repairs timely with the Contractor's repair schedule.

The Contractor shall provide at its own expense all spare parts, tools and space required to complete repairs. At the Agency's option, the Contractor may be required to remove the bus from the Agency's property while repairs are being effected. If the bus is removed from the Agency's property, then repair procedures must be diligently pursued by the Contractor's representative.

WR 2.3 Repairs by the Agency

WR 2.3.1 Parts Used

If the Agency performs the warranty-covered repairs, then it shall correct or repair the Defect and any Related Defects utilizing parts supplied by the Contractor specifically for this repair. At its discretion, the Agency may use Contractor-specified parts available from its own stock if deemed in its best interests.

WR 2.3.2 Contractor-Supplied Parts

The Agency may require that the Contractor supply parts for warranty-covered repairs being performed by the Agency. Those parts may be remanufactured but shall have the same form, fit and function, and warranty. The parts shall be shipped prepaid to the Agency from any source selected by the Contractor within fourteen (14) days of receipt of the request for said parts and shall not be subject to an Agency handling charge.

WR 2.3.3 Defective Component Return

The Contractor may request that parts covered by the warranty be returned to the manufacturing plant. The freight costs for this action shall be paid by the Contractor. Materials should be returned in accordance with the procedures outlined in "Warranty Processing Procedures."

WR 2.3.4 Failure Analysis

The Contractor shall, upon specific request of the Agency, provide a failure analysis of Fleet Defect or safety-related parts, or major components, removed from buses under the terms of the warranty that could affect fleet operation. Such reports shall be delivered within 60 days of the receipt of failed parts.

WR 2.3.5 Reimbursement for Labor and Other Related Costs

The Agency shall be reimbursed by the Contractor for labor. The amount shall be determined by the Agency for a qualified mechanic at a straight time wage rate of [insert wage] per hour, which includes fringe benefits and overhead adjusted for the Agency's most recently published rate in effect at the time the Work is performed, plus the cost of towing the bus if such action was necessary and if the bus was in the normal service area. These wage and fringe benefit rates shall not exceed the rates in effect in the Agency's service garage at the time the Defect correction is made.

WR 2.3.6 Reimbursement for Parts

The Agency shall be reimbursed by the Contractor for defective parts and for parts that must be replaced to correct the Defect. The reimbursement shall be at the current price at the time of repair and shall include taxes where applicable, plus 15 percent handling costs. Handling costs shall not be paid if parts are supplied by the Contractor and shipped to the Agency.

WR 2.3.7 Reimbursement Requirements

The Contractor shall respond to the warranty claim with an accept/reject decision including necessary failure analysis no later than sixty (60) days after the Agency submits the claim and defective part(s), when requested. Reimbursement for all accepted claims shall occur no later than sixty (60) days from the date of acceptance of a valid claim. The Agency may dispute rejected claims or claims for which the Contractor did not reimburse the full amount. The parties agree to review disputed warranty claims during the following quarter to reach an equitable decision to permit the disputed claim to be resolved and closed. The parties also agree to review all claims at least once per quarter throughout the entire warranty period to ensure that open claims are being tracked and properly dispositioned.

WR 2.4 Warranty after Replacement/Repairs

If any component, unit or subsystem is repaired, rebuilt or replaced by the Contractor or by the Agency with the concurrence of the Contractor, then the component, unit or subsystem shall have the unexpired warranty period of the original. Repairs shall not be warranted if Contractor-provided or authorized parts are not used for the repair, unless the Contractor has failed to respond within five days, in accordance with “Repairs by the Contractor.”

If an item is declared to be a Fleet Defect, then the warranty stops with the declaration of the Fleet Defect. Once the Fleet Defect is corrected, the item(s) shall have three (3) months or remaining time and/or miles of the original warranty, whichever is greater. This remaining warranty period shall begin on the repair/replacement date for corrected items on each bus if the repairs are completed by the Contractor or on the date the Contractor provides all parts to the Agency.

WR 2.4.1 Warranty Processing Procedures

The following list represents requirements by the Contractor to the Agency for processing warranty claims. One failure per bus per claim is allowed.

- bus number and VIN
- total vehicle life mileage at time of repair
- date of failure/repair
- acceptance/in-service date
- Contractor part number and description
- component serial number
- description of failure
- all costs associated with each failure/repair (invoices may be required for third-party costs):
 - towing
 - road calls
 - labor
 - materials
 - parts
 - handling
 - troubleshooting time

WR 2.5 Forms

The Agency’s forms will be accepted by the Contractor if all of the above information is included. Electronic submittal may be used if available between the Contractor and the Agency.

WR 2.6 Return of Parts

When returning defective parts to the Contractor, the Agency shall tag each part with the following:

- bus number and VIN
- claim number
- part number
- serial number (if available)

WR 2.7 Timeframe

Each claim must be submitted no more than thirty (30) days from the date of failure and/or repair, whichever is later. All defective parts must be returned to the Contractor, when requested, no more than forty-five (45) days from the date of repair.

WR 2.8 Reimbursements

Reimbursements are to be transmitted to the following address:

[Insert address]

SECTION 8: QUALITY ASSURANCE

QA 1. Contractor's In-Plant Quality Assurance Requirements

QA 1.1 Quality Assurance Organization

QA 1.1.1 Organization Establishment

The Contractor shall establish and maintain an effective in-plant quality assurance organization. It shall be a specifically defined organization and should be directly responsible to the Contractor's top management.

QA 1.1.2 Control

The quality assurance organization shall exercise quality control over all phases of production, from initiation of design through manufacture and preparation for delivery. The organization shall also control the quality of supplied articles.

QA 1.1.3 Authority and Responsibility

The quality assurance organization shall have the authority and responsibility for reliability, quality control, inspection planning, establishment of the quality control system, and acceptance/rejection of materials and manufactured articles in the production of the transit buses.

QA 1.2 Quality Assurance Organization Functions

QA 1.2.1 Minimum Functions

The quality assurance organization shall include the following minimum functions:

- **Work instructions:** The quality assurance organization shall verify inspection operation instructions to ascertain that the manufactured product meets all prescribed requirements.
- **Records maintenance:** The quality assurance organization shall maintain and use records and data essential to the effective operation of its program. These records and data shall be available for review by the resident inspectors. Inspection and test records for this procurement shall be available for a minimum of one year after inspections and tests are completed.
- **Corrective action:** The quality assurance organization shall detect and promptly ensure correction of any conditions that may result in the production of defective transit buses. These conditions may occur in designs, purchases, manufacture, tests or operations that culminate in defective supplies, services, facilities, technical data or standards.

QA 1.2.2 Basic Standards and Facilities

The following standards and facilities shall be basic in the quality assurance process:

- **Configuration control:** The Contractor shall maintain drawings, assembly procedures and other documentation that completely describe a qualified bus that meets all of the options and special requirements of this procurement. The quality assurance organization shall verify that each transit bus is manufactured in accordance with these controlled drawings, procedures and documentation.
- **Measuring and testing facilities:** The Contractor shall provide and maintain the necessary gauges and other measuring and testing devices for use by the quality assurance organization to verify that the buses conform to all specification requirements. These devices shall be calibrated at established periods against certified measurement standards that have known, valid relationships to national standards.

- **Production tooling as media of inspection:** When production jigs, fixtures, tooling masters, templates, patterns and other devices are used as media of inspection, they shall be proved for accuracy at formally established intervals and adjusted, replaced or repaired as required to maintain quality.
- **Equipment use by resident inspectors:** The Contractor's gauges and other measuring and testing devices shall be made available for use by the resident inspectors to verify that the buses conform to all specification requirements. If necessary, the Contractor's personnel shall be made available to operate the devices and to verify their condition and accuracy.

QA 1.2.3 Maintenance of Control

The Contractor shall maintain quality control of purchases:

- **Supplier control:** The Contractor shall require that each Supplier maintains a quality control program for the services and supplies that it provides. The Contractor's quality assurance organization shall inspect and test materials provided by Suppliers for conformance to specification requirements. Materials that have been inspected, tested and approved shall be identified as acceptable to the point of use in the manufacturing or assembly processes. Controls shall be established to prevent inadvertent use of nonconforming materials.
- **Purchasing data:** The Contractor shall verify that all applicable specification requirements are properly included or referenced in purchase orders of articles to be used on transit buses.

QA 1.2.4 Manufacturing Control

- **Controlled conditions:** The Contractor shall ensure that all basic production operations, as well as all other processing and fabricating, are performed under controlled conditions. Establishment of these controlled conditions shall be based on the documented Work instructions, adequate production equipment and special working environments if necessary.
- **Completed items:** A system for final inspection and test of completed transit buses shall be provided by the quality assurance organization. It shall measure the overall quality of each completed bus.
- **Nonconforming materials:** The quality assurance organization shall monitor the Contractor's system for controlling nonconforming materials. The system shall include procedures for identification, segregation and disposition.
- **Statistical techniques:** Statistical analysis, tests and other quality control procedures may be used when appropriate in the quality assurance processes.
- **Inspection status:** A system shall be maintained by the quality assurance organization for identifying the inspection status of components and completed transit buses. Identification may include cards, tags or other normal quality control devices.

QA 1.2.5 Inspection System

The quality assurance organization shall establish, maintain and periodically audit a fully documented inspection system. The system shall prescribe inspection and test of materials, Work in process and completed articles. As a minimum, it shall include the following controls:

- **Inspection personnel:** Sufficient trained inspectors shall be used to ensure that all materials, components and assemblies are inspected for conformance with the qualified bus design.
- **Inspection records:** Acceptance, rework or rejection identification shall be attached to inspected articles. Articles that have been accepted as a result of approved materials review actions shall be identified. Articles that have been reworked to specified drawing configurations shall not require special identification. Articles rejected as unsuitable or scrap shall be plainly marked and controlled

to prevent installation on the bus. Articles that become obsolete as a result of engineering changes or other actions shall be controlled to prevent unauthorized assembly or installation. Unusable articles shall be isolated and then scrapped. Discrepancies noted by the Contractor or resident inspectors during assembly shall be entered by the inspection personnel on a record that accompanies the major component, subassembly, assembly or bus from start of assembly through final inspection. Actions shall be taken to correct discrepancies or deficiencies in the manufacturing processes, procedures or other conditions that cause articles to be in nonconformity with the requirements of the Contract specifications. The inspection personnel shall verify the corrective actions and mark the discrepancy record. If discrepancies cannot be corrected by replacing the nonconforming materials, then the Agency shall approve the modification, repair or method of correction to the extent that the Contract specifications are affected.

- **Quality assurance audits:** The quality assurance organization shall establish and maintain a quality control audit program. Records of this program shall be subject to review by the Agency.

QA 2. Inspection

QA 2.1 Inspection Stations

Inspection stations shall be at the best locations to provide for the Work content and characteristics to be inspected. Stations shall provide the facilities and equipment to inspect structural, electrical, hydraulic and other components and assemblies for compliance with the design requirements.

Stations shall also be at the best locations to inspect or test characteristics before they are concealed by subsequent fabrication or assembly operations. These locations shall minimally include underbody structure completion, body framing completion, body prior to paint preparation, water test, propulsion system installation completion, underbody dress-up and completion, bus prior to final paint touchup, bus prior to road test, and bus final road test completion.

QA 2.2 Resident Inspectors

QA 2.2.1 Resident Inspector's Role

The Agency shall be represented at the Contractor's plant by resident inspectors. Resident inspectors may be Agency employees or outside contractors. The Agency shall provide the identity of each inspector and shall also identify their level of authority in writing. They shall monitor, in the Contractor's plant, the manufacture of transit buses built under the procurement. The presence of these resident inspectors in the plant shall not relieve the Contractor of its responsibility to meet all of the requirements of this procurement. The Agency shall designate a primary resident inspector, whose duties and responsibilities are delineated in "Pre-Production Meetings," "Authority" and "Pre-Delivery Tests," below. Contractor and resident inspector relations shall be governed by the guidelines included as Attachment A to this section.

QA 2.2.2 Pre-Production Meetings

The primary resident inspector may participate in design review and Pre-Production Meetings with the Agency. At these meetings, the configuration of the buses and the manufacturing processes shall be finalized, and all Contract documentation provided to the inspector.

No less than thirty (30) days prior to the beginning of bus manufacture, the primary resident inspector may meet with the Contractor's quality assurance manager and may conduct a pre-production audit meeting. They shall review the inspection procedures and finalize inspection checklists. The resident inspectors may begin monitoring bus construction activities two weeks prior to the start of bus fabrication.

QA 2.2.3 Authority

Records and data maintained by the quality assurance organization shall be available for review by the resident inspectors. Inspection and test records for this procurement shall be available for a minimum of one year after inspections and tests are completed.

The Contractor's gauges and other measuring and testing devices shall be made available for use by the resident inspectors to verify that the buses conform to all specification requirements. If necessary, the Contractor's personnel shall be made available to operate the devices and to verify their condition and accuracy.

Discrepancies noted by the resident inspector during assembly shall be entered by the Contractor's inspection personnel on a record that accompanies the major component, subassembly, assembly or bus from start of assembly through final inspection. Actions shall be taken to correct discrepancies or deficiencies in the manufacturing processes, procedures or other conditions that cause articles to be in nonconformity with the requirements of the Contract specifications. The inspection personnel shall verify the corrective actions and mark the discrepancy record. If discrepancies cannot be corrected by replacing the nonconforming materials, then the Agency shall approve the modification, repair or method of correction to the extent that the Contract specifications are affected.

The primary resident inspector shall remain in the Contractor's plant for the duration of bus assembly Work under this Contract. Only the primary resident inspector or designee shall be authorized to release the buses for delivery. The resident inspectors shall be authorized to approve the pre-delivery acceptance tests. Upon request to the quality assurance supervisors, the resident inspectors shall have access to the Contractor's quality assurance files related to this procurement. These files shall include drawings, assembly procedures, material standards, parts lists, inspection processing and reports, and records of Defects.

QA 2.2.4 Support Provisions

The Contractor shall provide office space for the resident inspectors in close proximity to the final assembly area. This office space shall be equipped with desks, outside and interplant telephones, Internet access, file cabinet and chairs.

QA 2.2.5 Compliance with Safety Requirements

At the time of the Pre-Production Meeting, the Contractor shall provide all safety and other operational restrictions that govern the Contractor's facilities. These issues will be discussed and the parties will agree which rules/restrictions will govern the Agency's inspector(s) and any other Agency representatives during the course of the Contract.

QA 3. Acceptance Tests

QA 3.1 Responsibility

Fully documented tests shall be conducted on each production bus following manufacture to determine its acceptance to the Agency. These acceptance tests shall include pre-delivery inspections and testing by the Contractor and inspections and testing by the Agency after the buses have been delivered.

QA 3.2 Pre-Delivery Tests

The Contractor shall conduct acceptance tests at its plant on each bus following completion of manufacture and before delivery to the Agency. These pre-delivery tests shall include visual and measured inspections, as

well as testing the total bus operation and, if electric drive, charging operation. The tests shall be conducted and documented in accordance with written test plans approved by the Agency.

Additional tests may be conducted at the Contractor's discretion to ensure that the completed buses have attained the required quality and have met the requirements in "Section 6: Technical Specifications." The Agency may, prior to commencement of production, demand that the Contractor demonstrate compliance with any requirement in that section if there is evidence that prior tests have been invalidated by the Contractor's change of Supplier or change in manufacturing process. Such demonstration shall be by actual test, or by supplying a report of a previously performed test on similar or like components and configuration. Any additional testing shall be recorded on appropriate test forms provided by the Contractor and shall be conducted before acceptance of the bus.

The pre-delivery tests shall be scheduled and conducted with thirty (30) days' notice so that they may be witnessed by the resident inspectors, who may accept or reject the results of the tests. The results of pre-delivery tests, and any other tests, shall be filed with the assembly inspection records for each bus. The underfloor equipment shall be available for inspection by the resident inspectors, using a pit or bus hoist provided by the Contractor. A hoist, scaffold or elevated platform shall be provided by the Contractor to easily and safely inspect bus roofs. Delivery of each bus shall require written authorization of the primary resident inspector. Authorization forms for the release of each bus for delivery shall be provided by the Contractor. An executed copy of the authorization shall accompany the delivery of each bus.

QA 3.2.1 Visual and Measured Inspections

Visual and measured inspections shall be conducted with the bus in a static condition. The purpose of the inspection testing includes verification of overall dimension and weight requirements, that required components are included and are ready for operation, and that components and subsystems designed to operate with the bus in a static condition do function as designed.

QA 3.2.2 Total Bus Operation

Total bus operation shall be evaluated during road tests. The purpose of the road tests is to observe and verify the operation of the bus as a system and to verify the functional operation of the subsystems that can be operated only while the bus is in motion.

Each bus shall be driven for a minimum of fifteen (15) miles during the road tests. If requested, computerized diagnostic printouts or electronic files showing the performance of each bus shall be produced and provided to the Agency. Observed Defects shall be recorded on the test forms. The bus shall be retested when Defects are corrected and adjustments are made. This process shall continue until Defects or required adjustments are no longer detected.

QA 4. Agency-Specific Requirements

[Insert Agency specific quality assurance requirements.]

Attachment A: New Bus Manufacturing Inspection Guidelines

Pre-Production Meeting

Responsibilities

Agency

- Provides conformed copy of technical requirements.
- Recommended staff to be involved may include the following:
 - Project manager
 - Technical engineer
 - Contract administrator
 - Quality assurance administrator
 - Warranty administrator
- Process for inspector's role (to deal with Agency) for negotiated changes after freeze date.
- Contractual requirements:
 - Milestones
 - Documentation
 - Title requirements
 - Deliverables
 - Payments
 - Reliability tracking

Manufacturer

- Identifies any open issues.
- Recommended staff to be involved may include the following:
 - Project manager
 - Technical engineer(s)
 - Contract administrator
 - Quality assurance administrator
 - Warranty administrator
- Production flow (buses/week, shifts).
- Delivery schedule and offsite component build-up schedule.
- Bus QA documentation (including supplier application approvals and/or any certifications required for the specific production).
- Communication flow/decision making.

Inspector

- Agree on decisions inspectors can and cannot make.
- Primary contact for problems, etc.
- Production flow process (description of manufacturing by station).
- Factory hours (manage inspection schedule based on production hours).
- Plant rules.
- Safety requirements.
- Orientation requirements.
- Work environment.
- Inspector's office space (per contract).

NOTE: As a result of this meeting, documentation should be produced detailing final production requirements and the planned configuration of the bus.

Build Schedule

The bus manufacturer's contract administrator shall supply a fleet build production schedule based on the dates in the Notice to Proceed, and a description of the manufacturer's schedule for plant operations.

The production schedule should contain specific milestone dates, such as the following:

- First vehicle on production line (date on which any work will begin)
- First vehicle off production line
- First vehicle through manufacturer's quality assurance inspections
- First vehicle shipped to the Agency
- Last vehicle on production line
- Last vehicle off production line
- Last vehicle shipped to the Agency

Plant Tour (if Meeting at OEM's Location)

The Agency will review the entire process from start to finish and review the work completed at each line station, including quality control measures.

Prototype/Pilot Vehicle Production

The Contractor shall conduct acceptance tests at its plant on each bus following completion of manufacture and before delivery to the Agency. These pre-delivery tests shall include visual and measured inspections, as well as testing the total bus operation. The tests shall be conducted and documented in accordance with written test plans approved by the Agency. The underfloor equipment shall be available for inspection by the resident inspectors, using a pit or bus hoist provided by the Contractor. A hoist, scaffold or elevated platform shall be provided by the Contractor to easily and safely inspect bus roofs. Delivery of each bus shall require written authorization of the primary resident inspector. Authorization forms for the release of each bus for delivery shall be provided by the Contractor. An executed copy of the authorization shall accompany the delivery of each bus.

Additional tests may be conducted at the Agency's discretion to ensure that the completed buses have attained the required quality and have met the requirements in "Section 6: Technical Specifications." The Agency may, prior to commencement of production, demand that the Contractor demonstrate compliance with any requirement in that section if there is evidence that prior tests have been invalidated by the Contractor's change of Supplier or change in manufacturing process. Such demonstration shall be by actual test, or by supplying a report of a previously performed test on similar or like components and configuration. Any additional testing shall be recorded on appropriate test forms provided by the Contractor and shall be conducted before acceptance of the bus.

The pre-delivery tests shall be scheduled and conducted with 30 days' notice so that they may be witnessed by the resident inspectors, who may accept or reject the results of the tests. The results of pre-delivery tests, and any other tests, shall be filed with the assembly inspection records for each bus.

Visual and Measured Inspections

Visual and measured inspections shall be conducted with the bus in a static condition. The purpose of the inspection testing includes verification of overall dimension and weight requirements, that required

components are included and are ready for operation, and that components and subsystems designed to operate with the bus in a static condition do function as designed.

Total Bus Operation

Total bus operation shall be evaluated during road tests. The purpose of the road tests is to observe and verify the operation of the bus as a system and to verify the functional operation of the subsystems that can be operated only while the bus is in motion.

Each bus shall be driven for a minimum of 15 miles during the road tests. If requested, computerized diagnostic printouts showing the performance of each bus shall be produced and provided to the Agency. Observed defects shall be recorded on the test forms. The bus shall be retested when defects are corrected and adjustments are made. This process shall continue until defects or required adjustments are no longer detected.

Post-Delivery Tests

The Agency shall conduct acceptance tests on each delivered bus. These tests shall be completed within 15 days after bus delivery and shall be conducted in accordance with the Agency's written test plans. The purpose of these tests is to identify defects that have become apparent between the time of bus release and delivery to the Agency. The post-delivery tests shall include visual inspection and bus operations. No post-delivery test shall apply new criteria that are different from criteria applied in a pre-delivery test.

Buses that fail to pass the post-delivery tests are subject to non-acceptance. The Agency shall record details of all defects on the appropriate test forms and shall notify the Contractor of acceptance or non-acceptance of each bus, after completion of the tests. The defects detected during these tests shall be repaired according to procedures defined in the contract.

Prototype/Pilot Vehicle Acceptance

In order to assess the Contractor's compliance with the Technical Specifications, the Agency and the Contractor shall, at the Pre-Production Meeting, jointly develop a Configuration and Performance Review document for review of the pilot vehicle. This document shall become part of the official record of the Pre-Production Meeting.

Potential dimensional/performance tests that may be included in the Configuration and Performance Review include the following:

- Complete electrical system audit
- Dimensional requirements audit
- Seating capacity
- Water test
- Water runoff test
- Function test of systems/subsystems and components
- Sound/noise level tests
- Vehicle top speed
- Acceleration tests
- Brake stop tests
- Airflow tests
- PA function tests
- Air/brake system audit

- Individual axle weight
- Standee capacity
- Body deflection tests
- Silent alarm function test
- Interior lighting
- Exterior lighting
- Gradeability test
- Kneeling system function
- HVAC pull down/heat
- Speedometer
- Outside air infiltration (smoke)
- Wheelchair ramps
- Propulsion system performance qualification
 - This test shall be jointly conducted by the Contractor and the propulsion system manufacturer (including but not limited to charge air cooler performance, air to boil test, loss of coolant, fuel system, electrical inputs and protection systems).
- Transmission performance qualifications
 - This test shall be jointly conducted by the Contractor and the transmission manufacturer (including but not limited to retarder operation, heat exchanger, interface with ABS and electrical inputs).

Buy America Audit

A post-delivery Buy America audit is required for federally funded bus procurements (see 49 CFR Part 663 for additional information). The on-site resident inspectors are to monitor the production processes to verify compliance with final assembly requirements identified by the Buy America pre-award audit. This audit is to verify compliance with final assembly requirements and final documentation of Buy America compliance and must be completed prior to title transfer.

NOTE: If there is not a pilot/prototype bus, then the Buy America post-delivery audit should be performed following completion of the first serial production bus. In addition to monitoring of the production processes, the Agency must verify compliance that more than 60 percent of the costs of all components are produced in the United States. Finally, the Agency must execute the required certificates.

Resident Inspection Process for Serial Production

At the discretion of the Agency, a decision is made to perform resident inspection using the Agency's personnel, a contract inspector, or a combination of both. The decision is based on factors such as the availability of personnel, knowledge/expertise in bus build project management, the size of the bus order, etc.

NOTE: The decision to have the resident inspection performed by Agency personnel results in a firm understanding and knowledge of the bus and affords the opportunity to identify parts that will be needed for general maintenance down the road.

Inspector Responsibilities

The resident inspection process for the serial production of the buses begins following the completion and acceptance of the prototype or pilot vehicle if required, or according to the serial bus production schedule. Resident inspectors should represent the Agency for all build-related issues (quality, conformance, etc.). Resident inspectors can also address contractual type issues but should only do so under the consult of

the Agency's contracts administrator. Resident inspectors are sent to the manufacturer's facility according to a Resident Inspection Schedule. Typically, one or two inspectors arrive on site at the manufacturing facility about one week prior to actual production to setup the resident inspection process and to begin preliminary quality assurance inspections for items such as power plant build-up and wire harness production, and to inspect incoming parts, fasteners, fluids, etc., that will be used in the production of the buses. During the serial production of the buses, the resident inspectors should monitor the production of each bus, verifying the quality of materials, components, sub-assemblies and manufacturing standards. In addition, the configuration of each vehicle should be audited using the vehicle manufacturer's Build Specification and other documents to ensure contract compliance and uniformity.

Inspector Rotation/Scheduling

During the resident inspection phase, a single inspector or multiple inspectors could be used. If it is decided to use multiple inspectors, then the inspectors could be rotated on a biweekly to monthly basis as required. During the rotation of inspectors, a sufficient period of overlap should be provided to guarantee the consistency of the resident inspection process.

Resident Inspector Orientation

A resident inspector orientation by the bus manufacturer should take place upon the arrival of the initial inspection team. The orientation should include expectations for the use of personal protective equipment (safety shoes, safety glasses, etc.), daily check-in and check-out requirements, lines of communication, use of production documents such as speed memos and line movement charts, inspector/production meetings, inspector office arrangements, and anything else pertinent to the inspection team's involvement during the build. Many of the above items should already be formalized during the Pre-Production Meeting.

Audits, Inspections and Tests

The resident inspection process monitors the production of each vehicle. Inspection stations should be strategically placed to test or inspect components or other installations before they are concealed by subsequent fabrication or assembly operations. These locations typically are placed for the inspection of underbody structure, body framing, electrical panels and harnesses, air and hydraulic line routings, installation of insulation, power plant build-up and installation, rust inhibitor/undercoating application, floor installation, front suspension alignment, and other critical areas.

Vehicle Inspections

Each bus is subjected to a series of inspections after the bus reaches the point of final completion on the assembly line. Typically, the vehicle manufacturer performs its own quality assurance inspections following assembly line completion before releasing each bus to the resident inspectors. The inspections for each vehicle are documented, signed off upon passing and included in the vehicle record.

These are the typical inspections performed on each bus by the resident inspectors:

- Water test inspection
- Road test inspection
- Interior inspection (including functionality)
- Hoist/undercarriage inspection
- Exterior inspection (including roof)
- Electrical inspection
- Wheelchair ramp/lift inspection

Water Test Inspection

The water test inspection checks the integrity of the vehicle's body seams, window frame seals and other exterior component closeouts for their ability to keep rainwater, road splash, melting snow and slush, and other exterior water from entering the inside of the vehicle. The vehicle's interior is inspected for signs of moisture and water leaks. To perform the leak inspection, interior ceiling and side panels are removed, and access doors are opened. If any moisture or water is detected, then the source of the leak will be located and repaired by the manufacturer, and the vehicle will be tested again.

Road Test Inspection

The road test inspection checks all the vehicle's systems and subsystems while the vehicle is in operation. Typically, the road test inspection is performed immediately following the water test inspection to reveal any standing water that may be present due to a leak, but was not noticed during the "static" water test. Objectionable vibrations, air leakage and other factors that affect ride quality are recorded and reported to the vehicle manufacturer for resolution. Vehicle stability, performance, braking and interlock systems, HVAC, and other critical areas are checked to ensure that the vehicle is complete and ready to provide safe and reliable service.

The following tests may be performed and recorded during the road test:

- Acceleration test
- Top speed test
- Gradeability test
- Service brake test
- Parking brake test
- Turning effort test
- Turning radius test
- Shift quality
- Quality of retarder or regenerative braking action

During the road test, a vehicle may be taken to a weigh station to record the vehicle's front axle weight, rear axle weight and total vehicle (curb) weight.

Interior Inspection

The interior inspection checks the fit and finish of the interior installations.

In addition, the inspection also verifies the installation and function of systems and subsystems according to the Build Specification. All systems and functions accessed from the interior are inspected for functionality, appearance and safety.

Examples of systems/functions inspected include the following:

- Interior and exterior lighting controls
- Front and rear door systems
- Flooring installation
- Passenger and operator's seat systems
- Wheelchair securement and ramp systems
- Fire suppression system
- Electrical installations (multiplex, tell-tale wiring, panels, etc.)

- Window systems and emergency escape portals
- Operator dash/side panel controls/indicators

Hoist/Undercarriage Inspection

The hoist/undercarriage inspection checks the installation of components, wiring, air lines, presence of fluid leaks, etc., located under the vehicle. Typically, this inspection is performed following the road test. The vehicle is lifted onto a hoist or pulled over a pit for the inspection. Areas inspected are the front suspension, air bags, airline routings, electrical connections and routings, drivetrain components, linkages and any other system or component that may be prone to early failure due to inadequate installation techniques. All lines, cables, hoses, etc., are inspected for proper securement and protection to prevent rubbing, chafing or any other condition that could result in a failure. The engine/powerplant and HVAC compartments are also inspected during this time.

Exterior Inspection

The exterior inspection checks the fit and finish of components installed on the exterior of the vehicle. Access panels are opened and accessories are inspected for proper installation. In addition, vehicle paint, graphics and proper decals are also inspected. Acceptable paint finish quality (orange peel, adhesion, etc.) should be agreed on with the vehicle manufacturer prior to production to ensure consistency of inspections.

Electrical Inspection

The vehicle's main electrical panels and other subpanels are inspected for proper components, to include relays, fuses, modules, terminal strips, decals, etc. In addition, electrical harnesses are inspected for proper wiring and termination techniques, bulkhead protection, looming and other items that could result in future electrical failure. Onboard vehicle compartment schematics are verified for accuracy.

Wheelchair Ramp Inspection

The wheelchair ramp assembly is inspected for proper installation and performance. Clearances critical to the operation of the ramp are verified, and the ramp's electrical systems are inspected to ensure appropriate wire routings and protection. The successful integration of the ramp assembly into the vehicle is verified, and the vehicle interlocks are checked during automatic and manual ramp operation.

Audits

During serial production of the bus's quality assurance inspection, tests may be performed to ensure that the manufacturer's quality standards are being followed. These inspection audits could be on items such as torque wrench calibrations, proper techniques for fastener installations, proper use and type of adhesives, use of correct installation drawings on the production line, etc.

Communications

The lines of communications, formal and informal, should be discussed and outlined in the Pre-Production Meeting. As previously discussed, resident inspectors should represent the Agency for all bus-build related issues (quality, conformance, etc.). Resident inspectors can relay communications addressing contractual type issues but should do so only under the consult of the Agency's contract administrator. Actual personnel contacts for the manufacturing facility should be established during resident inspector orientation. These contacts could include quality assurance, production, material handling, engineering and buy-off area personnel.

Documentation

The following documents/reports are typically generated during the bus build process:

- Vehicle build specification
- Sales order
- Pre-Production Meeting notes
- Prototype and production correspondence (vehicle build file)
- Manufacturer's vehicle record (Warranty file)
 - Vehicle line documents
 - Serialization documents (Warranty file)
 - Alignment verification
 - Brake testing
 - HVAC testing and checkout
 - Manufacturer's QA checklist and signoff
 - Weight slip (prototype and Warranty file)
 - Prototype performance tests document (vehicle build file)
 - Acceleration Test
 - Top Speed Test
 - Gradeability Test
 - Interior Noise Test A – Stationary
 - Interior Noise Test B – Dynamic
 - Exterior Noise Test A – Pull Away
 - Exterior Noise Test B – Pass-By
 - Exterior Noise Test C – Curb Idle
 - Turning Radius Test
 - Turning Effort Test
 - Parking Brake Test
 - Service Brake Test
 - Vehicle acceptance inspections—production (Warranty file)
 - Water Test Inspection Report
 - Road Test Inspection Report
 - Interior Inspection Report
 - Hoist/Undercarriage Inspection Report
 - Exterior Inspection Report
 - Electrical Inspection Report
 - Wheelchair Inspection Report
 - Speed Memos (Warranty file)
 - Agency Vehicle Inspection record(Warranty file)
 - Release for delivery documentation (Warranty file)
 - Post-Production Acceptance – Certificate of Acceptance(Accounting)
 - Post-Delivery Inspection Report – (Fleet Management & Warranty files)

Vehicle Release for Delivery

Upon satisfactory completion of all inspection, audit and test criteria, and resolution of any outstanding issues affecting the purchase of any or all buses, proper documentation (the Release for Delivery) is signed by the designated resident inspector authorizing the bus manufacturer to deliver the vehicle to the Agency's facility, where it will undergo a post-delivery inspection process and final acceptance. The satisfactory sign-off of the Release for Delivery should complete the resident inspector's duties for each bus. In final preparation for

delivery, the bus manufacturer may request the resident inspector to do a final walk-through of the bus after it has been cleaned and prepped for shipping.

Post-Delivery and Final Acceptance

The Agency shall conduct acceptance tests on each delivered bus. These tests shall be completed within 15 days after bus delivery and shall be conducted in accordance with the Agency's written test plans. The purpose of these tests is to identify defects that have become apparent between the time of bus release and delivery to the Agency. The post-delivery tests shall include visual inspection, along with a verification of system(s) functionality and overall bus operations. No post-delivery test shall apply new criteria that are different from criteria applied in a pre-delivery test.

Buses that fail to pass the post-delivery tests are subject to non-acceptance. The Agency shall record details of all defects on the appropriate test forms and shall notify the Contractor of acceptance or non-acceptance of each bus within five days after completion of the tests. The defects detected during these tests shall be repaired according to procedures defined in the contract after non-acceptance.

Certificate of Acceptance

- **Accepted**
- **Not accepted:** In the event that the bus does not meet all requirements for acceptance. The Agency must identify reasons for non-acceptance and work with the OEM to develop a timeline of addressing the problem for a satisfactory resolution and redelivery.
- **Conditional acceptance:** In the event that the bus does not meet all requirements for acceptance, the Agency may conditionally accept the bus and place it into revenue service pending receipt of Contractor furnished materials and/or labor necessary to address the identified issue(s).

SECTION 9: FORMS AND CERTIFICATIONS

CER 1. Proposer's Checklist

RFP [insert name of procurement]

Package 1: Technical Proposal

- 1. Letter of Transmittal
- 2. Technical Proposal
- 3. Acknowledgement of Addenda
- 4. Form for Proposal Deviation
- 5. Vehicle Questionnaire
- 6. References and non-priced information (if provided by Proposer)
- 7. Engineering organization chart, engineering change control procedure, field modification process
- 8. Manufacturing facility plant layout, other contracts, staffing
- 9. Production schedule and other Contract commitments for the duration of this Contract.
- 10. Quality Assurance Program

Package 2: Price Proposal

- 1. Letter of Transmittal
- 2. Pricing Schedule (including option buses, spare parts package, engineering, manuals, training, special tools and test equipment)

Package 3: Qualifications Package

- 1. Pre-Award Evaluation Data Form
- 2. A copy of the three (3) most recent audited financial statements or a statement from the Proposer regarding how financial information may be reviewed by the Agency
- 3. Letter for insurance
- 4. Letter for performance bond (if applicable)
- 5. Letter of commitment for parental financial guarantee (if applicable)
- 6. Proposal Form

Package 4: Proprietary/Confidential Information

- 1. Proprietary/Confidential Information

There may be items in the first three packages that are included in Package 4 because they are considered to be proprietary/confidential information. When this occurs, the Proposer must note that fact in packages 1 through 3.

CER 2. Request for Pre-Offer Change or Approved Equal

This form must be used for requested clarifications, changes, substitutes or approval of items equal to items specified with a brand name and must be submitted as far in advance of the Due Date, as specified in “Questions, Clarifications and Omissions.”

[insert Agency name]

[Insert RFP number and title]

| | |
|--|--|
| Request #: | |
| Proposer: | |
| RFP Section: | |
| Page: | |
| Questions/clarification or approved equal: | |
| Agency action: | <input type="checkbox"/> Approved <input type="checkbox"/> Denied <input type="checkbox"/> See addendum <input type="checkbox"/> See response below |
| Agency response: | |

CER 3. Acknowledgement of Addenda

Failure to acknowledge receipt of all addenda may cause the Proposal to be considered nonresponsive to the Solicitation. Acknowledged receipt of each addendum must be clearly established and included with the Proposal.

| | |
|--|--------|
| The undersigned acknowledges receipt of the following addenda to the documents: | |
| Addendum No.: | Dated: |
| Addendum No.: | Dated: |
| Addendum No.: | Dated: |
| Addendum No.: | Dated: |
| Proposer: Name: Title: Phone: Street address: City, state, ZIP: | |
| <hr/> | |
| Authorized signature | Date |

CER 4. Contractor Service and Parts Support Data

Location of nearest Technical Service Representative to Agency

Name:

Address:

Telephone:

Describe technical services readily available from said representative:

Location of nearest Parts Distribution Center to Agency:

Name:

Address:

Telephone:

Describe the extent of parts available at said center:

Policy for delivery of parts and components to be purchased for service and maintenance:

Regular method of shipment:

Cost to Agency:

CER 5. Form for Proposal Deviation

This form shall be completed for each condition, exception, reservation or understanding (i.e., Deviation) in the Proposal according to “Conditions, Exceptions, Reservations or Understandings.” One copy without any price/cost information is to be placed in the Technical Proposal as specified in “Technical Proposal Requirements,” and a separate copy with any price/cost information placed in the Price Proposal as specified in “Price Proposal Requirements.”

[insert Agency name]

[Insert RFP number and title]

| Deviation No.: | Contractor: | RFP section: | Page: |
|---|-------------|--------------|-------|
| Complete description of Deviation: | | | |
| Rationale (pros and cons): | | | |

CER 6. Pricing Schedule

NOTE: The following is an example of what a pricing schedule might look like and should be customized by the Agency to reflect the costs for its procurement.

[insert Agency name]
 [Insert RFP number and title]

| | All prices are to be in United States dollars | |
|---|---|-----------|
| | Unit Price | Extension |
| [Insert quantity, size, type and description] buses | | |
| Manuals | Lump Sum | |
| Training | Lump Sum | |
| Spare parts package | | |
| Test equipment and special tools | | |
| Extended Warranty [Agency to identify subsystem] | | |
| Extended Warranty [Agency to identify subsystem] | | |
| Extended Warranty [Agency to identify subsystem] | | |
| Extended Warranty [Agency to identify subsystem] | | |
| Other [Agency to specify] | | |
| Sales tax (if applicable) | | |
| Delivery charges | | |
| TOTAL PROPOSED PRICE | | |
| ADA equipment (included in above unit prices) | | |

This form is to be completed and included in the Price Package.

CER 7. Pre-Award Evaluation Data Form

NOTE: This form is to be completed and included in the Qualification Package. Attach additional pages if required.

[insert Agency name]
[Insert RFP number and title]

| |
|---|
| <p>1. Name of firm:</p> <p>2. Address:</p> <p>3. <input type="checkbox"/> Individual <input type="checkbox"/> Partnership <input type="checkbox"/> Corporation <input type="checkbox"/> Joint Venture</p> <p>4. Date organized: State in which incorporated:</p> <p>5. Names of officers or partners:</p> <p>a. b. c. d. e.</p> <p>6. How long has your firm been in business under its present name?</p> |
| <p>7. Attach as SCHEDULE ONE a list of similar current contracts that demonstrates your available capacity, including the quantity and type of bus, name of contracting party, percentage completed and expected completion date.</p> <p>8. Attach as SCHEDULE TWO a list of at least three similar contracts that demonstrates your technical proficiency, each with the name of the contracting party and number and they type of buses completed within the last five years.</p> <p>9. Have you been terminated or defaulted, in the past five years, on any Contract you were awarded? <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, then attach as SCHEDULE THREE the full particulars regarding each occurrence.</p> <p>10. Attach as SCHEDULE FOUR Proposer's last three (3) financial statements prepared in accordance with generally accepted accounting principles of the jurisdiction in which the Proposer is located, and audited by an independent certified public accountant; or a statement from the Proposer regarding how financial information may be reviewed by the Agency (This may require execution of an acceptable nondisclosure agreement between the Agency and the Proposer.)</p> <p>11. Attach as SCHEDULE FIVE a list of all principal Subcontractors and the percentage and character of Work (Contract amount) that each will perform on this Contract.</p> <p>12. If the Contractor or Subcontractor is a joint venture, submit PRE-AWARD EVALUATION DATA forms for each member of the joint venture.</p> |
| <p>The above information is confidential and will not be divulged to any unauthorized personnel.</p> |
| <p>The undersigned certifies to the accuracy of all information: Name and title: Company:</p> <hr style="border: 0; border-top: 1px solid black; margin-top: 10px;"/> |
| <p>Authorized signature Date</p> |

CER 8. Federal Certifications

CER 8.1 Buy America Certification

This form is to be submitted with an offer exceeding the small purchase threshold for federal assistance programs, currently set at \$100,000.

Certificate of Compliance

The Proposer hereby certifies that it will comply with the requirements of 49 USC Section 5323(j)(2)(C), Section 165(b)(3) of the Surface Transportation Assistance Act of 1982, as amended, and the regulations of 49 CFR 661.11:

Name and title:
Company:

Authorized signature

Date

Certificate of Non-Compliance

The Proposer hereby certifies that it cannot comply with the requirements of 49 USC Section 5323(j)(2)(C) and Section 165(b)(3) of the Surface Transportation Assistance Act of 1982, as amended, but may qualify for an exception to the requirements consistent with 49 USC Sections 5323(j)(2)(B) or (j)(2)(D), Sections 165(b)(2) or (b)(4) of the Surface Transportation Assistance Act, as amended, and regulations in 49 CFR 661.7.

Name and title:
Company:

Authorized signature

Date

CER 8.2 Debarment and Suspension Certification for Prospective Contractor

Primary covered transactions must be completed by Proposer for contract value over \$25,000.

Choose one alternative:

- The Proposer, [insert name], certifies to the best of its knowledge and belief that it and its principals:
1. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any federal department or agency;
 2. Have not within a three-year period preceding this Proposal been convicted of 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) transaction or Contract under a public transaction; violation of federal or state antitrust statutes or commission or embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
 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 2 of this certification; and
 4. Have not within a three-year period preceding this Proposal had one or more public transactions (federal, state or local) terminated for cause or default.

OR

- The Proposer is unable to certify to all of the statements in this certification, and attaches its explanation to this certification. (In explanation, certify to those statements that can be certified to and explain those that cannot.)

The Proposer certifies or affirms the truthfulness and accuracy of the contents of the statements submitted on or with this certification and understands that the provisions of Title 31 USC § Sections 3801 are applicable thereto.

Executed in [insert city and state].

Name:

Authorized signature

Date

CER 8.3 Debarment and Suspension Certification (Lower-Tier Covered Transaction)

This form is to be submitted by each Subcontractor receiving an amount exceeding \$25,000.

The prospective lower-tier participant (Proposer) certifies, by submission of this Proposal, that neither it nor its "principals" as defined at 49 CFR § 29.105(p) is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any federal department or agency.

If the prospective Proposer is unable to certify to the statement above, it shall attach an explanation, and indicate that it has done so by placing an "X" in the following space: _____

THE PROPOSER, _____, CERTIFIES OR AFFIRMS THE TRUTHFULNESS AND ACCURACY OF EACH STATEMENT OF ITS CERTIFICATION AND EXPLANATION, IF ANY. IN ADDITION, THE PROPOSER UNDERSTANDS AND AGREES THAT THE PROVISIONS OF 31 USC §§ 3801 ET SEQ. APPLY TO THIS CERTIFICATION AND EXPLANATION, IF ANY.

Name and title of the Proposer's authorized official:

Authorized signature

Date

CER 8.4 Non-Collusion Affidavit

This affidavit is to be filled out and executed by the Proposer; if a corporation makes the bid, then by its properly executed agent. The name of the individual swearing to the affidavit should appear on the line marked "Name of Affiant." The affiant's capacity, when a partner or officer of a corporation, should be inserted on the line marked "Capacity." The representative of the Proposer should sign his or her individual name at the end, not a partnership or corporation name, and swear to this affidavit before a notary public, who must attach his or her seal.

| | |
|---|---|
| State of _____, County of _____ | |
| I, _____, being first duly sworn, do hereby state that <small>(Name of Affiant)</small> | |
| I am _____ of _____ <small>Capacity) (Name of Firm, Partnership or Corporation)</small> | |
| whose business is _____ | |
| and who resides at _____ | |
| and that _____ <small>(Give names of all persons, firms, or corporations interested in the bid)</small> | |
| is/are the only person(s) with me in the profits of the herein contained Contract; that the Contract is made without any connection or interest in the profits thereof with any persons making any bid or Proposal for said Work; that the said Contract is on my part, in all respects, fair and without collusion or fraud, and also that no members of the Board of Trustees, head of any department or bureau, or employee therein, or any employee of the Authority, is directly or indirectly interested therein. | |
| _____ <small>Signature of Affiant Date</small> | |
| Sworn to before me this _____ day of _____, 20____. | |
| _____ <small>Notary public</small> | _____ <small>My commission expires</small> |
| Seal | |

CER 8.5 Lobbying Certification

This form is to be submitted with an offer exceeding \$100,000.

The Proposer certifies, to the best its knowledge and belief, that:

1. 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 a federal department or agency, a member of the U.S. Congress, an officer or employee of the U.S. Congress, or an employee of a member of the U.S. 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 thereof.
2. 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 instruction, as amended by "Government wide Guidance for New Restrictions on Lobbying," 61 Fed. Reg. 1413 (1/19/96).
3. 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 sub recipients 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, USC § 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.

THE PROPOSER, _____, CERTIFIES OR AFFIRMS THE TRUTHFULNESS AND ACCURACY OF EACH STATEMENT OF ITS CERTIFICATION AND DISCLOSURE, IF ANY. IN ADDITION, THE PROPOSER UNDERSTANDS AND AGREES THAT THE PROVISIONS OF 31 USC §§ 3801 ET SEQ. APPLY TO THIS CERTIFICATION AND DISCLOSURE, IF ANY.

Name of the bidder or Proposer's authorized official:

Title:

Signature

Date

Per paragraph 2 of the included form Lobbying Certification, add Standard Form–LLL, "Disclosure Form to Report Lobbying," if applicable.

CER 8.6 Certificate of Compliance with Bus Testing Requirement

The undersigned certifies that the vehicle offered in this procurement complies and will, when delivered, comply with 49 USC § 5323(c) and FTA's implementing regulation at 49 CFR Part 665 according to the indicated one of the following three alternatives.

Mark one and only one of the three blank spaces with an "X."

1. _____ The buses offered herewith have been tested in accordance with 49 CFR Part 665 on _____ (date). If multiple buses are being proposed, provide additional bus testing information below or on attached sheet. The vehicles being sold should have the identical configuration and major components as the vehicle in the test report, which must be submitted with this Proposal. If the configuration or components are not identical, then the manufacturer shall provide with its Proposal a description of the change and the manufacturer's basis for concluding that it is not a major change requiring additional testing. If multiple buses are being proposed, testing data on additional buses shall be listed on the bottom of this page.
2. _____ The manufacturer represents that the vehicle is "grandfathered" (has been used in mass transit service in the United States before October 1, 1988, and is currently being produced without a major change in configuration or components), and submits with this Proposal the name and address of the recipient of such a vehicle and the details of that vehicle's configuration and major components.
3. _____ The vehicle is a new model and will be tested and the results will be submitted to the Agency prior to acceptance of the first bus.

The undersigned understands that misrepresenting the testing status of a vehicle acquired with federal financial assistance may subject the undersigned to civil penalties as outlined in the Department of Transportation's regulation on Program Fraud Civil Remedies, 49 CFR Part 31. In addition, the undersigned understands that FTA may suspend or debar a manufacturer under the procedures in 49 CFR Part 29.

Company name:

Name and title of the Proposer's authorized official:

Authorized signature

Date

CER 8.7 DBE Approval Certification

I hereby certify that the Proposer has complied with the requirements of 49 CFR 26, Participation by Disadvantaged Business Enterprises in DOT Programs, and that its goals have not been disapproved by the Federal Transit Administration.

Name and title of the Proposer's authorized official:

Authorized signature

Date

CER 8.8 Federal Motor Vehicle Safety Standards

The Proposer and (if selected) Contractor shall submit (1) manufacturer's FMVSS self-certification sticker information that the vehicle complies with relevant FMVSS or (2) manufacturer's certified statement that the contracted buses will not be subject to FMVSS regulations.

Company name:

Name of signer:

Title:

Authorized signature

Date

CER 9. Other Certifications

CER 9.1 Proposal Form

NOTE: The following is an example of a Proposal form to be modified as appropriate by the Agency and included in the RFP.

Proposer shall complete the following form and include it in the price Proposal.

PROPOSAL

By execution below by a duly authorized representative(s) of the Proposer, the Proposer hereby offers to furnish equipment and services as specified in its Proposal submitted to [insert Agency name] in response to Request for Proposal No. [insert RFP number] in its entirety.

Proposer: _____

Street address: _____

City, state, ZIP: _____

Name and title of Authorized Signer(s): _____

Name and title of Authorized Signer(s): _____

Phone: _____

Authorized signature

Date

Authorized signature

Date

CER 9.2 Notice of Award

NOTE: This form is included as an example. Standard industry practice is to execute a separate Contract as provided as an example in Appendix E.

By execution below, [insert Agency name] accepts Proposal as indicated above.

Contracting officer: _____

Authorized signature

Date

CER 9.3 Certification of Compliance with Standards, Certifications and Regulations

CER 9.3 identifies the specifications, standards, regulations, and references used within this RFP. This form must be completed and included in the Technical Proposal and requires an indication of the state of compliance and an opportunity for listing other pertinent references. Please indicate “compliance” as, full, partial or N/A (not applicable). If “partial” or “N/A,” please describe.

| Standard | Title | Compliance | If “partial” or “N/A,” please describe |
|-----------------|--|-------------------|---|
| SAE J10 | Automotive and Off-Highway Air Brake Reservoir Performance and Identification Requirements - Truck and Bus J10_201312 | | |
| SAE J211a | Instrumentation for Impact Test J211A_197112 | | |
| SAE J287 | Driver Hand Control Reach J287_201603 | | |
| SAE J366 | Exterior Sound Level for Heavy Trucks and Buses (STABILIZED Sep 2011) J366_201109 | | |
| SAE J382 | Windshield Defrosting Systems Performance Requirements-- Trucks, Buses, and Multipurpose Vehicles (Cancelled Sep 2000) J382_200009 | | |
| SAE J534 | Lubrication Fittings J534_201508 | | |
| SAE J537 | Storage Batteries J537_201604 | | |
| SAE J541 | Voltage Drop for Starting Motor Circuits (Cancelled Jul 2013) J541_201307 | | |
| SAE J587 | License Plate Illumination Devices (Rear Registration Plate Illumination Devices) J587_201711 | | |
| SAE J593 | Backup Lamp (Reversing Lamp) J593_201606 | | |
| SAE J673 | Automotive Safety Glazing Materials J673_201506 | | |
| SAE J680 | Location and Operation of Air Brake Controls in Motor Truck Cabs J680_201508 | | |
| SAE J686 | Motor Vehicle License Plates (STABILIZED Jul 2012) J686_201207 | | |
| SAE J689 | Curbstone Clearance, Approach, Departure, and Ramp Breakover Angles—Passenger Car and Light Truck (Cancelled Aug 2009) J689_200908 | | |
| SAE J833 | Human Physical Dimensions | | |
| SAE J844 | Nonmetallic Air Brake System Tubing (STABILIZED Dec 2012) J844_201212 | | |
| SAE J941 | Motor Vehicle Drivers’ Eye Locations J941_201003 | | |
| SAE J994 | Alarm—Backup—Electric Laboratory Performance Testing J994_201409 | | |
| SAE J1050 | Describing and Measuring the Driver’s Field of View J1050_200902 | | |

Request for Proposal
 [insert date of solicitation]
 [insert Proposal number]

| Standard | Title | Compliance | If “partial” or “N/A,” please describe |
|-----------------|---|-------------------|---|
| SAE J1113 | Electromagnetic Compatibility Measurement Procedures and Limits for Components of Vehicles, Boats (up to 15 m), and Machines (Except Aircraft) (16.6 Hz to 18 GHz) J1113/1_201810 | | |
| SAE J1127 | Low Voltage Battery Cable J1127_201512 | | |
| SAE J1128 | Low Voltage Primary Cable J1128_201512 | | |
| SAE J1149 | Metallic Air Brake System Tubing and Pipe (STABILIZED Oct 2015) J1149_201510 | | |
| SAE J1292 | Automobile and Motor Coach Wiring(STABILIZED Apr 2016) J1292_201604 | | |
| SAE J1308 | Fan Guard for Off-Road Machines J1308_201312 | | |
| SAE J1455 | Recommended Environmental Practices for Electronic Equipment Design in Heavy-Duty Vehicle Applications J1455_201703 | | |
| SAE J1587 | Electronic Data Interchange Between Microcomputer Systems in Heavy-Duty Vehicle Applications (STABILIZED Jan 2013) J1587_201301 | | |
| SAE J1654 | Unshielded High Voltage Primary Cable J1654_201609 | | |
| SAE J1708 | Serial Data Communications Between Microcomputer Systems in Heavy-Duty Vehicle Applications (STABILIZED Sep 2016) J1708_201609 | | |
| SAE J1763 | A Conceptual Its Architecture: An Atis Perspective (Cancelled May 2003) J1763_200304 | | |
| SAE J1772 | SAE Electric Vehicle and Plug in Hybrid Electric Vehicle Conductive Charge Coupler J1772_201710 | | |
| SAE J1939 | Serial Control and Communications Heavy Duty Vehicle Network - Top Level Document J1939_201808 | | |
| SAE J1986 | Balance Weight and Rim Flange Design Specifications, Test Procedures, and Performance Recommendations J1986_201603 | | |
| SAE J1995 | Engine Power Test Code - Spark Ignition and Compression Ignition - Gross Power and Torque Rating J1995_201401 | | |
| SAE J2344 | Guidelines for Electric Vehicle Safety J2344_201003 | | |
| SAE J2402 | Road Vehicles—Symbols for Controls, Indicators, and Tell-tales J2402_201001 | | |
| SAE J2464 | Electric and Hybrid Electric Vehicle Rechargeable Energy Storage System (RESS) Safety and Abuse Testing J2464_200911 | | |
| SAE J2711 | Recommended Practice for Measuring Fuel Economy and Emissions of Hybrid-Electric and Conventional Heavy-Duty Vehicles(STABILIZED Jul 2018) J2711_201807 | | |
| SAE J2910 | Recommended Practice for the Design and Test of Hybrid Electric and Electric Trucks and Buses for Electrical Safety J2910_201404 | | |

Request for Proposal
 [insert date of solicitation]
 [insert Proposal number]

| Standard | Title | Compliance | If “partial” or “N/A,” please describe |
|----------------------|---|-------------------|---|
| SAE J3068 | Electric Vehicle Power Transfer System Using a Three-Phase Capable Coupler J3068_201804 | | |
| FMVSS 105 | Hydraulic and Electric Brake Systems | | |
| FMVSS 121 | Air Brake Systems | | |
| FMVSS 207 | Seating Systems | | |
| FMVSS 210 | Seat Belt Assembly Anchorages | | |
| FMVSS 217 | Bus Emergency Exits and Window Retention and Release | | |
| FMVSS 301 | Fuel System Integrity | | |
| FMVSS 302 | Flammability of Interior Materials | | |
| FMVSS 403 | Platform Lift Systems for Motor Vehicles | | |
| FMVSS 404 | Platform Lift Installations in Motor Vehicles | | |
| ANSI/IAS NGV2 (1998) | Basic Requirements for Compressed Natural Gas Vehicle (NGV) Fuel Containers | | |
| ANSI/IAS PRD1 (1998) | Pressure Relief Devices For Natural Gas Vehicle (NGV) Fuel Containers | | |
| ANSI Z26.1 | Safety Glazing Materials for Glazing Motor Vehicles and Motor Vehicle Equipment Operating on Land Highways - Safety Standard | | |
| ANSI/ASHR AE 52.1 | Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size | | |
| ASTM A240 | Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications | | |
| ASTM A269 | Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service | | |
| ASTM B117 | Standard Practice for Operating Salt Spray (Fog) Apparatus | | |
| ASTM D1003 | Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics | | |
| ASTM D4541-85 | Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers | | |
| ASTM E162-90 | Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source | | |
| ASTM E424 | Standard Test Methods for Solar Energy Transmittance and Reflectance (Terrestrial) of Sheet Materials | | |
| ECE R100 Rev 2 | Uniform provisions concerning the approval of vehicles with regard to specific requirements for the electric power train | | |
| FTA Docket 90A | Recommended Fire Safety Practices for Transit Bus and Van Materials Selection | | |
| CGA C-6.4 | Methods for External Visual Inspection of Natural Gas Vehicle (NGV) Fuel Containers and Their Installation | | |

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| Standard | Title | Compliance | If “partial” or “N/A,” please describe |
|---|--|------------|--|
| NGV-3.1/ CGA-12.3 | Fuel system components for compressed natural gas powered vehicles | | |
| CARB 2292.5 | Specifications for Compressed Natural Gas | | |
| UL 935 | Standard for Fluorescent-Lamp Ballasts | | |
| ISO 5128 | Acoustics – Measurement of noise inside motor vehicles | | |
| ISO 26262 | Road Vehicles – Functional Safety | | |
| NFPA-52 | Vehicular Natural Gas Fuel Systems Code | | |
| PS 1-95 | Construction and Industrial Plywood | | |
| UN/DOT 38.3 | UN Transportation Testing for Lithium Batteries | | |
| UNECE Council Directive 95/54(R10) | Adapting to technical progress Council Directive 72/245/EEC on the approximation of the laws of the Member States relating to the suppression of radio interference produced by spark-ignition engines fitted to motor vehicles and amending Directive 70/156/EEC on the approximation of the laws of the Member States relating to the type-approval of motor vehicles and their trailers | | |

CER 10. Vehicle Technical Information

NOTE: This is a sample form. The Agency should customize it to comply with its proposed requirements.

This form must be completed and included in the Technical Proposal.

GENERAL COACH DATA SHEET [insert bus type]

| | |
|-------------------------------------|--|
| Bus manufacturer: | |
| Bus model: | |
| Understructure manufacturer: | |
| Model number: | |

Basic Body Construction

| | |
|-------|--|
| Type: | |
|-------|--|

Tubing or frame member thickness and dimensions

| | |
|----------------|--|
| Overstructure | |
| Understructure | |

Skin thickness and material

| | |
|-------------|--|
| Roof | |
| Sidewall | |
| Skirt panel | |
| Front end | |
| Rear end | |

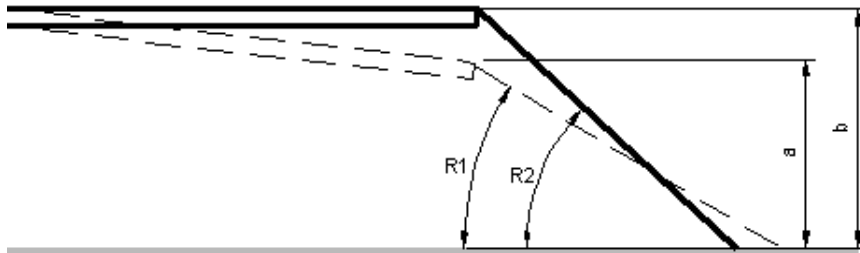
Dimensions

| | | | | | |
|--|--|-----|----|-----|-----|
| Overall length | Over bumpers | [] | ft | [] | in. |
| | Over body | [] | ft | [] | in. |
| Overall width | Over body excluding mirrors | [] | ft | [] | in. |
| | Over body including mirrors—driving position | [] | ft | [] | in. |
| | Over tires front axles | [] | ft | [] | in. |
| | Over tires center axle | [] | ft | [] | in. |
| | Over tires rear axles | [] | ft | [] | in. |
| Overall height (maximum) | | [] | ft | [] | in. |
| Overall height (main roof line) | | [] | ft | [] | in. |

| | | |
|-------------------------------|----------------------|-----|
| Angle of approach | <input type="text"/> | deg |
| Breakover angle | <input type="text"/> | deg |
| Breakover angle (rear) | <input type="text"/> | deg |
| Angle of departure | <input type="text"/> | deg |

| Doorway Dimensions | Front | | Rear | |
|---------------------------|----------------------|-----|----------------------|-----|
| Width between door posts | <input type="text"/> | in. | <input type="text"/> | in. |
| Door width between panels | <input type="text"/> | in. | <input type="text"/> | in. |
| Clear door width | <input type="text"/> | in. | <input type="text"/> | in. |
| Doorway height | <input type="text"/> | in. | <input type="text"/> | in. |
| Knuckle clearance | <input type="text"/> | in. | <input type="text"/> | in. |

Step height from ground measured at center of doorway



| | Front doorway, empty | | Ramp angle | | Rear Doorway, empty |
|-----------|-----------------------------|--|-------------------|--------------------------|-----------------------------|
| Kneeled | a. <input type="text"/> in. | | R1 | <input type="text"/> deg | a. <input type="text"/> in. |
| Unkneeled | b. <input type="text"/> in. | | R2 | <input type="text"/> deg | b. <input type="text"/> in. |

Interior head room (center of aisle)

| | |
|----------------------|--------------------------|
| Front axle location | <input type="text"/> in. |
| Center axle location | <input type="text"/> in. |
| Rear axle location | <input type="text"/> in. |

Aisle width between transverse seats in.

Floor height above ground (centerline of bus)

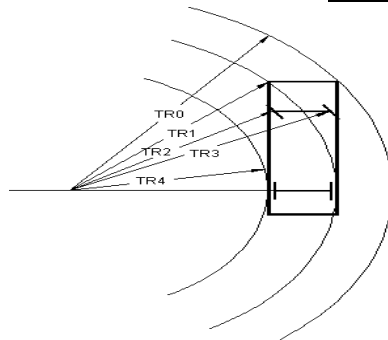
| | |
|---------------|--------------------------|
| At front door | <input type="text"/> in. |
| At front axle | <input type="text"/> in. |
| At drive axle | <input type="text"/> in. |
| At rear door | <input type="text"/> in. |

Minimum ground clearance (between bus and ground, with bus unkneeled)

Excluding axles in.
 Including axles in.

Horizontal turning envelope (see diagram below)

Outside body turning radius, TR0 (including bumper) ft in.
 Front inner corner radius, TR1 ft in.
 Front wheel inner turning radius, TR2 ft in.
 Front wheel outer turning radius, TR3 ft in.
 Inside Body Turning Radius innermost point, TR4 (including bumper) ft in.



Wheel base

Front in.
 Rear in.

Overhang, centerline of axle over bumper

Front in.
 Rear in.

Floor

Interior length ft in.
 Interior width (excluding coving) ft in.
 Total standee area (approximately) sq ft
 Minimum distance between wheelhouses:
 Front in.
 Rear in.
 Center in.
 Maximum interior floor slope (from horizontal) deg

Passenger capacity provided

| | | |
|--------------------------|----------------------|-----|
| Total maximum seating | <input type="text"/> | |
| Standee capacity | <input type="text"/> | |
| Minimum hip to knee room | <input type="text"/> | in. |
| Minimum foot room | <input type="text"/> | in. |

Weight

| | No. of people | Front axle | | | Center axle | | | Rear axle | | | Total bus |
|--|---------------|------------|-------|-------|-------------|-------|-------|-----------|--------|-------|-----------|
| | | Left | Right | Total | Left | Right | Total | Left | Rig ht | Total | |
| Empty bus, full fuel and farebox | | | | | | | | | | | |
| Fully seated, full fuel and farebox | | | | | | | | | | | |
| Fully loaded standee and fully seated, full fuel and farebox | | | | | | | | | | | |
| Crush load (1.5x fully loaded) | | | | | | | | | | | |
| GVWR | | | | | | | | | | | |
| GAWR | | | | | | | | | | | |

Engine, main

| | | | | | |
|-----------------------------|----------------------|--------|----|----------------------|-----|
| Manufacturer | <input type="text"/> | | | | |
| Type and weight rating | <input type="text"/> | | | | |
| Model number | <input type="text"/> | | | | |
| Bore | <input type="text"/> | in. | | | |
| Stroke | <input type="text"/> | in. | | | |
| Displacement | <input type="text"/> | cu in. | | | |
| Compression ratio | <input type="text"/> | | | | |
| Injector type and size | <input type="text"/> | | | | |
| Net SAE horsepower | <input type="text"/> | hp | at | <input type="text"/> | RPM |
| Net SAE torque | <input type="text"/> | lb/ft | at | <input type="text"/> | RPM |
| Crankcase oil capacity | | | | | |
| New engine, dry | <input type="text"/> | gal | | | |
| New engine, wet | <input type="text"/> | gal | | | |
| Turbocharger make and model | <input type="text"/> | | | | |
| Maximum speed, no load | <input type="text"/> | RPM | | | |
| Maximum speed, full load | <input type="text"/> | RPM | | | |
| Speed at idle | <input type="text"/> | RPM | | | |
| Speed at fast idle | <input type="text"/> | RPM | | | |

Engine information/graphs to be attached with this form:

- Engine speed vs. road speed
- Torque vs. engine speed
- Horsepower vs. engine speed
- Fuel consumption vs. engine speed
- Vehicle speed vs. time (both loaded and unloaded)
- Vehicle speed vs. grade (both loaded and unloaded)
- Acceleration vs. time
- Change of acceleration vs. time

Traction Motor

| | | | |
|------------------------|--|--|-----------|
| Manufacturer | | | |
| Model Number | | | |
| Type | | | |
| Max Power at Speed | | | kW @ rpm |
| Max Torque at Speed | | | N-m @ rpm |
| Continuous rated power | | | kW |
| Average efficiency | | | % |
| Max motor speed | | | rpm |
| Cooling Type | | | |

Attach torque-speed curve and efficiency maps

Hybrid drive or transmission

| | | | |
|--|----------|--|----------|
| Manufacturer | | | |
| Type | | | |
| Speeds | | | |
| Gear ratios | Forward: | | Reverse: |
| Shift speeds | | | |
| 1st–2nd | | | mph |
| 2nd–3rd | | | mph |
| 3rd–4th | | | mph |
| 4th–5th (if applicable) | | | mph |
| 5th–6th (if applicable) | | | mph |
| Fuel capacity (including heat exchanger and filters) | | | |

Voltage regulator

| | | | |
|--------------|--|--|--|
| Manufacturer | | | |
| Model | | | |

Voltage equalizer

| | |
|--------------|--|
| Manufacturer | |
| Model | |

Alternator

| | | | |
|-------------------------------|--|--|------|
| Manufacturer | | | |
| Type | | | |
| Model | | | |
| Output at idle | | | amps |
| Output at maximum speed | | | amps |
| Maximum warranted speed | | | rpm |
| Speed at idle (approximately) | | | rpm |
| Drive type | | | |

Auxiliary Inverter(s)

| | |
|-------------------|--|
| Manufacturer(s) | |
| Model Number(s) | |
| Output voltage(s) | |

DC-DC Converter(s)

| | |
|-------------------|--|
| Manufacturer(s) | |
| Model Number(s) | |
| Output voltage(s) | |

Auxiliary (Hotel) Loads as Installed

List of Accessories, excluding HVAC

| Accessory | Average Power Consumption on Agency Design Operating Profile (kW) | Max Power Consumption (kW) |
|-----------|---|-------------------------------|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Starter motor

| | |
|--------------|--|
| Manufacturer | |
| Type | |
| Model | |

Air compressor

| | | | |
|------------------------------------|--|--|-----|
| Manufacturer | | | |
| Type | | | |
| Rated capacity | | | CFM |
| Capacity at idle (approximately) | | | CFM |
| Capacity at maximum speed (engine) | | | CFM |
| Maximum warranted speed | | | rpm |
| Speed idle | | | rpm |
| Drive type | | | |
| Governor: | | | |
| Cut-in pressure | | | psi |
| Cut-out pressure | | | psi |

Axles

First

| | | | |
|--------------------------|--|--|----|
| Manufacturer | | | |
| Type | | | |
| Model number | | | |
| Gross axle weight rating | | | lb |
| Axle load | | | lb |

Second

| | | | |
|--------------------------|--|--|----|
| Manufacturer | | | |
| Type | | | |
| Model number | | | |
| Gross axle weight rating | | | lb |
| Axle load | | | lb |

Third

| | | | |
|--------------------------|--|--|----|
| Manufacturer | | | |
| Type | | | |
| Model number | | | |
| Gross axle weight rating | | | lb |
| Axle load | | | lb |
| Axle ratio | | | |

Suspension system

| | | | |
|--------------|---------|--|--|
| Manufacturer | | | |
| Type: | First: | | |
| | Second: | | |
| | Third: | | |

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 [insert Proposal number]

| | | |
|----------|---------|--|
| Springs: | First: | |
| | Second: | |
| | Third: | |

Joint

| | |
|--------------|--|
| Manufacturer | |
| Type | |
| Model number | |

Wheels and tires

Wheels

| | |
|----------|--|
| Make | |
| Size | |
| Capacity | |
| Material | |

Tires

| | |
|-------------------------|--------------------------|
| Manufacturer | |
| Type | |
| Size | |
| Load range/air pressure | <input type="text"/> psi |

Steering, power

Pump

| | |
|-------------------------------|--------------------------|
| Manufacturer and model number | |
| Type | |
| Relief pressure | <input type="text"/> psi |

Booster/gear box

| | |
|-------------------------------|--|
| Manufacturer and model number | |
| Type | |
| Ratio | |

| | |
|----------------------------------|---|
| Power steering fluid capacity | <input type="text"/> gal |
| Maximum effort at steering wheel | <input type="text"/> lb (unloaded stationary coach on dry asphalt pavement) |
| Steering wheel diameter | <input type="text"/> in. |

Brakes

| | | |
|---|---------|--|
| Make of fundamental brake system | | |
| Brake chambers vendor size and part number: | First: | |
| | Second: | |
| | Third: | |

Brake operation effort

Slack adjuster's vendor's type and part numbers

| | | |
|---------|-----------------|--|
| First: | Right: | |
| | Left: | |
| Second: | Right: | |
| | Left: | |
| Third: | Right: | |
| | Left: | |
| Length: | First take-up: | |
| | Second take-up: | |
| | Third take-up: | |

Brake drums/discs

| | | | |
|---------|--------------|--|-----|
| First: | Manufacturer | | |
| | Part number | | |
| | Diameter | | in. |
| Second: | Manufacturer | | |
| | Part number | | |
| | Diameter | | in. |
| Third: | Manufacturer | | |
| | Part number | | |
| | Diameter | | in. |

| | |
|---------------------------|--|
| Brake lining manufacturer | |
| Type | |

Brake lining identification

| | | |
|---------|---------|--|
| First: | Forward | |
| | Reverse | |
| Second: | Forward | |
| | Reverse | |
| Third: | Forward | |
| | Reverse | |

Brake linings per shoe

| | |
|--------|--|
| First | |
| Second | |
| Third | |

Brake lining widths

| | | |
|--------|----------------------|-----|
| First | <input type="text"/> | in. |
| Second | <input type="text"/> | in. |
| Third | <input type="text"/> | in. |

Brake lining lengths

| | | |
|--------|----------------------|-----|
| First | <input type="text"/> | in. |
| Second | <input type="text"/> | in. |
| Third | <input type="text"/> | in. |

Brake lining thickness in.

Brake lining per axle

| | | |
|--------|----------------------|---------|
| First | <input type="text"/> | sq. in. |
| Second | <input type="text"/> | sq. in. |
| Third | <input type="text"/> | sq. in. |

Cooling system

Radiator/charge air cooler

| | | | |
|---|--------------------------------|--------------------------|--|
| Manufacturer | <input type="text"/> | | |
| Type | <input type="text"/> | | |
| Model number | <input type="text"/> | | |
| Number of tubes | <input type="text"/> | | |
| Tubes outer diameter | <input type="text"/> in./ | <input type="text"/> in. | |
| Fins per inch | <input type="text"/> fins | | |
| Fin thickness | <input type="text"/> in. | | |
| Total cooling and heating system capacity | <input type="text"/> gal | | |
| Radiator fan speed control | <input type="text"/> | | |
| Surge tank capacity | <input type="text"/> qt | | |
| Engine thermostat temperature setting: | Initial opening (fully closed) | <input type="text"/> °F | |
| | Fully open | <input type="text"/> °F | |
| Overheat alarm temperature sending unit setting | <input type="text"/> °F | | |
| Shutdown temperature setting | <input type="text"/> °F | | |

Air reservoir capacity

| | | |
|---------------------|----------------------|--------|
| Supply reservoir | <input type="text"/> | cu in. |
| Primary reservoir | <input type="text"/> | cu in. |
| Secondary reservoir | <input type="text"/> | cu in. |
| Packing reservoir | <input type="text"/> | cu in. |
| Accessory reservoir | <input type="text"/> | cu in. |

Other reservoir type cu in.

Heating, ventilation and air conditioning equipment

| | | |
|---|----------------------|--------|
| Heating system capacity | <input type="text"/> | BTU/hr |
| Electrical load at maximum heating capacity | <input type="text"/> | kW |
| Air conditioning capacity | <input type="text"/> | BTU |
| Electrical load at maximum cooling capacity | <input type="text"/> | kW |
| Ventilating capacity | <input type="text"/> | CFM |

Compressor

| | | | |
|-------------------------|----------------------|----------------------|-------------------------|
| Manufacturer | <input type="text"/> | | |
| Model | <input type="text"/> | | |
| Number of cylinders | <input type="text"/> | | |
| Drive ratio | <input type="text"/> | | |
| Maximum warranted speed | <input type="text"/> | rpm | |
| Operating speed | <input type="text"/> | rpm (recommended) | |
| Weight | <input type="text"/> | lb | |
| Oil capacity | Dry | <input type="text"/> | gal |
| | Wet | <input type="text"/> | gal |
| Refrigerant: | Type | <input type="text"/> | <input type="text"/> lb |

Condenser

| | | | |
|------------------------|----------------------|-----|--|
| Manufacturer | <input type="text"/> | | |
| Model | <input type="text"/> | | |
| Number of fins/in. | <input type="text"/> | | |
| Outer diameter of tube | <input type="text"/> | in. | |
| Fin thickness | <input type="text"/> | in. | |

Condenser fan

| | | | |
|---------------------|----------------------|-----|--|
| Manufacturer | <input type="text"/> | | |
| Model | <input type="text"/> | | |
| Fan diameter | <input type="text"/> | in. | |
| Speed maximum | <input type="text"/> | rpm | |
| Flow rate (maximum) | <input type="text"/> | CFM | |

Receiver

| | | | |
|--------------|----------------------|----|--|
| Manufacturer | <input type="text"/> | | |
| Model | <input type="text"/> | | |
| Capacity | <input type="text"/> | lb | |

Condenser fan drive motors

| | | |
|-----------------|--|-----|
| Manufacturer | | |
| Model | | |
| Type | | |
| Horsepower | | hp |
| Operating speed | | rpm |

Evaporator fan drive motors

| | | |
|-----------------|--|-----|
| Manufacturer | | |
| Model | | |
| Type | | |
| Horsepower | | hp |
| Operating speed | | rpm |

Evaporator(s)

| | | |
|------------------------|--|-----|
| Manufacturer | | |
| Model | | |
| Number of rows | | |
| Number of fins/in. | | |
| Outer diameter of tube | | in. |
| Fin thickness | | in. |
| Number of evaporators | | |

Expansion valve

| | | |
|--------------|--|--|
| Manufacturer | | |
| Model | | |

Filter-drier

| | | |
|--------------|--|--|
| Manufacturer | | |
| Model | | |

Heater cores

| | | |
|------------------------|--|--------|
| Manufacturer | | |
| Model | | |
| Capacity | | Btu/hr |
| Number of rows | | |
| Number of fins/in. | | |
| Outer diameter of tube | | in. |
| Fin thickness | | in. |
| Number of heater cores | | |

Floor heater blowers

| | |
|-------|--|
| Front | |
| Rear | |

Controls

| | |
|--------------|--|
| Manufacturer | |
| Model | |

Driver's heater

| | | |
|--------------|--|--------|
| Manufacturer | | |
| Model | | |
| Capacity | | Btu/hr |

Ventilation system

| | |
|------|--|
| Type | |
|------|--|

Coolant heater

| | | |
|----------|--|-----|
| Make | | |
| Model | | |
| Capacity | | Btu |

Interior lighting

| | | |
|--------------------|--|--|
| Manufacturer | | |
| Type | | |
| Number of fixtures | | |
| Size of fixtures | | |
| Power pack | | |

Doors

Front

| | |
|-------------------------------------|--|
| Manufacturer of operating equipment | |
| Type of door | |
| Type of operating equipment | |

Rear

| | |
|-------------------------------------|--|
| Manufacturer of operating equipment | |
| Type of door | |
| Type of operating equipment | |

Passenger windows

Front

| | | | |
|--------------|--------------------|--|--|
| Manufacturer | | | |
| Model | | | |
| Type | | | |
| Number: | Side | | |
| | Rear | | |
| Sizes: | | | |
| | | | |
| Glazing: | Type | | |
| | Thickness | | |
| | Color of tint | | |
| | Light transmission | | |

Mirrors

| | Size | Type | Manufacturer | Part no. | Model no. |
|---------------------|------|------|--------------|----------|-----------|
| Right side exterior | | | | | |
| Left side exterior | | | | | |
| Center rearview | | | | | |
| Front entrance area | | | | | |
| Upper-right corner | | | | | |
| Rear exit area | | | | | |

Seats

Passenger

| | |
|--------------|--|
| Manufacturer | |
| Model | |
| Type | |

Operator

| | |
|-----------------------|--|
| Manufacturer | |
| Model and part number | |
| Type | |

Paint

| | |
|--------------|--|
| Manufacturer | |
| Type | |

Wheelchair ramp equipment

| | | | |
|------------------------------|--------|-----|--|
| Manufacturer | | | |
| Model number | | | |
| Capacity | | lb | |
| Width of platform | | in. | |
| Length of platform | | in. | |
| System fluid capacity | | qt | |
| Type of fluid used | | | |
| Operating hydraulic pressure | | psi | |
| Hydraulic cylinders: | Size | | |
| | Number | | |

Wheelchair securement equipment

| | | | |
|--------------|--|--|--|
| Manufacturer | | | |
| Model number | | | |

Destination signs

| | | | |
|--------------|--|--|--|
| Manufacturer | | | |
| Type | | | |

Character length

| | | |
|----------------------|-----|-----|
| Front destination | [] | in. |
| Front route | [] | in. |
| Curbside destination | [] | in. |
| Rear route | [] | in. |

Character height

| | | |
|----------------------|-----|-----|
| Front destination | [] | in. |
| Front route | [] | in. |
| Curbside destination | [] | in. |
| Rear route | [] | in. |

Number of characters

| | | |
|----------------------|-----|--|
| Front destination | [] | |
| Front route | [] | |
| Curbside destination | [] | |
| Rear route | [] | |

Message width

| | | |
|----------------------|--|-----|
| Front destination | | in. |
| Front route | | in. |
| Curbside destination | | in. |
| Rear route | | in. |

Electrical

Multiplex system

| | |
|--------------|--|
| Manufacturer | |
| Model number | |

Energy Storage

Low Voltage

| | |
|--------------------|--|
| Manufacturer | |
| Model number | |
| Type | |
| Cold cranking amps | |

High Voltage

| | |
|---|--|
| Type/chemistry | |
| Manufacturer (cell) | |
| Model (cell) | |
| Nominal cell voltage | |
| Minimum cell voltage | |
| Maximum cell voltage | |
| Cell capacity (Ah) | |
| Manufacturer/supplier (pack or smallest removable unit) | |
| Model name (pack or smallest removable unit) | |

| | | |
|--|--|-----|
| Weight of pack (smallest removable unit) | | lbs |
| Gross energy capacity of each pack (smallest removable unit) | | kWh |
| Total number of packs in ESS | | |
| Gross energy capacity of ESS when new | | kWh |
| Usable energy capacity of ESS when new | | kWh |
| Gross energy capacity of ESS at warrantable end of life | | kWh |
| Usable energy capacity of ESS at warrantable end of life | | kWh |
| Nominal voltage of ESS | | V |
| Minimum allowable operating SoC | | % |
| Maximum allowable operating SoC | | % |
| Tested cycle until warrantable end of life | | |

| | | | | |
|----------------------------------|--|----|--|----|
| Average ESS operating efficiency | | | | % |
| Operating temperature range | | | | °F |
| Energy storage cooling system | | | | |
| Manufacturer | | | | |
| Model number | | | | |
| Type (e.g., forced air, liquid) | | | | |
| Average power consumption | | kW | | |
| Max power consumption | | kW | | |
| Battery management system | | | | |
| Manufacturer | | | | |
| Model number | | | | |

Charging Compatibility

| | |
|----------------------------------|--|
| Charger inlet type | |
| Charging standards/compatibility | |

Communication system

GPS

| | |
|--------------|--|
| Manufacturer | |
| Model number | |

PA system

| | Manufacturer | Model number | Number |
|-------------------|--------------|--------------|--------|
| Amplifier | | | |
| Microphone | | | |
| Internal speakers | | | |
| External speaker | | | |

Security camera system

| | | | |
|-------------------|--|--|--|
| Manufacturer | | | |
| Model number | | | |
| Number of cameras | | | |
| Storage capacity | | | |

Bike racks

| | | | |
|--------------|--|--|--|
| Manufacturer | | | |
| Model number | | | |

Fire detection system

| | | |
|---------------------------|--|--|
| Manufacturer | | |
| Model number | | |
| Fire detectors | | |
| Type (thermal or optical) | | |
| Number of detectors | | |

Automatic voice annunciator system

| | | |
|-----------------------|--|--|
| Manufacturer | | |
| Model and part number | | |

Annunciator LED sign

| | | | |
|--------------------|--|-----|--|
| Number of signs | | | |
| Housing dimensions | | | |
| Character length | | in. | |
| Character height | | in. | |
| Character width | | in. | |

GPS antenna

| | | |
|-----------------------|--|--|
| Manufacturer | | |
| Model and part number | | |

Automatic passenger counter

| | | |
|-----------------------|----|--|
| Manufacturer | | |
| Model and part number | a. | |
| | b. | |
| | c. | |
| Sensor type | | |

Real-time bus arrival prediction system

| | Manufacturer | Model number |
|-------------------|--------------|--------------|
| Router | | |
| Cellular modem | | |
| Charge protection | | |

Electronic tire pressure monitoring system

| | | |
|--------------|--|--|
| Manufacturer | | |
| Model number | | |

Electronic brake stroke/wear indicator system

| | |
|--------------|--|
| Manufacturer | |
| Model number | |

NOTE: All information above is accurate to the timeframe upon submission. The Agency reserves the right to update above data if changes occur, upon consultation with the customer.

SECTION 10: CONTRACT

[Agency to insert its Form of Contract. A sample Contract is provided in Appendix D.]

SECTION 11: APPENDIXES

Appendix A: Guidelines for Calculating Liquidated Damages

Calculation of Liquidated Damages

Prior to its Solicitation, the Agency should document and file for the record its derivation of the amount of liquidated damage that is entered in “Liquidated Damages for Late Delivery of the Bus.” The following identifies some suggested areas for consideration by which an Agency may be damaged if buses are not delivered as contracted.

For determining amounts for liquidated damages, the following guidance is provided:

1. The liquidated damage amount must not be punitive but shall be based upon damages that the Agency would incur as a result of the delay.
2. The liquidated damage amount must be calculated on the basis of damages that the Agency would incur and be substantiated by experience data.
3. A definition of days and any exempted days for delay should be included.

Cost to Retain Old Fleet

If the purpose of the procurement is to replace older buses that are being retired, there can be two areas of damage that are additive: extra cost of maintenance and cost of purchasing or renting additional buses to meet fleet availability requirements.

1. **Extra cost of maintenance.** The *difference* in maintenance costs, old buses minus new ones, is a realistic damage, assuming that older buses will be continued in service for the duration and not replaced with alternative leased buses.
2. **Cost to obtain additional buses to meet fleet availability.** Reliability of the older buses is not expected to be as good as for new ones, and they can be expected to be out of service for maintenance or repair for longer periods than new ones. Therefore, additional buses may be needed to ensure that required service on routes is met.

Cost to Obtain Alternative Fleet

The damage may be attributed to requirements to obtain an alternative fleet for the duration of the delay. Such may be precipitated because a sales agreement on the old buses being replaced is expected to have been executed prior to the Contract delivery date for new buses or because the new buses are needed for new or expanded services.

1. **Cost to replace old buses being sold.** This approach is an alternative to the cost of retaining the old fleet of (1) above. It is suggested that the liquidated damage be the lower of this alternative and that of (1).
2. **Cost to meet requirements for new or expanded service.** Under this approach, the liquidated damage would simply be the daily costs of the alternative fleet as calculated above.

Increased Contract Administrative Costs

Delays in delivery will increase the period that the Contract must be administered and possibly increase the effort or waste the effort of either in-house staff or consultants for in-plant inspection and to assist in taking delivery and acceptance.

1. **Increased Contract period.** The amount of the damage can be calculated as the average daily cost of Contract administration, apart from any technical services.
2. **Increased technical services.** Technical services for in-plant inspection and to assist in taking delivery and acceptance will have been budgeted consistent with the Contract schedule. The extra budget for these services could be determined as a daily rate.

Fines

Damages may include fines for which a court has already imposed or can be expected to be imposed on the Procuring Authority not meeting required emission (noise or air quality) reductions or features mandated by the Americans with Disabilities Act. Include this element only if the Agency can prove its vulnerability for such fines and a purpose of the procurement is to comply with such laws or ordinances.

Fuel Consumption

If the new buses are expected to consume less fuel per passenger capacity, then the difference in fuel consumption costs per day may be included.

Appendix B: Guidelines for Calculating Early Delivery Incentives

Any provision of incentive payments for early delivery should be made on the basis of savings that may be reasonably expected to accrue to the Agency. Prior to its Solicitation, the Agency should document and file for the record its derivation of the amount of any incentive that would be entered in the option provided in “Liquidated Damages for Late Delivery of the Bus.” It is suggested that any savings be shared between the Contractor and the Agency on the basis of some predetermined ratio, not exceeding an amount approximately that of the anticipated profit under the Contract. The following provides suggested areas in which an Agency may accrue savings for early delivery.

Savings to Retire Old Fleet Early

If the purpose of the procurement is to replace older buses that are being retired, there can be savings in maintenance costs. The *difference* in maintenance costs, old buses minus new ones, could be a savings if the old fleet can be retired early.

Decreased Contract Administrative Costs

Early delivery can decrease the period that the Contract must be administered. The amount of savings can be calculated as the average daily cost of Contract administration, apart from any technical services.

Fines

If the Agency is being fined or can be expected to be imposed for failure to meet court-mandated emissions standards or requirements of the Americans with Disabilities Act, and early delivery reduces any such fines, savings will accrue. This element should be included *only* if the Agency can prove its vulnerability to such fines and a purpose of the procurement is to comply with such laws or ordinances.

Fuel Consumption

If the new buses are expected to consume less fuel per passenger capacity, then the *difference* in fuel consumption costs per day may be included as a savings if the old fleet can in fact be replaced by the early delivered fleet.

Appendix C: Examples of Evaluation Criteria

EXAMPLE 1: EVALUATION OF PROPOSALS AND SELECTION PROCESS

A. Evaluation/Selection Committee

An Evaluation/Selection Committee (Committee), which may include Agency staff, consortium members, and possibly one or more outside experts, will review and screen the Proposals submitted according to the pre-established criteria as set forth below.

B. Pre-Proposal Meeting (maximum of 5 points)

Attendance at the Pre-Proposal Meeting on [insert date].

C. Technical Evaluation Criteria(maximum of 80 points)

Proposals will be evaluated using the following principal selection criteria:

1. **Product design and performance (0–30 points):** The information provided by the Proposer in its technical submittal relating to the buses to be provided will be utilized to evaluate the Proposal in relation to this factor. Vehicle construction and system design, as well as documented reliability, may be used in this evaluation, as well as other design and performance elements of the components that comprise those systems. At a minimum, test results, safety and maintenance factors, and cost of normal operation for the bus design and system components proposed, may be considered in determining a final value for this factor.
2. **Proposer’s reputation and performance (0–30 points):** The Committee will consider the capability and reputation of the Proposer as presented in the Proposal or as is determined by review of information available from references or other resources. The evaluation may look at the Proposer’s overall organizational and financial capabilities and consider key components such as organizational reporting structure, quality control, quality assurance, research and development, technical, training and parts support, response time, product capabilities, ability to furnish multiple bus configurations, bonding capacity, and financial history, as well as other considerations, in reaching a final point determination. The committee may also look at judgments, liens, Fleet Defect history, warranty claims and the steps that the manufacturer took to resolve these concerns in assessing the overall reputation of the manufacturer.
3. **Delivery schedule (0–20 points):** The Committee will review the proposed delivery schedule for the Agency’s minimum purchase of coaches. Delivery schedules that fulfill the delivery requirements, with evidence that the schedule can be accomplished, may receive higher points for this category.

D. Cost Proposal Evaluation (maximum of 20 points)

As described below, the proposed cost as submitted by the Proposer on the Agency’s form will be assigned a maximum of 20 points. The Contractor is *required* to use the Agency’s form, without alteration, for submittal of its cost Proposal. *Please DO NOT use your own forms.*

The cost will be evaluated in the following manner:

1. Cost Proposal Criteria (0–20 points)

- a. The Cost Proposal criteria will be based on the “Total of Both the Low-Floor and Standard Floor Bus,” Line 3.C. of Appendix B as noted in Section 8.B.6, “Sum of Total Base Offer per Bus.”

- b. The lowest average Cost Proposal will receive 20 points. Every other Proposal previously found to be in the Competitive Range will be given points proportionately in relation to the lowest price. This point total will be calculated by dividing the lowest price by the total price of the Proposal being evaluated and the result multiplied by the maximum weight for price (20 points) to arrive at a Cost Proposal score.

Example: $\text{Lowest Proposed Price} / \text{Proposer's Proposed Price} \times 20 = \text{Proposal Score}$

The application of the above formula will result in a uniform assignment of points relative to the criterion of price.

E. Evaluation Methodology

The maximum number of points achievable in each of the aforementioned areas is as follows:

- **Attendance at Pre-Proposal Meeting:** 0–5 points
- **Product design and performance:** 0–30 points
- **Manufacturer’s reputation and performance:** 0–30 points
- **Delivery schedule:** 0–20 points
- **Cost proposal:** 0–20 points

TOTAL POSSIBLE POINTS: 105

EXAMPLE 2: EVALUATION PROCESS

Following receipt of the Proposals, the Proposals will be evaluated for compliance with the following minimum requirements. Those Proposals that do not evidence compliance may not be considered beyond the preliminary review.

Minimum Requirements

- The Proposer must be an existing vehicle manufacturer with an existing manufacturing facility.
- The Proposal must be for a high-capacity vehicle with a nominal length not to exceed 45 ft.
- The vehicle must be constructed from composite material.
- The proposed vehicle must have the capability for either a CNG propulsion system or for a gasoline/hybrid propulsion system.
- The proposed vehicle must have a minimum of 44 seats.

Proposals found to be compliant with the minimum qualifications will then be evaluated to determine those Proposals that represent technically acceptable offers.

Each Proposal will be rated according to the following ratings:

| Rating | Definition |
|--------------------|--|
| Exceptional | Exceeds evaluation standard in a way beneficial to the Agency, and has no significant weaknesses. Innovative, comprehensive and complete in all details. Low-risk. Complies with all primary program objectives for the procurement. |
| Acceptable | Meets evaluation standards, and any weaknesses are readily correctable. Limited risk. Complies with many of the primary program objectives for the procurement. |

| | |
|---------------------|--|
| Marginal | Fails to meet evaluation standard; however, any significant deficiencies are correctable. Lacks essential information to support Proposal. Moderate risk. Complies with only one or two of the program objectives for the procurement. |
| Unacceptable | Fails to meet evaluation standard, and the deficiency is uncorrectable. Proposal would have to undergo a major revision to become acceptable. Demonstrated lack of understanding of the Agency's requirements or omissions of major areas. Unacceptable risk. Complies with none or one of the program objectives for the procurement. |

Performance risk is the evaluation of each Proposer's present and past work to assess confidence in the Proposer's ability to perform against a proposed Contract. The following definitions are used when assessing performance risk:

| Rating | Definition |
|-----------------------|--|
| High | Significant doubt exists, based on the Proposer's performance record, that the Proposer can perform the proposed effort. |
| Moderate | Some doubt exists, based on the Proposer's performance record, that the Proposer can perform the proposed effort. |
| Low | Little doubt exists, based on the Proposer's performance record, that the Proposer can perform the proposed effort. |
| Not applicable | No significant performance record is identifiable. |

The Agency may require clarifications or oral interviews with Proposers. Discussions may also be held with Proposers to determine acceptability of proposed Deviations and/or to address deficiencies and weaknesses of the Proposal. See "Agency Rights" for additional information.

After completion of the evaluations, the Agency shall request pricing from those firms that have submitted technically acceptable Proposals. The firms will be given approximately one week to submit pricing. The received pricing will then be reviewed. The Agency does not anticipate negotiation of price offers. The award will be made to the Proposer that possesses the appropriate facility, as well as the managerial, financial and technical capabilities necessary to fulfill the requirements of the Contract, and whose Proposal conforms to Solicitation requirements and is judged by an integrated assessment of the evaluation criteria to be most advantageous to the Agency, when price and other factors are considered.

For the purposes of this procurement, all evaluation factors other than price, when combined, are significantly more important than the cost/price area in this acquisition. Therefore, the Agency may select other than the lowest-priced technically acceptable Proposal if it is determined that the additional technical merit offered is worth the additional cost in relation to other Proposals received. For evaluation purposes, if Proposals become more technically equivalent, then price becomes relatively more important.

The Agency is more concerned with obtaining superior technical features than with making an award at the lowest overall price to the Agency. However, the Agency will not make an award at a significantly higher overall cost to the Agency to achieve slightly superior technical features.

The Agency reserves the right to reject any or all Proposals, to waive informalities or irregularities to the extent permitted by law in any Proposal received, and to be the sole judge of the merits of the respective Proposals received.

Evaluation Criteria

The award will be based upon the factors listed below in addition to price and may not necessarily be made to the lowest-price Proposer. Factors are ranked in order of importance, with the most important factor listed first.

- Minimum vehicle performance requirements
- Vehicle structure
- Advanced design provisions
- Proposed technical Deviations
- Manufacturing process
- Qualifications of the Proposer
- Past performance and current commitments
- Maintainability
- Proposed operating cost and reliability
- Emissions
- System safety provisions
- Technical support
- Project management
- Deviations from Contract terms and conditions

The primary sub-criteria under each factor are the following:

- **Performance requirements:**
 - Vehicle performance
 - Reduced exterior sound levels
 - Minimum range requirements
 - Compliance with general performance requirements
- **Vehicle structure:**
 - Previous service experience of the vehicle, if applicable
 - Current and/or planned durability testing, including existing test results
 - Physical dimensions
 - Interior layout, including compliance with ADA requirements
 - Layout of the operator's compartment, including the operator's field of view
 - Available ergonomic information
 - Functional enhancements, including integration of electronic controls and minimizing the number of gauges and switches
- **Advanced design provisions:** This addresses the design characteristics, including how the design complies with the program's design objectives.
- **Proposed technical deviations:** This addresses the effect and acceptability of proposed technical deviations, including proposed benefits to the Agency and Deviations that will result in cost reductions.
- **Manufacturing process:** This addresses the proposed manufacturing process, including a detailed description of the proposed facilities where the Work would be done.
- **Proposed quality assurance program**
- **Qualifications of the Proposer:**
 - Organization chart showing the organization proposed for this Contract
 - History of the Proposer, including information about manufacturing capabilities
 - Experience in producing the same or similar vehicles as those being proposed, with emphasis on experience in producing CNG and gasoline/hybrid vehicles

- Experience in producing composite structure vehicles
- Maintenance and warranty experience, including a qualified staff to provide the necessary services
- Proposer's ISO certification(s) or equivalent
- **Proposer's facilities to be used for significant portions of the Work, including Subcontractors' facilities:**
 - Location of the facility and whether the facility is owned or leased
 - Work to be performed at the facility
 - Capacity and resources available at the facility for fulfilment of this Contract
 - Length of time the facility has been in operation to do the kind of Work proposed to be performed at the facility.
- **Past performance and current commitments:**
 - Reference list
 - Proposer's Work under way, or for which the Proposer is committed
- **Maintainability:**
 - Maintainability of the proposed powerplant
 - Maintainability of proposed component parts
 - Maintenance requirements
 - Skills needed to perform maintenance Work
 - Required special equipment, tools or maintenance facility requirements that must be implemented to maintain the vehicles
 - Proposed diagnostic equipment needed to maintain the vehicles
 - Proposed "built-in" diagnostic equipment, if offered
 - Reasonableness of proposed scheduled maintenance requirements
 - Proposed spare parts package required to support the schedule maintenance and replacement of major components
- **Proposed operating costs and reliability:**
 - Expected reliability and service life of major proposed components
- **Projected emissions of the vehicle**
- **System safety provisions:**
 - Proposed safety features
 - Knowledge of state codes and regulations affecting vehicles
 - Vehicle code changes required for the vehicle to legally operate in the state, if any
- **Technical support:**
 - Identification of proposed parts and service center
 - Service center staffing and qualifications
 - Availability of electronic maintenance documentation and comprehensive plan for providing technical updates for the life of the proposed vehicles
 - Proposed availability of spare parts, including methodology for storing parts locally and for expediting needed parts
 - Proposed training plans and instruction program
 - Proposed diagnostic equipment required to maintain the vehicles
 - Provision of advanced features such as wireless self-diagnostics and/or database management.
- **Project management:**
 - Proposed general project schedule and plan to ensure schedule compliance or to expedite the delivery schedule
 - Experience of the proposed project management team, including the experience of key personnel.

- Experience of technical personnel supporting each area of technical expertise as required by the Contract specifications, including test and system integration personnel
- Experience of the proposed key contact for the project, including the level of authority that this individual will have to make decisions that are “binding” on the Proposer
- Plan for the coordination of major Suppliers and Subcontractors, if any
- Major component Suppliers and the products to be provided by each for this Contract
- The interface relationships between engineering, manufacturing, program control, quality control and test departments
- Proposed critical path schedule for the production of the pilot vehicle and remaining vehicles as well as the methodology for controlling the schedule
- **Proposed Deviations from nontechnical terms and conditions:**
 - Rationale for the proposed Deviation
 - Benefit and/or risk to Agency if the request is granted

Certifications

The certifications will be reviewed for proper execution and responsiveness.

Type of Contract to be Awarded

The Agency intends to award a fixed-price Contract per unit for up to [insert number] vehicles. The services of the Contractor will be based on the scope of Work as outlined in “Section 1: Description of Work.”

Period for Acceptance

The Proposal shall be valid for [insert number of days proposal is valid] calendar days from the date stipulated in the RFP for receipt of Proposals. If this offer is accepted within that time period, the Proposer agrees to furnish all services and items as stipulated in the RFP and in any accompanying amendments.

Appendix D: Sample Contract

NOTE: The following is a sample Contract, which is included as an illustration of a format that an Agency may choose to use.

CONTRACT

1. Contract Documents and Order of Precedence

The Contract consists of the documents listed below. In case of any conflict among these documents, the order of precedence shall be:

1. Form of Contract
2. “Section 4: Special Provisions”
3. “Section 3: General Conditions,” and “Section 5: Federal Requirements”
4. “Section 6: Technical Specifications,” “Section 7: Warranty Requirements,” and “Section 8: Quality Assurance”
5. Contractor’s Best and Final Offer (including Contractor Proposal)

NOTE: An Agency may issue a conformed Contract that comprises all of the changes, Deviations and addenda that were a part of the negotiation process. In that case, the above order of precedence would be applicable. Absent a conformed Contract, it may be appropriate to include the Contractor’s final Proposal and BAFO as accepted by the Agency as the first document in the order of precedence. It should be noted that this alternative could present more risk to the Agency as the Contractor’s BAFO and Proposal could contradict the RFP requirements and would prevail over them.

In this instance, the order of precedence might be as follows:

1. Form of Contract
2. Contractor’s Best and Final Offer (including Contractor Proposal)
3. Addenda
4. “Section 4: Special Conditions”
5. “Section 3: General Conditions,” and “Section 5: Federal Requirements”
6. “Section 6: Technical Specifications,” “Section 7: Warranty Requirements,” and “Section 8: Quality Assurance”

A modification or change to any Contract document shall take its precedence from the term it amends. All other documents and terms and conditions shall remain unchanged.

2. Compensation

The Agency shall pay [insert dollar amount in both words and numbers of the base Contract], and the Contractor shall accept the amount as full compensation for all costs and expenses of completing the Work in accordance with the Contract, including but not limited to all labor and material required, overhead, storage and shipping, risks and obligations, taxes (as applicable), fees and profit, and any unforeseen costs.

NOTE: The Agency may insert a full pricing schedule here.

3. Contract Term and Period of Performance

The effective date of this Contract shall be the effective date set forth in the Notice to Proceed (NTP). The Contractor shall commence work after the effective date of the Contract, upon receipt of the NTP.

The base Contract will contain orders for [insert number and type of vehicles]. The Contract delivery date for the vehicles, in accordance with the delivery schedule set forth in “Delivery Schedule,” shall be [insert date].

If any option is exercised, the option vehicles or other option items shall be delivered in accordance with the schedule contained in the Notice of Exercise of Option.

4. Notices

Any Notice legally required to be given by one party to another under the Contract shall be in writing, dated and signed by the party giving such Notice or by a duly authorized representative of such party.

Notices shall not be effective unless transmitted by any method that provides confirmation of transmission and delivery, such as fax, certified mail or registered mail and addressed to:

[Insert Agency name, address, point of contact and Contract number]
[Insert Contractor name, address and point of contact]

5. Entire Agreement

This Contract constitutes the complete and entire agreement between the Agency and Contractor and supersedes any prior representations, understandings, communications, commitments, agreements or Proposals, oral or written, that are not incorporated as a part of the Contract.

[Agency to inserts its normal signature format in accordance with its governing law and regulations. The Agency should ensure that the signature format conforms to state law and Agency policy.]

| | |
|---|---|
| _____ Contractor name | _____ Agency name |
| _____ Signature of authorized official | _____ Signature of authorized official |
| _____ (Print or type name and title) | _____ (Print or type name and title) |
| _____ Date | _____ Date |
| _____ Tax ID number | Approved as to form by: _____ Insert name and title |

Appendix E: Sample Performance Bond Form

NOTE: The following is a sample Performance Bond, which is included as an illustration of a format that an Agency may choose to use.

FAITHFUL PERFORMANCE BOND

[insert Agency name]

CONTRACT NO. ____

[insert title of procurement]

PERFORMANCE BOND

WHEREAS the [insert Agency name] has awarded to _____ (“Principal”), Contract No. _____, Up To [Agency to insert quantity and type of bus] AND

WHEREAS Principal is required under the terms of the Contract to furnish a Bond for the faithful performance of the Contract;

NOW, THEREFORE, we _____, as Principal, and _____, (“Surety”), as Surety, are held and firmly bound unto [Agency] in the sum of [insert amount], in lawful money of the United States of America, for payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severably, firmly by these presents. In case suit is brought upon this Bond, Surety shall pay reasonable attorneys’ fees to [Agency] in an amount to be fixed by the court. In no event shall the surety be liable under this Bond for an amount greater than the aggregate penal sum designated in this paragraph.

The condition of this obligation is such that, if the hereby-bonded Principal or its heirs, executors, administrators, successors, assigns, or Subcontractors shall in all things stand to and abide by and well and truly keep and perform all the undertakings, terms, covenants, conditions and agreements in the Contract and any alteration thereof, made as therein provided, all within the time and in the manner therein-designated and in all respects according to their true intent and meaning, then this obligation shall become null and void; otherwise, it shall be and remain in full force and effect.

Further, Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration, or modification of the Contract, or of the Goods to be furnished thereunder, shall in any way affect its obligations under this Bond, and it does hereby waive notice of any such change, extension of time, alteration, or modification of the Contract or of the Goods and Technical Services to be performed thereunder.

Request for Proposal
[insert date of solicitation]
[insert Proposal number]

IN WITNESS WHEREOF, three identical counterparts of this instrument, each of which shall for all purposes be deemed an original hereof, have been duly executed by Principal and Surety named herein, on the ___ day of _____, 20___, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative pursuant to authority of its governing body.

By _____
("Principal")

By _____
("Surety")

By _____

Appendix F: Sample Assignment of an Option to Purchase Agreement

[insert Agency name], “Assignor”, hereby assigns to _____ of _____, “Assignee,” its option to purchase from, “Seller”, _____ floor transit Vehicles (“Option Vehicles”) at a price and under the terms and conditions contained in Assignor’s Contract No. [insert Contract number], dated with Seller (“Contract”).

Such option commenced, per terms of Contract, on, and may be exercised at any time on or before.

With respect to the Option Vehicles assigned hereunder and this Assignment, Assignee agrees to perform all covenants, conditions and obligations required of Assignor under said Contract and agrees to defend, indemnify and hold Assignor harmless from any liability or obligation under said Contract. Assignee further agrees to hold Assignor harmless from any deficiency or Defect in the legality or enforcement of the terms of said Contract or option to purchase thereunder. Assignee agrees and understands that Assignor is not acting as a broker or agent in this transaction and is not representing Seller or Assignee, but rather is acting as a principle in assigning its interest in the above-referenced option to purchase the Option Vehicles under the Contract to Assignee.

Assignee hereby unconditionally releases and covenants not to sue Assignor upon any claims, liabilities, damages, obligations or judgments whatsoever, in law or in equity, whether known or unknown, or claimed, which they or either of them have or claim to have or which they or either of them may have or claim to have in the future against Assignor, with respect to the Option Vehicles or any rights whatsoever assigned hereunder.

Dated this _____ day of _____, 20____

Assignor

Assignee

I hereby accept and approve the terms of this agreement and agree to hold Assignor harmless from any further liability or obligation under our agreement.

Seller

Appendix G: Example of a Software Escrow Agreement

NOTE: This is a sample form of escrow agreement that may be used in conjunction with SP 10, Software escrow account, when the Contract involves software that is considered proprietary on the part of the Contractor.

ESCROW AGREEMENT

THIS AGREEMENT (“Escrow Agreement”) is made and entered into as of this day of, 20__ by and among [insert name of Contractor], a [insert state] corporation (“Licensor”), [insert Agency name] (“Licensee”), and _____, a national banking association, as escrow agent (“Escrow Agent”).

WHEREAS, Licensor and Licensee have entered into an agreement pursuant to which Licensor has licensed to Licensee the use of specified computer programs and related materials, being described with particularity therein (the “License Agreement”), which License Agreement is attached hereto as Exhibit D; and

WHEREAS, the Escrow Agent can provide third-party software escrow protection by storing, retaining and allowing limited access to proprietary computer software, related media and materials.

NOW, THEREFORE, in consideration of the promises and mutual covenants contained herein and for other good and valuable consideration, receipt of which is hereby acknowledged, the parties hereby agree as follows:

1. DEPOSIT OF DOCUMENTATION

- (a) The term “Documentation” as used in this Escrow Agreement means the computer source code for the application software magnetic media provided pursuant to the License Agreement (the “System Software”) owned by Licensor and, in turn, licensed to Licensee, and such other related technical documentation and materials as shown in Exhibit A.
- (b) Licensor agrees to deposit with the Escrow Agent a complete copy of the Documentation as provided in Exhibit A on or before _____, 20__.
- (c) As Licensor creates new releases of the System Software or any part thereof, Licensor shall promptly deposit one copy of each of the Documentation applicable thereto in escrow with the Escrow Agent. Concurrently with each such deposit, Licensor shall deliver to the Escrow Agent and Licensee a revised Exhibit A, and shall deliver to Licensee a certificate in the form attached hereto as Exhibit B. Licensor shall maintain in escrow the latest field-supported releases of the Documentation or the last emergency maintenance release, whichever is most current; provided, however, all Documentation deposited in the escrow account pursuant to this Escrow Agreement shall remain in escrow so long as Licensor is obligated under the License Agreement to provide the System Software to Licensee.
- (d) All copies of source codes delivered hereunder shall be clearly marked, both on the sealed container in which the magnetic media comprising such copies are contained and on the magnetic media themselves, to indicate the Documentation and the version thereof represented by such copies.

2. STORAGE AND SECURITY

- (a) The Escrow Agent shall act as custodian of the Documentation until this escrow is terminated pursuant to Section 3 of this Escrow Agreement. The Escrow Agent shall establish, under its control, a secure receptacle for the purpose of storing the Documentation. The Escrow Agent shall exercise reasonable care to keep the Documentation protected from electric or magnetic current that could damage the Documentation, and shall provide the same degree of care of the Documentation as it maintains for its software including without limitation

source code and valuable documents and those of clients stored in the same location; provided, however, that the Escrow Agent shall have no liability with respect to any damage to the Documentation unless such damage is the result of the fault of the Escrow Agent.

- (b) The Documentation deposited with the Escrow Agent by Licensor pursuant to this Escrow Agreement shall remain the exclusive property of the Licensor, except as otherwise provided herein.
- (c) Except as provided in this Escrow Agreement or the attached Exhibits or as required by applicable law, the Escrow Agent agrees that:
 - (1) The Escrow Agent shall not divulge, disclose or otherwise make available to any person other than Licensor, or make any use whatsoever of the Documentation except in accordance with this Escrow Agreement;
 - (2) The Escrow Agent shall not permit any person access to the Documentation, except as may be necessary for the Escrow Agent's authorized representatives to perform its function under this Escrow Agreement; and
 - (3) Access to the Documentation by Licensor shall be granted by the Escrow Agent only to those persons duly authorized in writing by a competent officer of Licensor.
- (d) The Escrow Agent shall have no obligation or responsibility to verify or determine that the Documentation deposited with the Escrow Agent by Licensor does, in fact, consist of those items which Licensor is obligated to deliver under this or any other agreement, and the Escrow Agent shall bear no responsibility whatsoever to determine the existence, relevance, completeness, currency or accuracy of the Documentation at any time.
- (e) The Escrow Agent's sole responsibility shall be to accept, store, protect and deliver the Documentation deposited with the Escrow Agent by Licensor in accordance with the terms and conditions of this Escrow Agreement.
- (f) If the Escrow Agent should at any time be confronted with inconsistent claims or demands by the other parties to this Escrow Agreement, then, subject to the provisions of Section 8, it shall have the right to interplead the parties in any court of competent jurisdiction and request that the court determine the respective rights of the parties with respect to this Escrow Agreement and the Documentation and, upon doing so, the Escrow Agent automatically shall be released from any obligation or liability as a consequence of any such claims or demands.

3. RELEASE FROM ESCROW

- (a) The Escrow Agent shall release the Documentation (or any designated part thereof) at any time in accordance with a written notice signed by both Licensor and Licensee and specifying the particular item or items of Documentation to be released and the party to whom release shall be made.
- (b) The Escrow Agent shall release the Documentation 16 (sixteen) days following receipt of a notice from Licensee (the "Licensee Notice") given in accordance with Section 10 hereof, unless the Escrow Agent receives a counter-notice in accordance with Section 3(c) hereof, given in accordance with Section 10 hereof. The Licensee Notice shall state that a Licensee Release Condition, as hereinafter defined, has occurred and shall state with particularity the nature of such Licensee Release Condition. The Licensee Notice shall be given to Licensor in accordance with Section 10 hereof at the same time and by the same means that it is transmitted to the Escrow Agent, and proof of such transmission shall be submitted to the Escrow Agent along with the Licensee Notice. A "Licensee Release Condition" shall mean: (1) any material breach by Licensor of any material term or condition of the License Agreement, if such material breach has not been cured within the 30 (thirty) day period following Licensor's receipt of written notice thereof pursuant to the License Agreement; or (2) Licensor fails to support

the System Software licensed to Licensee as required by the License Agreement; or (3) Licensor fails to fulfill its warranty obligations pursuant to the License Agreement.

- (c) If Licensor disputes the existence of a Licensee Release Condition, Licensor shall give to Licensee and the Escrow Agent a counter-notice in accordance with Section 10 hereof, within 15 (fifteen) days of the date on which the Licensee Notice was given to the Escrow Agent and Licensor.
- (d) If the Escrow Agent is given a counter-notice under Section 3(c) hereof, it shall not release the requested item or items of the Documentation until and unless it receives an order and instruction, in writing, signed either by representatives of both Licensee and Licensor, or by an arbitrator as provided in Section 8 hereof.

Any receipt of the Documentation (or any designated part thereof) by Licensee pursuant to this Section 3 shall be subject to the terms and conditions of the License Agreement, such that Licensee shall accord the same security and protection to the Documentation or any part as it is obligated to give to the System Software.

The Escrow Agent shall release to Licensor all Documentation held by it upon termination of the License Agreement pursuant to clause (2) of the first sentence of Section 4 or, if that day is not a business day, on the next succeeding business day.

4. TERMINATION

- (a) This Escrow Agreement shall terminate upon the earlier of: (1) the release by the Escrow Agent of all the Documentation pursuant to the terms of this Agreement; or (2) (month/day/year) (or if the Escrow Agent receives documentation satisfactory to it to the effect that the term of the License Agreement has been extended pursuant to the provisions thereof, then such date as is 180 (one hundred eighty) days following the expiration date of the term of the License Agreement, as extended from time to time). No party shall have any liability hereunder (except pursuant to Section 2(c)) for acts or omissions occurring after termination of this Escrow Agreement. Upon such termination, the Escrow Agent shall return the Documentation then in escrow to Licensor after the payment of all costs, fees and expenses due to the Escrow Agent, including fees and expenses of its agents and attorneys.
- (b) Licensee and Licensor may terminate this Escrow Agreement by mutual written agreement upon 15 (fifteen) days' advance written notice to the Escrow Agent.
- (c) This Escrow Agreement cannot be changed or terminated orally and may be changed only with the prior written consent of all of the parties hereto. This Escrow Agreement is not intended to modify or supersede any of the arrangements of Licensor and Licensee as set forth in the License Agreement.
- (d) The Escrow Agent may resign as escrow agent at any time upon 30 (thirty) days' notice to Licensor and Licensee, but only if a successor escrow agent has been appointed prior to the effective date of the Escrow Agent's resignation. Upon receipt of notice of resignation, Licensor and Licensee promptly shall use their best efforts to designate a successor escrow agent to serve in accordance with the terms of this Agreement. If a successor escrow agent has not been appointed within a 60 (sixty) day period, the Escrow Agent may apply to a court of competent jurisdiction to have a successor appointed. Upon receipt of an affidavit signed by an officer of Licensor and an officer of Licensee directing the disposition of the Documentation to a successor escrow agent, the Escrow Agent shall promptly comply with that affidavit.

5. INDEMNIFICATION

The Escrow Agent shall not be liable to any party under this Escrow Agreement in connection with the performance of its duties hereunder, except for liability resulting from the Escrow Agent's fault. Licensor and Licensee shall, jointly and severally, indemnify and hold the Escrow Agent harmless against any loss, damage or expense, including legal fees, that it may incur to anyone as a result of acting as escrow agent under this Agreement, except for any loss, liability, damage

or expense arising from the Escrow Agent’s fault. If Licensor or Licensee makes any payment (an “Indemnification Payment”) to the Escrow Agent pursuant to the provisions of the preceding sentence, then the party making the Indemnification Payment (the “Paying Party”) shall be entitled to contribution from the other (the “Contributing Party”) in an amount such that following contribution by the Contributing Party, the Paying Party and the Contributing Party shall each bear the portion of the Indemnification Payment as is proportionate to the relative fault of each of them with respect to the event that gave rise to the Indemnification Payment; provided, however, that if neither the Paying Party nor the Contributing Party is at fault, the Paying Party shall be entitled to contribution from the Contributing Party in an amount equal to one-half of the Indemnification Payment. The provisions of the preceding sentence shall not in any way limit the liability of Licensor or Licensee to the Escrow Agent pursuant to the second sentence of this Section 5 or any other provision of this Agreement.

6. GOOD FAITH RELIANCE

The Escrow Agent may rely and act upon written instructions, instruments or signatures believed by the Escrow Agent in good faith to be genuine and may assume that any person purporting to give any written notice, respect, advice or instruction in connection with or relating to this Escrow Agreement has been duly authorized to do so. The Escrow Agent’s duties shall be determined with respect to this Agreement and applicable laws only, and the Escrow Agent is not charged with knowledge of or duties under any other document, including the License Agreement.

7. FEES

- (a) In consideration of performing its functions as Escrow Agent, the Escrow Agent shall be compensated as set forth on Exhibit C. The fees set forth on Exhibit C will be billed periodically by the Escrow Agent to:

- (b) The fees set forth in Exhibit C are for ordinary services as escrow holder. In the event the Escrow Agent is required to incur any additional or extraordinary legal fees as a result of being escrow holder, including intervention in any litigation or proceeding, the Escrow Agent shall receive full compensation for any such reasonable legal fees that are documented to the Licensor and/or Licensee’s satisfaction.

8. ARBITRATION

Any dispute or controversy between Licensor and Licensee regarding the release of the Documentation shall be settled by arbitration to be held in the City of (*insert city and state*), in accordance with the rules of the American Arbitration Association.

Licensor and Licensee shall jointly select an arbitrator within 10 (ten) days following the giving of a counter-notice under Section 3(c) hereof. If during that 10 (ten) day period, Licensor and Licensee do not jointly select an arbitrator, then the arbitrator shall be administratively appointed by the [insert city and state] Regional Office of the American Arbitration Association, and neither the Licensor nor Licensee shall have the right to object to such appointment. Any arbitration pursuant to this Section 8 shall be conducted on an expedited basis and shall be binding upon Licensor and Licensee. Licensor and Licensee shall use their respective best efforts to conclude such arbitration within 45 (forty-five) days from the date an arbitrator is elected pursuant to this Section 8. The prevailing party in any arbitration pursuant to this Section 8 shall be entitled to recover from the other party all reasonable out-of-pocket expenses in connection with such arbitration including but not limited to the fees of the arbitrator, reasonable legal fees and disbursements and business-class travel and lodging expenses. Escrow Agent shall be entitled to fully rely upon the decision and rulings of such arbitrator.

9. ENTIRE AGREEMENT

This Escrow Agreement, including Exhibits A, B and C hereto, constitutes the entire agreement among the parties concerning the subject matter hereof and shall supersede all previous communications, representations, understandings and agreements, either oral or written among the parties. This Escrow Agreement is intended to be and shall be treated as an agreement separate and distinct from the License Agreement.

10. NOTICE

All notices required or permitted by this Escrow Agreement shall be sufficiently served by mailing the same by certified or registered mail, return receipt requested, to the parties at their respective addresses, as follows:

(a) Escrow Agent:

Attn: _____

Ref: _____

(b) Licensor:

Attn: _____

(c) Licensee:

Attn: _____

11. COUNTERPARTS

This Escrow Agreement may be executed in one or more counterparts, each of which shall be deemed an original, and all of which taken together shall constitute one and the same instrument.

12. GOVERNING LAW

This Escrow Agreement shall be governed by and construed in accordance with the laws of the State of [insert state], without regard to its choice-of-laws or conflicts-of-law provisions.

13. SEVERABILITY

In the event any of the provisions of this Escrow Agreement shall be held by a court of competent jurisdiction to be contrary to any state or federal law, the remaining provisions of this Escrow Agreement will remain in full force and effect.

14. HEADINGS

The section headings in this Escrow Agreement do not form a part of it, but are for convenience only and shall not limit or affect the meaning of the provisions.

15. MISCELLANEOUS

- (a) If in doubt as to its duties hereunder, Escrow Agent may consult with counsel of its choice.
- (b) Nothing in this Agreement shall impose on the Escrow Agent the duty to qualify to do business or act as fiduciary in any jurisdiction other than

IN WITNESS WHEREOF, the parties have executed this Escrow Agreement on the date first above written.

As Escrow Agent: _____
Name and title

Signature Date

As Licensor: _____
Name and title

Signature Date

As Licensee: _____
Name and title

Signature Date

EXHIBIT A
DOCUMENTATION

EXHIBIT B
CERTIFICATE AS TO DEPOSIT OF ADDITIONAL SOURCE CODES

_____ (“Licensor”) hereby certifies
to _____ (“Licensee”) that Licensor has delivered to Escrow
Agent on _____, 20__, to be held in escrow pursuant to the terms of the Escrow
Agreement dated as of _____, 20__, among Licensor, Licensee and Escrow
Agent, one copy of each of the following Source Codes:

[describe source codes]

Dated: _____, 20__

CONTRACTOR

As Licensor: _____
Name and title

Signature

Date

EXHIBIT C
FEES

EXHIBIT D

[Insert Form of License Agreement per Introductory paragraph of Escrow Agreement.]

Appendix H: Guidelines for Selecting Electric Bus Specifications

General Approach and Considerations

Transit agencies can choose from a number of electric drive propulsion and refueling/charging options for transit buses. This Standard Bus Procurement Guidelines document has been updated as of April 2021 to include one of these options: battery-electric buses that may utilize depot-based charging and/or on-route charging. Agencies should note that other options are available, such as fuel cell electric with hydrogen refueling and trolleybuses. It is anticipated that the transit industry overall will utilize a mix of options to achieve the unique objectives and characteristics of their operation in order to deploy zero-emission buses.

Transit agencies are very familiar with and accustomed to using APTA's *Bus Procurement Guidelines* when purchasing conventional bus technologies. However, the emergence of zero-emission buses introduces different—and more complex factors—that must be considered to achieve the greatest benefits from the advanced technology vehicles and avoid costly deployment failures. These procurement guidelines related to battery electric buses are intended to offer guidance to agencies on the considerations that are unique to the technology and that should be reflected in procurement documents (e.g., range, charging preference). As every transit agency has a unique set of attributes and the variety of available zero-emission bus technologies must be matched and managed accordingly, there is not a one-size-fits all approach for the procurement document of battery electric buses. Moreover, considerations may evolve as agencies move to full-scale transition to zero emission fleets.

Factors Affecting Range

A single range value is difficult to specify for electric buses for a few reasons. First, there are multiple ways to meet agency's range requirements or block durations with various bus/charger combinations. For instance, a bus with a small battery pack (i.e., less energy capacity) can be used in combination with on-route or opportunity charging to meet longer range needs. Alternatively, a bus with a large battery packs (i.e., more energy capacity) can be used in combination with depot charging to meet certain needs. Therefore, range specifications for a bus need to be considered in the context of the overall charging and operations solution.

Second, unlike diesel or CNG buses, there are many operational factors outside of battery size that can significantly affect range for electric buses. These include: route average speed, route grades, driving behavior, outside air temperature, thermal comfort setpoints for passengers and driver, passenger loads, and battery state of health. These factors make specifying and verifying range difficult.

Section TS 8.2 has attempted to provide a form for procuring agencies to identify the conditions for its specific environment so that bus manufacturers can 1) propose an appropriate bus and charging solution, and 2) can provide appropriate range expectations for the agency.

TS 8. Fuel Economy and Range (Design Operating Profile) now includes specific references to battery electric buses that are critical for consideration when developing procurement documents. **Altoona Fuel Economy Tests (Section TS 8.1)** evaluates the range for battery electric buses and provides an “apples to apples” comparison of range across a set standard for all buses. The buses are tested under Altoona's pass/fail procedures on three duty cycles: Manhattan cycle, Orange County cycle, and EPA HD-UDDS cycle. However, results from Altoona testing do not reflect how a particular battery electric bus model will operate in a transit agency's specific environment. **Section TS 8.2 Agency Operating Profile (Battery Electric Bus)**

are now part of the Guidelines and allow agencies the opportunity to provide their unique operational requirements.

In order for Transit Agencies to procure electric buses that meet the requirements of their specific fleet and, specifically, duty cycle, it is important to define and communicate those operational requirements to proposing manufacturers. Accurate definition of an agency's characteristics allows manufacturers to propose a bus configuration that will sufficiently meet those needs. It also allows manufacturers to provide accurate expectations of how the buses will behave in that particular operation. Section TS 8.2 provides a few different methods for an Agency to determine and communicate those operational requirements depending on their resources and capabilities. It should be noted that while these methods are used in an attempt to get accurate range expectations and comparisons for all proposed buses, the bus manufacturers will use various methods to predict range and could affect results.

The Agency inputs in Section TS 8.2 Default allow for the most basic characterization of an agency's operation by providing general route information. However, a more refined and accurate characterization and proposal response can be obtained by using the Alternatives provided. Under the first Alternative, a transit agency may either provide or request proposers to collect route and duty cycle data for bus modeling and bus simulation purposes. This Alternative will allow for the most personalized operational analysis of a bus on the agency's route or routes. If a transit agency is unable to provide or request route specific information, then the second alternative can be used in their spec, for which they will provide an estimated percentage of each standard duty cycle (Manhattan, Orange County, and EPA HD-UDDS) that is representative of their service. The Manhattan duty cycle represents dense urban operation with frequent stops and low speeds. The Orange County duty cycle represents urban operation with average stops and speeds. The EPA HD-UDDS cycle represents sparse urban operation with higher average speeds and durations at highway speed.

In addition, Section TS 8.2 requires proposers to provide a narrative with its Technical Proposal addressing specific operational characteristics of the proposed battery electric bus based on the characteristics defined by the Agency.

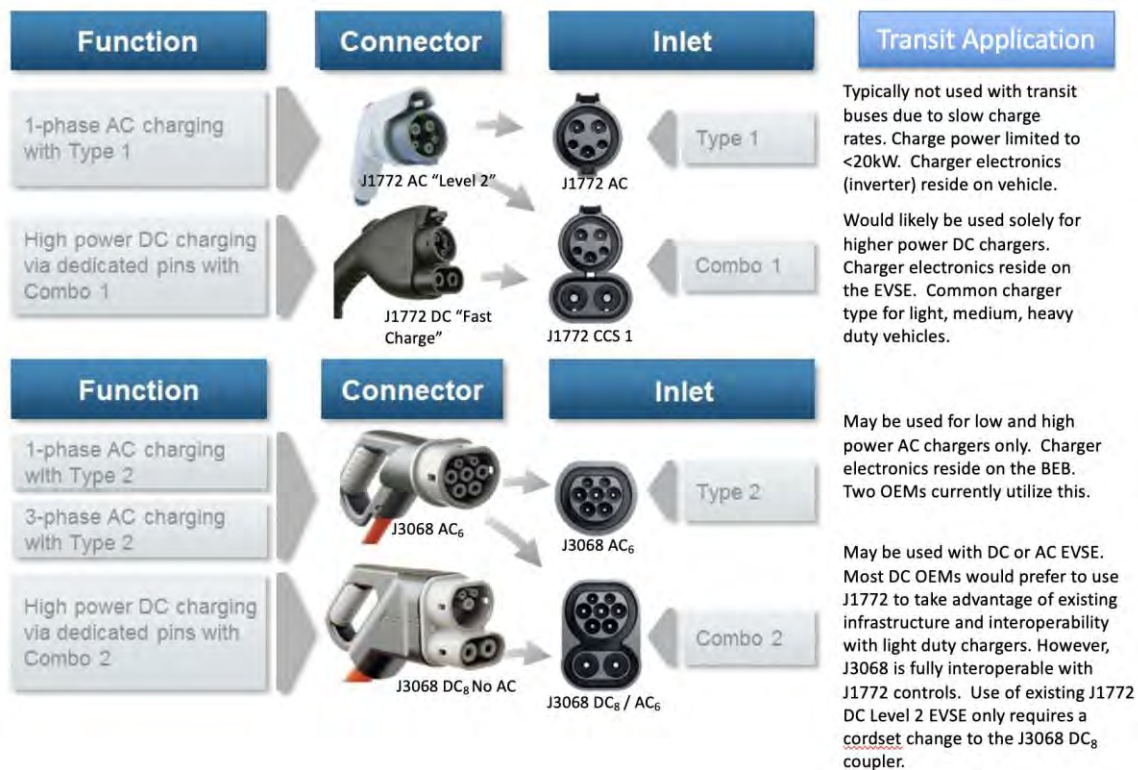
Charging Types (Part of Section TS 9.3.5)

When making decisions regarding bus-side charging requirements, agencies must consider a few things including:

- First, the Agency must consider the overall charging strategy i.e. bus and charging combinations -- depot, on-route overhead or wireless (static or dynamic) -- that it has selected in order to meet its routes. This may have been identified either prior to the procurement or through the procurement process. Either way, the bus receptacle must match the intended charger type.
- Second, if the Agency has existing EVSE, it must consider whether or not to stay consistent with its existing charger types and allow for the procured buses to have the capability of charging at those chargers. If the Agency does not have existing EVSE, it still must consider allowing for interoperability with future procurements. Having to maintain and manage various types of EVSE and electric buses with respect to charging may lead to increased operations costs or potentially conversion costs.
- Third, the Agency must ensure that the technical specifications for the chargers being procured are consistent with the buses being procured. Procurement of the chargers and buses may or may not be

accomplished under the same procurement process, but either way, specification must be aligned to ensure interoperability with respect to physical interconnection, communication, and electrical power transfer. Further, while standards can help ensure interoperability with respect to mechanical coupling, electrical compatibility, and communications, bus and charger combinations should still be verified if compatibility is not already established by the OEM and charger manufacturer. Figure 1 notes the different plug-in charger types and the SAE standards they use. Please note that an overhead conductive charger should conform to SAE J3105-1 and a wireless charger should conform to the forthcoming SAE J2954-2 standard.

Figure H-1: Charger Types



Energy Storage System Capacity (part of TS 9.3.5)

At the time of developing this APTA Standard Bus Procurement Guideline, there is no established, standardized method for measuring battery state of health. Measuring battery capacity onboard a bus is difficult and may not be precise or, in the case of simply measuring the amount of energy dispensed in a charge cycle, be able to provide discharge capacity of the battery. Measured battery capacity is affected by discharge rate and must be accounted for or normalized. Absent a standard, agencies must rely on the OEMs to provide the measurement and/or method in order to agree with the measurement expectations for which stated capacity and warranty are provided. Section TS 9.3.5 attempts to allow for OEMs to provide a method for measuring battery capacity but also allow for independent third-party measurement. Industry groups are working on establishing a standardized method for measuring battery capacity and state of health for the all-

electric transit bus in particular. Once this established, this section should be modified by the user to reflect that standard.

Fire Suppression Section TS 5.10

The default is “no fire suppression system” because, in a battery electric bus, the BMS is the primary source of fire prevention and detection for traction batteries. The most effective means of safety in the event of a fire is evacuation.

Abbreviation and Acronyms

| | |
|--------------|---|
| A/C | air conditioning |
| ABS | antilock braking system |
| AC | alternating current |
| ACQ | alkaline copper quaternary |
| ADA | Americans with Disabilities Act |
| ADB | advanced design bus |
| Ah | amp hour |
| ALR | auto-locking retractor |
| APA | The Engineered Wood Association, formerly the American Plywood Association |
| APC | automatic passenger counter |
| APTA | American Public Transportation Association |
| ASTM | ASTM International, formerly the American Society for Testing and Materials |
| ATC | automatic traction control |
| AVL | automatic vehicle location |
| AWG | American Wire Gauge |
| BAFO | Best and Final Offer |
| BMS | Battery Management System |
| BRT | bus rapid transit |
| CARB | California Air Resources Board |
| CCS | climate control system |
| CCTV | closed-circuit television |
| cfm | cubic feet per minute |
| CGA | Compressed Gas Association |
| CNG | compressed natural gas |
| dB | decibel |
| DBE | disadvantaged business enterprise |
| DC | direct current |
| DDU | driver display unit |
| DEF | diesel exhaust fluid |
| DOT | Department of Transportation |
| DPF | diesel particulate filter |
| EDR | event data recorder |
| ECM | Engine Control and Monitoring |
| ECS | emission control system |
| ELR | emergency locking retractor |
| EMI | electromagnetic interference |
| EPA | Environmental Protection Agency |
| EOL | end of life |
| ESS | energy storage system |
| EVSE | electric vehicle supply equipment |
| fc | foot-candle |
| FEA | Finite Element Analysis |
| FEMA | failure mode effects analysis |
| FMCSA | Federal Motor Carrier Safety Administration |
| FMVSS | Federal Motor Vehicle Safety Standards |
| FTA | Federal Transit Administration |

| | |
|----------------|---|
| GAWR | gross axle weight rated |
| GPS | global positioning system |
| GVW | gross vehicle weight |
| GVWR | gross vehicle weight rated |
| H-point | hip-point |
| HDS | hybrid drive system |
| HMI | human-machine interface |
| HSC | hybrid system controller |
| HV | high voltage |
| HVAC | heating, ventilation and air conditioning |
| I/O | input/output |
| IEEE | Institute of Electrical and Electronics Engineers |
| inHg | inches of mercury |
| ISO | International Standards Organization |
| kJ | kilojoule |
| LEL | LED emergency light |
| LFL | lower flammability limit |
| LV | low voltage |
| mA | milliamperes |
| MDT | mobile data terminal |
| MPa | mega-Pascal |
| NC | normally closed |
| NFPA | National Fire Protection Association |
| NGV | natural gas vehicle |
| NOx | nitrogen oxide |
| NO | normally open |
| NTP | notice to proceed |
| OEM | original equipment manufacturer |
| OSI | Open Systems Interconnect |
| PA | public address |
| PMO | project management oversight |
| PPV | price per vehicle |
| PRD | pressure relief device |
| psi | pounds per square inch |
| RF | radio frequency |
| RFI | radio frequency interference |
| RTC | real-time clock |
| SAE | SAE International, formerly the Society of Automotive Engineers |
| scf | standard cubic feet |
| SLW | seated load weight |
| SoC | state of charge |
| UL | Underwriters Laboratories |
| UNECE | United Nations Economic Commission for Europe |
| UPS | uninterruptable power supply |
| USC | United States Code |
| USCA | United States Code Annotated |
| V DC | volts of direct current |

| | |
|-------------|----------------------------|
| WEOL | warrantable end of life |
| Wh | watt-hours |
| VIN | vehicle information number |
| ZEV | zero-emission vehicle |

Summary of document changes

- Document was revised with new language for battery electric bus procurements.
 - Section 6 Technical Specifications:
 - New entries to Section TS 2 Definitions to reference battery bus elements
 - In Section TS 5, Operating Environment, Noise, Fire Safety, and Fire Suppression updated to be inclusive of battery buses and to specifically reference different propulsion systems.
 - In TS 7 Vehicle Performance, new language added for battery buses and other language specified for other propulsion system relating to power requirements, acceleration
 - In TS 8 Fuel Economy/Range – language added to specify requirements for various propulsions systems including battery bus. Agency Operating Profile for battery bus added.
 - In TS 9 Engine - language added to specify requirements for various propulsions systems including battery bus including new Energy Storage section.
 - In TS 10 Cooling Systems – language significantly updated to reflect conditions of various propulsion systems
 - In TS 19 Emission and Exhaust, language added for battery buses
 - TS 31.1.1 Regenerative Braking for Hybrid or Electric added
 - TS 42 General Electrical Requirements – added language relating to high voltage batteries and low voltage batteries for battery buses
 - TS 54 Heat, Ventilating and Air Conditioning – added language specific to various propulsion systems including battery.
 - TS 55 Controls and Temperature Uniformity – added Alternatives for Battery or Fuel Cell Bus
 - Section 7 Warranty Requirements:
 - Language added for Complete Bus Warranty for electric buses
 - Language added for Propulsion System Warranty for electric bus
 - Language added for Energy Storage System for electric bus
 - CER 10 Vehicle Technical Information – new language added for electric bus
 - Other major language updates not specific to battery buses include:
 - TS 3 Referenced Publications – more detailed language
 - TS 5 - Language related to vehicle weight and maintenance inspections
 - TS 16 Radiator – updated language and alternative added
 - TS 75.19 – Farebox – added new alternatives and specified types of transit vehicles applicable
 - New section: Certification of Compliance with Standards, Certifications and Regulations
 - Language added to CER 10 Vehicle Technical Information
 - Appendix H: Guidelines for Selecting Electric Bus Specifications added

Document history

| Document Version | Working Group Vote | Public Comment/ Technical Oversight | CEO Approval | Policy & Planning Approval | Publish Date |
|-------------------------|---------------------------|--|---------------------|---------------------------------------|---------------------|
| First published | | | | | 2008 |
| First revision | | | | | 2013 |
| Second revision | August 2019 | September 2019 | April 16, 2021 | April 28, 2021 | April 30, 2021 |
| Revision 2.1 | Feb. 23, 2021 | March 2021 | May 24, 2021 | June 3, 2021 | June 8, 2021 |

Document ID #: APTA BTS-BPG-GL-001-13, Rev. 2.1

Federal Clauses

ACCESS TO RECORDS AND REPORTS

- a. Record Retention. The Contractor will retain, and will require its subcontractors of all tiers to retain, complete and readily accessible records related in whole or in part to the contract, including, but not limited to, data, documents, reports, statistics, sub-Contracts, leases, subcontracts, arrangements, other third party Contracts of any type, and supporting materials related to those records.
- b. Retention Period. The Contractor agrees to comply with the record retention requirements in accordance with 2 C.F.R. § 200.333. The Contractor shall maintain all books, records, accounts and reports required under this Contract for a period of at not less than three (3) years after the date of termination or expiration of this Contract, except in the event of litigation or settlement of claims arising from the performance of this Contract, in which case records shall be maintained until the disposition of all such litigation, appeals, claims or exceptions related thereto.
- c. Access to Records. The Contractor agrees to provide sufficient access to FTA and its contractors to inspect and audit records and information related to performance of this contract as reasonably may be required.
- d. Access to the Sites of Performance. The Contractor agrees to permit FTA and its contractors access to the sites of performance under this contract as reasonably may be required.

AMERICANS WITH DISABILITIES ACT (ADA)

The contractor agrees to comply with the requirements of 49 U.S.C. § 5301 (d), which states the Federal policy that the elderly and persons with disabilities have the same right as other persons to use mass transportation service and facilities, and that special efforts shall be made in planning and designing those services and facilities to implement that policy. The contractor also agrees to comply with all applicable requirements of section 504 of the Rehabilitation Act of 1973, as amended, 29 U.S.C. § 794, which prohibits discrimination on the basis of handicaps, with the Americans with Disabilities Act of 1990 (ADA), as amended, 42 U.S.C. §§ 12101 et seq., which requires that accessible facilities and services be made available to persons with disabilities, including any subsequent amendments to that Act, and with the Architectural Barriers act of 1968, as amended, 42 U.S.C. §§ 4151 et seq., which requires that buildings and public accommodations be accessible to persons with disabilities, including any subsequent amendments to that Act. In addition, the contractor agrees to comply with any and all applicable requirements issued by the FTA, DOT, DOJ, U.S. GSA, U.S. EEOC, U.S. FCC, any subsequent amendments thereto and any other nondiscrimination statute(s) that may apply to the Project.

BUS TESTING

The operator of the bus testing facility is required to provide the resulting test report to the entity that submits the bus for testing. The manufacturer or dealer of a new bus model or a bus produced with a major change in component or configuration is required to provide a copy of the corresponding full bus testing report and any applicable partial testing report(s) to the Agency during the point in the procurement process specified by the Agency, but in all cases before final acceptance of the first bus by the Agency. The complete bus testing reporting requirements are provided in 49 C.F.R. § 665.11.

BUY AMERICA REQUIREMENTS

The contractor agrees to comply with 49 U.S.C. 5323a) and 49 C.F.R. part 661 and 2 CFR § 200.322 Domestic preferences for procurements, which provide that Federal funds may not be obligated unless all steel, iron, and manufactured products used in FTA funded projects are produced in the United States, unless a waiver has been granted by FTA or the product is subject to a general waiver. General waivers are listed in 49 C.F.R. § 661.7. Separate requirements for rolling stock are set out at 49 U.S.C. 5323a)(2)(C), 49 U.S.C. § 5323(u) and 49 C.F.R. § 661.11. The bidder or offeror must submit to the Agency the appropriate Buy America certification. Bids or offers that are not accompanied by a completed Buy America certification will be rejected as nonresponsive.

Notice of Policy on the Implementation of the Phased Increase in Domestic Content Under the Buy America Waiver for Rolling Stock and Notice of Public Interest Waiver of Buy America Domestic Content Requirements for Rolling Stock Procurement in Limited Circumstances IV, 81 Federal Register 60278 (September 1, 2016)

For rolling stock contracts entered into on or after October 1, 2015, i.e., the effective date of the FAST Act, the applicable domestic content percentage under section 5323(j)(2)(C) will be based on the scheduled delivery date of the first production vehicle (i.e., the first vehicle intended to carry passengers in revenue service), final acceptance notwithstanding. Thus, if a recipient or group of recipients as part of a joint procurement entered into a contract for rolling stock on or after October 1, 2015, then the new FAST Act provisions applicable for the date of delivery of the first production vehicle shall apply. Accordingly, if the first production vehicle is delivered in FY2018 or FY2019, the domestic content must be more than 65 percent, and if the first production vehicle is delivered in FY2020 or beyond, the domestic content must be more than 70 percent. These delivery provisions apply to contracts entered into on or after October 1, 2015, unless a waiver is granted. If the delivery date of the first production vehicle is delayed such that it will be delivered in a year with a higher domestic content, FTA will address those situations on a case-by-case basis. The FAST Act amendments do not apply to contracts entered into before October 1, 2015, even if the contract provides for the delivery of the first production vehicle after FY2017. For contracts entered into before October 1, 2015, all vehicles delivered under the original contract base order and any properly exercised options by recipients who are direct parties to the contract may contain a domestic content of more than 60 percent, per the pre-FAST Act requirements.

BYRD ANTI-LOBBYING AMENDMENT

Contractors who apply or bid for an award of \$100,000 or more shall file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 U.S.C. § 1352. Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the Agency."

CARGO PREFERENCE REQUIREMENTS

The contractor 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 loading 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 described in the preceding paragraph 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.), and
- c. to include these requirements in all subcontracts issued pursuant to this contract when the subcontract may involve the transport of equipment, material, or commodities by ocean vessel.

CIVIL RIGHTS LAWS AND REGULATIONS

The following Federal Civil Rights laws and regulations apply to all contracts.

1 Federal Equal Employment Opportunity (EEO) Requirements. These include, but are not limited to:

- a) Nondiscrimination in Federal Public Transportation Programs. 49 U.S.C. § 5332, covering projects, programs, and activities financed under 49 U.S.C. Chapter 53, prohibits discrimination on the basis of race, color, religion, national origin, sex (including sexual orientation and gender identity), disability, or age, and prohibits discrimination in employment or business opportunity.
- b) Prohibition against Employment Discrimination. Title VII of the Civil Rights Act of 1964, as amended, 42 U.S.C. § 2000e, and Executive Order No. 11246, "Equal Employment Opportunity," September 24, 1965, as amended, prohibit discrimination in employment on the basis of race, color, religion, sex, or national origin.
- 2 Nondiscrimination on the Basis of Sex. Title IX of the Education Amendments of 1972, as amended, 20 U.S.C. § 1681 et seq. and implementing Federal regulations, "Nondiscrimination on the Basis of Sex in Education Programs or Activities Receiving Federal Financial Assistance," 49 C.F.R. part 25 prohibit discrimination on the basis of sex.
- 3 Nondiscrimination on the Basis of Age. The "Age Discrimination Act of 1975," as amended, 42 U.S.C. § 6101 et seq., and Department of Health and Human Services implementing regulations, "Nondiscrimination on the Basis of Age in Programs or Activities Receiving Federal Financial Assistance," 45 C.F.R. part 90, prohibit discrimination by participants in federally assisted programs against individuals on the basis of age. The Age Discrimination in Employment Act (ADEA), 29 U.S.C. § 621 et seq., and Equal Employment Opportunity Commission (EEOC) implementing regulations, "Age Discrimination in Employment Act," 29 C.F.R. part 1625, also prohibit employment discrimination against individuals age 40 and over on the basis of age.

4 Federal Protections for Individuals with Disabilities. The Americans with Disabilities Act of 1990, as amended (ADA), 42 U.S.C. § 12101 et seq., prohibits discrimination against qualified individuals with disabilities in programs, activities, and services, and imposes specific requirements on public and private entities. Third party contractors must comply with their responsibilities under Titles I, II, III, IV, and V of the ADA in employment, public services, public accommodations, telecommunications, and other provisions, many of which are subject to regulations issued by other Federal agencies.

Civil Rights and Equal Opportunity

The Agency is an Equal Opportunity Employer. As such, the Agency agrees to comply with all applicable Federal civil rights laws and implementing regulations. Apart from inconsistent requirements imposed by Federal laws or regulations, the Agency agrees to comply with the requirements of 49 U.S.C. § 5323(h) (3) by not using any Federal assistance awarded by FTA to support procurements using exclusionary or discriminatory specifications. Under this Contract, the Contractor shall at all times comply with the following requirements and shall include these requirements in each subcontract entered into as part thereof.

1. Nondiscrimination. In accordance with Federal transit law at 49 U.S.C. § 5332, the Contractor agrees that it will not discriminate against any employee or applicant for employment because of race, color, religion, national origin, sex, disability, or age. In addition, the Contractor agrees to comply with applicable Federal implementing regulations and other implementing requirements FTA may issue.
2. Race, Color, Religion, National Origin, Sex. In accordance with Title VII of the Civil Rights Act, as amended, 42 U.S.C. § 2000e et seq., and Federal transit laws at 49 U.S.C. § 5332, the Contractor 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. chapter 60, and Executive Order No. 11246, "Equal Employment Opportunity in Federal Employment," September 24, 1965, 42 U.S.C. § 2000e note, as amended by any later Executive Order that amends or supersedes it, referenced in 42 U.S.C. § 2000e note. The Contractor agrees to take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, national origin, or sex (including sexual orientation and gender identity). Such action shall include, but not be limited to, the following: employment, promotion, 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 Contractor agrees to comply with any implementing requirements FTA may issue.
3. Age. In accordance with the Age Discrimination in Employment Act, 29 U.S.C. §§ 621-634, U.S. Equal Employment Opportunity Commission (U.S. EEOC) regulations, "Age Discrimination in Employment Act," 29 C.F.R. part 1625, the Age Discrimination Act of 1975, as amended, 42 U.S.C. § 6101 et seq., U.S. Health and Human Services regulations, "Nondiscrimination on the Basis of Age in Programs or Activities Receiving Federal Financial Assistance," 45 C.F.R. part 90, and Federal transit law at 49 U.S.C. § 5332, the Contractor agrees to refrain from discrimination against present and prospective employees for reason of age. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.
4. **Disabilities.** In accordance with section 504 of the Rehabilitation Act of 1973, as amended, 29 U.S.C. § 794, the Americans with Disabilities Act of 1990, as amended, 42 U.S.C. § 12101 et seq., the Architectural Barriers Act of 1968, as amended, 42 U.S.C. § 4151 et seq., and Federal transit law at 49 U.S.C. § 5332, the Contractor agrees that it will not discriminate against individuals on the basis of disability. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.
5. **Promoting Free Speech and Religious Liberty.** The Contractor shall ensure that Federal funding is expended in full accordance with the U.S. Constitution, Federal Law, and statutory and public policy requirements: including, but not limited to, those protecting free speech, religious liberty, public welfare, the environment, and prohibiting discrimination.

CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

The Contractor agrees to comply with all applicable standards, orders, or regulations issued pursuant to the Clean Air Act (42 U.S.C. § 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. § 1251-1387). Violations must be reported to FTA and the Regional Office of the Environmental Protection Agency. The following applies for contracts of amounts in excess of \$150,000:

Clean Air Act

- (1) The contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. § 7401 et seq.
- (2) The contractor agrees to report each violation to the Agency and understands and agrees that the Agency will, in turn, report each violation as required to assure notification to the Agency, Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office.
- (3) The contractor agrees to include these requirements in each subcontract exceeding \$150,000 financed in whole or in part with Federal assistance provided by FTA.

Federal Water Pollution Control Act

- (1) The contractor 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.
- (2) The contractor agrees to report each violation to the Agency and understands and agrees that the Agency will, in turn, report each violation as required to assure notification to the Agency, Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office.
- (3) The contractor agrees to include these requirements in each subcontract exceeding \$150,000 financed in whole or in part with Federal assistance provided by FTA."

CONFORMANCE WITH ITS NATIONAL ARCHITECTURE

Intelligent Transportation Systems (ITS) projects shall conform to the National ITS Architecture and standards. Conformance with the National ITS Architecture is interpreted to mean the use of the National ITS Architecture to develop a regional ITS architecture in support of integration and the subsequent adherence of all ITS projects to that regional ITS architecture. Development of the regional ITS architecture should be consistent with the transportation planning process for Statewide and Metropolitan Transportation Planning (49 CFR Part 613 and 621).

CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

- a. Applicability: This requirement applies to all FTA grant and cooperative agreement programs.
- b. Where applicable (see 40 U.S.C. § 3701), all contracts awarded by the non-Federal entity in excess of \$100,000 that involve the employment of mechanics or laborers must include a provision for compliance with 40 U.S.C. §§ 3702 and 3704, as supplemented by Department of Labor regulations at 29 C.F.R. Part S. See 2 C.F.R. Part 200, Appendix II.
- c. Under 40 U.S.C. § 3702, each contractor must be required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week.
- d. The requirements of 40 U.S.C. § 3704 are applicable to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.
- e. The regulation at 29 C.F.R. § 5.5(b) provides the required contract clause concerning compliance with the Contract Work Hours and Safety Standards Act:

Compliance with the Contract Work Hours and Safety Standards Act.

- (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 therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), 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 agency 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 insert in any subcontracts the clauses set forth in paragraph (1) through (4) of this section and also a clause requiring the 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 the clauses set forth in paragraphs (1) through (4) of this section."

DEBARMENT AND SUSPENSION

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a. Applicability: This requirement applies to all FTA grant and cooperative agreement programs for a contract in the amount of at least \$25,000

(1) This contract is a covered transaction for purposes of 2 C.F.R. pt. 180 and 2 C.F.R. pt. 3000. As such the contractor is required to verify that none of the contractor, its principals (defined at 2 C.F.R. § 180.995), or its affiliates (defined at 2 C.F.R. § 180.905) are excluded (defined at 2 C.F.R. § 180.940) or disqualified (defined at 2 C.F.R. § 180.935).

(2) C.F.R. pt. 3000, subpart C and must include a requirement to comply with these regulations in any lower tier covered transaction it enters into.

(3) The accompanying certification is a material representation of fact relied upon by the subrecipient. If it is later determined that the contractor did not comply with 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C, in addition to remedies available to the Agency and subrecipient, 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 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C while this offer is valid and throughout the period of any contract that may arise from this offer. The bidder or proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions."

DISADVANTAGED BUSINESS ENTERPRISE (DBE)

The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 C.F.R. part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the Agency deems appropriate, which may include, but is not limited to:

(1) Withholding monthly progress payments; (2) Assessing sanctions; (3) Liquidated damages; and/or (4) Disqualifying the contractor from future bidding as non-responsible. 49 C.F.R. § 26.13(b).

Prime contractors are required to pay subcontractors for satisfactory performance of their contracts no later than 30 days from receipt of each payment the Agency makes to the prime contractor. 49 C.F.R. § 26.29(a).

Finally, for contracts with defined DBE contract goals, each FTA Recipient must include in each prime contract a provision stating that the contractor shall utilize the specific DBEs listed unless the contractor obtains the Agency's written consent; and that, unless the Agency's consent is provided, the contractor shall not be entitled to any payment for work or material unless it is performed or supplied by the listed DBE. 49 C.F.R. § 26.53(1).

It is the policy of the Agency and the United States Department of Transportation ("DOT") that Disadvantaged Business Enterprises ("DBE's"), as defined herein and in the Federal regulations published at 49 C.F.R. part 26, shall have an equal opportunity to participate in DOT-assisted contracts.

DHS SEAL, LOGO, AND FLAGS

The contractor shall not use the DHS seal(s), logos, crests, or reproductions of flags or likenesses of DHS agency officials without specific FTA pre-approval.

ENERGY CONSERVATION

The contractor 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.

EQUAL EMPLOYMENT OPPORTUNITY

During the performance of this contract, the contractor agrees as follows:

(1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following: 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. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.

(2) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

(3) The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.

(4) The contractor will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice to be provided by the agency contracting officer, advising the labor union or workers' representative of the contractor's commitments under section 202 of Executive Order 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(5) The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(6) The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the

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Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(7) In the event of the contractor's non-compliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be canceled, terminated or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(8) The contractor will include the provisions of paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as may be directed by the Secretary of Labor as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that in the event the contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

FEDERAL CHANGES

49 CFR Part 18 Federal Changes - Contractor 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 Purchaser and FTA, as they may be amended or promulgated from time to time during the term of this contract. Contractor's failure to so comply shall constitute a material breach of this contract.

FLY AMERICA

a) Definitions. As used in this clause

1) "International air transportation" means transportation by air between a place in the United States and a place outside the United States or between two places both of which are outside the United States. 2) "United States" means the 50 States, the District of Columbia, and outlying areas. 3) "U.S.-flag air carrier" means an air carrier holding a certificate under 49 U.S.C. Chapter 411.

b) When Federal funds are used to fund travel, Section 5 of the International Air Transportation Fair Competitive Practices Act of 1974 (49 U.S.C. 40118) (Fly America Act) requires contractors, Agencies, and others use U.S.-flag air carriers for U.S. Government-financed international air transportation of personnel (and their personal effects) or property, to the extent that service by those carriers is available. It requires the Comptroller General of the United States, in the absence of satisfactory proof of the necessity for foreign-flag air transportation, to disallow expenditures from funds, appropriated or otherwise established for the account of the United States, for international air transportation secured aboard a foreign-flag air carrier if a U.S.-flag air carrier is available to provide such services.

c) If available, the Contractor, in performing work under this contract, shall use U.S.-flag carriers for international air transportation of personnel (and their personal effects) or property.

d) In the event that the Contractor selects a carrier other than a U.S.-flag air carrier for international air transportation, the Contractor shall include a statement on vouchers involving such transportation essentially as follows:

Statement of Unavailability of U.S.-Flag Air Carriers

International air transportation of persons (and their personal effects) or property by U.S.-flag air carrier was not available or it was necessary to use foreign-flag air carrier service for the following reasons. See FAR § 47.403. [State reasons]:

e) Contractor shall include the substance of this clause, including this paragraph (e), in each subcontract or purchase under this contract that may involve international air transportation.

INCORPORATION OF FEDERAL TRANSIT ADMINISTRATION (FTA) TERMS

Incorporation of Federal Transit Administration (FTA) Terms - The provisions within 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 the current FTA Circular 4220 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 Contract. The Contractor shall not perform any act, fail to perform any act, or refuse to comply with any request which would cause a violation of the FTA terms and conditions.

NO GOVERNMENT OBLIGATION TO THIRD PARTIES

The Agency and Contractor 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 Agency, Contractor or any other party (whether or not a party to that contract) pertaining to any maker resulting from the underlying Contract. The Contractor agrees to include the above clause in each subcontract financed in whole or in part with Federal assistance provided by the FTA. It is further agreed that the clause shall not be modified, except to identify the subcontractor who will be subject to its provisions.

PRE-AWARD AND POST-DELIVERY AUDITS OF ROLLING STOCK PURCHASES

The Contractor agrees to comply with 49 U.S.C. § 5323(m) and FTA's implementing regulation at 49 C.F.R. part 663. The Contractor shall comply with the Buy America certification(s) submitted with its proposal/bid. The Contractor agrees to participate and cooperate in any pre-award and post-delivery audits performed pursuant to 49 C.F.R. part 663 and related FTA guidance.

PROGRAM FRAUD AND FALSE OR FRAUDULENT STATEMENTS AND RELATED ACTS

The contractor acknowledges that 31 U.S.C. Chap. 38 (Administrative Remedies for False Claims and Statements) applies to the contractor's actions pertaining to this contract."

PROMPT PAYMENT

The contractor is required to pay its subcontractors performing work related to this contract for satisfactory performance of that work no later than 30 days

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after the contractor's receipt of payment for that work. In addition, the contractor is required to return any retainage payments to those subcontractors within 30 days after the subcontractor's work related to this contract is satisfactorily completed.

The contractor must promptly notify the Agency, whenever a DBE subcontractor performing work related to this contract is terminated or fails to complete its work and must make good faith efforts to engage another DBE subcontractor to perform at least the same amount of work. The contractor may not terminate any DBE subcontractor and perform that work through its own forces or those of an affiliate without prior written consent of the Agency.

SAFE OPERATION OF MOTOR VEHICLES

Seat Belt Use

The Contractor is encouraged to adopt and promote on-the-job seat belt use policies and programs for its employees and other personnel that operate company-owned vehicles, company rented vehicles, or personally operated vehicles. The terms "company-owned" and "company-leased" refer to vehicles owned or leased either by the Contractor or Agency.

Distracted Driving

The Contractor agrees to adopt and enforce workplace safety policies to decrease crashes caused by distracted drivers, including policies to ban text messaging while using an electronic device supplied by an employer, and driving a vehicle the driver owns or rents, a vehicle Contractor owns, leases, or rents, or a privately-owned vehicle when on official business in connection with the work performed under this Contract.

SPECIAL NOTIFICATION REQUIREMENTS FOR STATES

Applies to States -

a. To the extent required under federal law, the State, as the Recipient, agrees to provide the following information about federal assistance awarded for its State Program, Project, or related activities:

- (1) The Identification of FTA as the federal agency providing the federal assistance for a State Program or Project;
- (2) The Catalog of Federal Domestic Assistance Number of the program from which the federal assistance for a State Program or Project is authorized; and
- (3) The amount of federal assistance FTA has provided for a State Program or Project.

b. Documents - The State agrees to provide the information required under this provision in the following documents: (1) applications for federal assistance, (2) requests for proposals or solicitations, (3) forms, (4) notifications, (5) press releases, and (6) other publications.

SIMPLIFIED ACQUISITION THRESHOLD

Contracts for more than the simplified acquisition threshold, which is the inflation adjusted amount determined by the Civilian Agency Acquisition Council and the Defense Acquisition Regulations Council (Councils) as authorized by 41 U.S.C. § 1908, or otherwise set by law, must address administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms, and provide for such sanctions and penalties as appropriate. (Note that the simplified acquisition threshold determines the procurement procedures that must be employed pursuant to 2 C.F.R. §§ 200.317-200.327. The simplified acquisition threshold does not exempt a procurement from other eligibility or processes requirements that may apply. For example, Buy America's eligibility and process requirements apply to any procurement in excess of \$150,000. 49 U.S.C. § 5323a)(13).

TERMINATION

Termination for Convenience (General Provision)

The Agency may terminate this contract, in whole or in part, at any time by written notice to the Contractor when it is in the Agency's best interest. The Contractor shall be paid its costs, including contract close-out costs, and profit on work performed up to the time of termination. The Contractor shall promptly submit its termination claim to Agency to be paid the Contractor. If the Contractor has any property in its possession belonging to Agency, the Contractor will account for the same, and dispose of it in the manner Agency directs.

Termination for Default [Breach or Cause] (General Provision)

If the Contractor does not deliver supplies in accordance with the contract delivery schedule, or if the contract is for services, the Contractor fails to perform in the manner called for in the contract, or if the Contractor fails to comply with any other provisions of the contract, the Agency may terminate this contract for default. Termination shall be effected by serving a Notice of Termination on the Contractor setting forth the manner in which the Contractor is in default. The Contractor will be paid only the contract price for supplies delivered and accepted, or services performed in accordance with the manner of performance set forth in the contract. If it is later determined by the Agency that the Contractor had an excusable reason for not performing, such as a strike, fire, or flood, events which are not the fault of or are beyond the control of the Contractor, the Agency, after setting up a new delivery of performance schedule, may allow the Contractor to continue work, or treat the termination as a Termination for Convenience.

Opportunity to Cure (General Provision)

The Agency, in its sole discretion may, in the case of a termination for breach or default, allow the Contractor [an appropriately short period of time] in which to cure the defect. In such case, the Notice of Termination will state the time period in which cure is permitted and other appropriate conditions

If Contractor fails to remedy to Agency's satisfaction the breach or default of any of the terms, covenants, or conditions of this Contract within [10 days] after receipt by Contractor of written notice from Agency setting forth the nature of said breach or default, Agency shall have the right to terminate the contract without any further obligation to Contractor. Any such termination for default shall not in any way operate to preclude Agency from also pursuing all available remedies against Contractor and its sureties for said breach or default.

Waiver of Remedies for any Breach

In the event that Agency elects to waive its remedies for any breach by Contractor of any covenant, term or condition of this contract, such waiver by Agency shall not limit Agency's remedies for any succeeding breach of that or of any other covenant, term, or condition of this contract.

Termination for Convenience (Professional or Transit Service Contracts)

The Agency, by written notice, may terminate this contract, in whole or in part, when it is in the Agency's interest. If this contract is terminated, the Agency shall be liable only for payment under the payment provisions of this contract for services rendered before the effective date of termination.

Termination for Default (Supplies and Service)

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If the Contractor fails to deliver supplies or to perform the services within the time specified in this contract or any extension, or if the Contractor fails to comply with any other provisions of this contract, the Agency may terminate this contract for default. The Agency shall terminate by delivering to the Contractor a Notice of Termination specifying the nature of the default. The Contractor will only be paid the contract price for supplies delivered and accepted, or services performed in accordance with the manner or performance set forth in this contract. If, after termination for failure to fulfill contract obligations, it is determined that the Contractor was not in default, the rights and obligations of the parties shall be the same as if the termination had been issued for the convenience of the Agency.

Termination for Default (Transportation Services)

If the Contractor fails to pick up the commodities or to perform the services, including delivery services, within the time specified in this contract or any extension, or if the Contractor fails to comply with any other provisions of this contract, the Agency may terminate this contract for default. The Agency shall terminate by delivering to the Contractor a Notice of Termination specifying the nature of default. The Contractor will only be paid the contract price for services performed in accordance with the manner of performance set forth in this contract.

If this contract is terminated while the Contractor has possession of Agency goods, the Contractor shall, upon direction of the Agency, protect and preserve the goods until surrendered to the Agency or its agent. The Contractor and Agency shall agree on payment for the preservation and protection of goods. Failure to agree on an amount will be resolved under the Dispute clause.

If, after termination for failure to fulfill contract obligations, it is determined that the Contractor was not in default, the rights and obligations of the parties shall be the same as if the termination had been issued for the convenience of the Agency.

Termination for Default (Construction)

If the Contractor refuses or fails to prosecute the work or any separable part, with the diligence that will ensure its completion within the time specified in this contract or any extension or fails to complete the work within this time, or if the Contractor fails to comply with any other provision of this contract, Agency may terminate this contract for default. The Agency shall terminate by delivering to the Contractor a Notice of Termination specifying the nature of the default. In this event, the Agency may take over the work and compete it by contract or otherwise, and may take possession of and use any materials, appliances, and plant on the work site necessary for completing the work. The Contractor and its sureties shall be liable for any damage to the Agency resulting from the Contractor's refusal or failure to complete the work within specified time, whether or not the Contractor's right to proceed with the work is terminated. This liability includes any increased costs incurred by the Agency in completing the work.

The Contractor's right to proceed shall not be terminated nor shall the Contractor be charged with damages under this clause if: 1. The delay in completing the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor. Examples of such causes include: acts of God, acts of Agency, acts of another contractor in the performance of a contract with Agency, epidemics, quarantine restrictions, strikes, freight embargoes; and 2. The Contractor, within [10] days from the beginning of any delay, notifies Agency in writing of the causes of delay. If, in the judgment of Agency, the delay is excusable, the time for completing the work shall be extended. The judgment of Agency shall be final and conclusive for the parties, but subject to appeal under the Disputes clause(s) of this contract. 3. If, after termination of the Contractor's right to proceed, it is determined that the Contractor was not in default, or that the delay was excusable, the rights and obligations of the parties will be the same as if the termination had been issued for the convenience of Agency.

Termination for Convenience or Default (Architect and Engineering)

The Agency may terminate this contract in whole or in part, for the Agency's convenience or because of the failure of the Contractor to fulfill the contract obligations. The Agency shall terminate by delivering to the Contractor a Notice of Termination specifying the nature, extent, and effective date of the termination. Upon receipt of the notice, the Contractor shall (1) immediately discontinue all services affected (unless the notice directs otherwise), and (2) deliver to the Agency's Contracting Officer all data, drawings, specifications, reports, estimates, summaries, and other information and materials accumulated in performing this contract, whether completed or in process. Agency has a royalty-free, nonexclusive, and irrevocable license to reproduce, publish or otherwise use, all such data, drawings, specifications, reports, estimates, summaries, and other information and materials.

If the termination is for the convenience of the Agency, the Agency's Contracting Officer shall make an equitable adjustment in the contract price but shall allow no anticipated profit on unperformed services. If the termination is for failure of the Contractor to fulfill the contract obligations, the Agency may complete the work by contract or otherwise and the Contractor shall be liable for any additional cost incurred by the Agency. If, after termination for failure to fulfill contract obligations, it is determined that the Contractor was not in default, the rights and obligations of the parties shall be the same as if the termination had been issued for the convenience of Agency.

Termination for Convenience or Default (Cost-Type Contracts)

The Agency may terminate this contract, or any portion of it, by serving a Notice of Termination on the Contractor. The notice shall state whether the termination is for convenience of Agency or for the default of the Contractor. If the termination is for default, the notice shall state the manner in which the Contractor has failed to perform the requirements of the contract. The Contractor shall account for any property in its possession paid for from funds received from the Agency, or property supplied to the Contractor by the Agency. If the termination is for default, the Agency may fix the fee, if the contract provides for a fee, to be paid the Contractor in proportion to the value, if any, of work performed up to the time of termination. The Contractor shall promptly submit its termination claim to the Agency and the parties shall negotiate the termination settlement to be paid the Contractor.

If the termination is for the convenience of Agency, the Contractor shall be paid its contract close-out costs, and a fee, if the contract provided for payment of a fee, in proportion to the work performed up to the time of termination.

If, after serving a Notice of Termination for Default, the Agency determines that the Contractor has an excusable reason for not performing, the Agency, after setting up a new work schedule, may allow the Contractor to continue work, or treat the termination as a Termination for Convenience.

VIOLATION AND BREACH OF CONTRACT

Rights and Remedies of the Agency

The Agency shall have the following rights in the event that the Agency deems the Contractor guilty of a breach of any term under the Contract.

1. The right to take over and complete the work or any part thereof as agency for and at the expense of the Contractor, either directly or through other contractors; 2. The right to cancel this Contract as to any or all of the work yet to be performed; 3. The right to specific performance, an injunction or any other appropriate equitable remedy; and 4. The right to money damages.

For purposes of this Contract, breach shall include.

Rights and Remedies of Contractor

Attachment J IFB6447

Inasmuch as the Contractor can be adequately compensated by money damages for any breach of this Contract, which may be committed by the Agency, the Contractor expressly agrees that no default, act or omission of the Agency shall constitute a material breach of this Contract, entitling Contractor to cancel or rescind the Contract (unless the Agency directs Contractor to do so) or to suspend or abandon performance.

Remedies

Substantial failure of the Contractor to complete the Project in accordance with the terms of this Contract will be a default of this Contract. In the event of a default, the Agency will have all remedies in law and equity, including the right to specific performance, without further assistance, and the rights to termination or suspension as provided herein. The Contractor recognizes that in the event of a breach of this Contract by the Contractor before the Agency takes action contemplated herein, the Agency will provide the Contractor with sixty (60) days written notice that the Agency considers that such a breach has occurred and will provide the Contractor a reasonable period of time to respond and to take necessary corrective action.

Disputes

Disputes arising in the performance of this Contract that are not resolved by agreement of the parties shall be decided in writing by an authorized representative of Agency. This decision shall be final and conclusive unless within [10] days from the date of receipt of its copy, the Contractor mails or otherwise furnishes a written appeal to the Agency's authorized representative. In connection with any such appeal, the Contractor shall be afforded an opportunity to be heard and to offer evidence in support of its position. The decision of the Agency's authorized representative shall be binding upon the contractor and the Contractor shall abide by the decision.

In the event that a resolution of the dispute is not mutually agreed upon, the parties can agree to mediate the dispute or proceed with litigation. Notwithstanding any provision of this section, or any other provision of this Contract, it is expressly agreed and understood that any court proceeding arising out of a dispute under the Contract shall be heard by a Court de novo and the court shall not be limited in such proceeding to the issue of whether the Authority acted in an arbitrary, capricious or grossly erroneous manner.

Pending final settlement of any dispute, the parties shall proceed diligently with the performance of the Contract, and in accordance with the Agency's direction or decisions made thereof.

Performance during Dispute

Unless otherwise directed by Agency, Contractor shall continue performance under this Contract while matters in dispute are being resolved.

Claims for Damages

Should either party to the Contract suffer injury or damage to person or property because of any act or omission of the party or of any of its employees, agents or others for whose acts it is legally liable, a claim for damages therefor shall be made in writing to such other party within a reasonable time after the first observance of such injury or damage.

Remedies

Unless this Contract provides otherwise, all claims, counterclaims, disputes and other matters in question between the Agency and the Contractor arising out of or relating to this Contract or its breach will be decided by arbitration if the parties mutually agree, or in a court of competent jurisdiction within the State in which the Agency is located.

Rights and Remedies

The duties and obligations imposed by the Contract documents and the rights and remedies available thereunder shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by law. No action or failure to act by the Agency or Contractor shall constitute a waiver of any right or duty afforded any of them under the Contract, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach thereunder, except as may be specifically agreed in writing.

Disputes, Breaches, Defaults, and Litigation.

FTA has a vested interest in the settlement of any violation of federal law, regulation, or requirement, or any disagreement involving the Award, the accompanying Underlying Agreement, and any Amendments thereto including, but not limited to, a default, breach, major dispute, or litigation, and FTA reserves the right to concur in any settlement or compromise. (b) Notification to FTA; Flow Down Requirement. If a current or prospective legal matter that may affect the Federal Government emerges, the Recipient must promptly notify the FTA Chief Counsel and FTA Regional Counsel for the Region in which the Recipient is located. The Recipient must include a similar notification requirement in its Third Party Agreements and must require each Third Party Participant to include an equivalent provision in its subagreements at every tier, for any agreement that is a "covered transaction" according to 2 C.F.R. §§ 180.220 and 1200.220. (1) The types of legal matters that require notification include, but are not limited to, a major dispute, breach, default, litigation, or naming the Federal Government as a party to litigation or a legal disagreement in any forum for any reason. (2) Matters that may affect the Federal Government include, but are not limited to, the Federal Government's interests in the Award, the accompanying Underlying Agreement, and any Amendments thereto, or the Federal Government's administration or enforcement of federal laws, regulations, and requirements. (3) Additional Notice to U.S. DOT Inspector General. The Recipient must promptly notify the U.S. DOT Inspector General in addition to the FTA Chief Counsel or Regional Counsel for the Region in which the Recipient is located, if the Recipient has knowledge of potential fraud, waste, or abuse occurring on a Project receiving assistance from FTA. The notification provision applies if a person has or may have submitted a false claim under the False Claims Act, 31 U.S.C. § 3729, et seq., or has or may have committed a criminal or civil violation of law pertaining to such matters as fraud, conflict of interest, bid rigging, misappropriation or embezzlement, bribery, gratuity, or similar misconduct involving federal assistance. This responsibility occurs whether the Project is subject to this Agreement or another agreement between the Recipient and FTA, or an agreement involving a principal, officer, employee, agent, or Third Party Participant of the Recipient. It also applies to subcontractors at any tier. Knowledge, as used in this paragraph, includes, but is not limited to, knowledge of a 95 criminal or civil investigation by a Federal, state, or local law enforcement or other investigative agency, a criminal indictment or civil complaint, or probable cause that could support a criminal indictment, or any other credible information in the possession of the Recipient. In this paragraph, "promptly" means to refer information without delay and without change. This notification provision applies to all divisions of the Recipient, including divisions tasked with law enforcement or investigatory functions. (c) Federal Interest in Recovery. The Federal Government retains the right to a proportionate share of any proceeds recovered from any third party, based on the percentage of the federal share for the Underlying Agreement. Notwithstanding the preceding sentence, the Recipient may return all liquidated damages it receives to its Award Budget for its Underlying Agreement rather than return the federal share of those liquidated damages to the Federal Government, provided that the Recipient receives FTA's prior written concurrence. (d) Enforcement. The Recipient must pursue its legal rights and remedies available under any third party agreement or any federal, state, or local law or regulation.

Attachment J
IFB6447

FTA Master Agreement, Section 39(b) If a current or prospective legal matter that may affect the Federal Government emerges, the Recipient must promptly notify the FTA Chief Counsel and FTA Regional Counsel for the Region in which the Recipient is located. The Recipient must include a similar notification requirement in its Third Party Agreements and must require each Third Party Participant to include an equivalent provision in its subagreements at every tier, for any agreement that is a "covered transaction" according to 2 C.F.R. §§180.220 and 1200.220.

2 C.F.R. §§ 180.220(b)–(c) (b) Specifically, a contract for goods or services is a covered transaction if any of the following applies: (1) The contract is awarded by a participant in a nonprocurement transaction that is covered under §180.210, and the amount of the contract is expected to equal or exceed \$25,000. (2) The contract requires the consent of an official of a Federal agency. In that case, the contract, regardless of the amount, always is a covered transaction, and it does not matter who awarded it. For example, it could be a subcontract awarded by a contractor at a tier below a nonprocurement transaction, as shown in the appendix to this part. (3) The contract is for Federally-required audit services. (c) A subcontract also is a covered transaction if,— (1) It is awarded by a participant in a procurement transaction under a nonprocurement transaction of a Federal agency that extends the coverage of paragraph (b)(1) of this section to additional tiers of contracts (see the diagram in the appendix to this part showing that optional lower tier coverage); and (2) The value of the subcontract is expected to equal or exceed \$25,000.

Federal Certifications

CERTIFICATION AND RESTRICTIONS ON LOBBYING

I, _____ hereby certify
(Name and title of official)

On behalf of _____ that:
(Name of Bidder/Company Name)

- 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 any agency, a Member of Congress, and 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.
- If any funds other than federal appropriated funds have been paid or will be paid to any person influencing or attempting to influence an officer or employee of any agency, a Member of Congress, and officer or employee of Congress, or an employee of a Member of Congress in connection with the 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.
- The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including sub-contracts, sub-grants and contracts under grants, loans, and cooperative agreements) and that all sub-recipients 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.

The undersigned certifies or affirms the truthfulness and accuracy of the contents of the statements submitted on or with this certification and understands that the provisions of 31 U.S.C. Section 3801, et seq., are applicable thereto.

Name of Bidder/Company Name: _____

Type or print name: _____

Signature of authorized representative: _____ Date _____ / _____ / _____

Signature of notary and SEAL: _____

**GOVERNMENT-WIDE DEBARMENT AND SUSPENSION
(NONPROCUREMENT)**

Instructions for Certification By signing and submitting this bid or proposal, the prospective lower tier participant is providing the signed certification set out below.

(1) It will comply and facilitate compliance with U.S. DOT regulations, "Nonprocurement Suspension and Debarment," 2 CFR part 1200, which adopts and supplements the U.S. Office of Management and Budget (U.S. OMB) "Guidelines to Agencies on Governmentwide Debarment and Suspension (Nonprocurement)," 2 CFR part 180,

(2) To the best of its knowledge and belief, that its Principals and Subrecipients at the first tier:

a. Are eligible to participate in covered transactions of any Federal department or agency and are not presently:

1. Debarred,
2. Suspended,
3. Proposed for debarment,
4. Declared ineligible,
5. Voluntarily excluded, or
6. Disqualified,

b. Its management has not within a three-year period preceding its latest application or proposal been convicted of or had a civil judgment rendered against any of them for:

1. Commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction, or contract under a public transaction,
2. Violation of any Federal or State antitrust statute, or,
3. Commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making any false statement, or receiving stolen property,

c. It is 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 listed in the preceding subsection 2.b of this Certification,

d. It has not had one or more public transactions (Federal, State, or local) terminated for cause or default within a three-year period preceding this Certification,

e. If, at a later time, it receives any information that contradicts the statements of subsections 2.a —2.d above, it will promptly provide that information to FTA,

f. It will treat each lower tier contract or lower tier subcontract under its Project as a covered lower tier contract for purposes of 2 CFR part 1200 and 2 CFR part 180 if it:

1. Equals or exceeds \$25,000,,
2. Is for audit services, or,
3. Requires the consent of a Federal official, and

g. It will require that each covered lower tier contractor and subcontractor:

1. Comply and facilitate compliance with the Federal requirements of 2 CFR parts 180 and 1200, and
2. Assure that each lower tier participant in its Project is not presently declared by any Federal department or agency to be:

- a. Debarred from participation in its federally funded Project,
- b. Suspended from participation in its federally funded Project,
- c. Proposed for debarment from participation in its federally funded Project,
- d. Declared ineligible to participate in its federally funded Project,
- e. Voluntarily excluded from participation in its federally funded Project, or
- f. Disqualified from participation in its federally funded Project, and

3. It will provide a written explanation as indicated on a page attached in FTA's TrAMS platform or the Signature Page if it or any of its principals, including any of its first tier Subrecipients or its Third-Party Participants at a lower tier, is unable to certify compliance with the preceding statements in this Certification Group.

(3) It will provide a written explanation as indicated on a page attached in FTA's TrAMS platform or the Signature Page if it or any of its principals, including any of its first tier Subrecipients or its Third-Party Participants at a lower tier, is unable to certify compliance with the preceding statements in this Certification Group.

Certification

Contractor: _____

Signature of Authorized Official: _____ Date ____ / ____ / ____

Name and Title of Contractor's Authorized Official: _____

BUS TESTING CERTIFICATION

The undersigned bidder [Contractor/Manufacturer] certifies that the vehicle model or vehicle models offered in this bid submission complies with 49 CFR Part 665.

A copy of the test report (for each bid ITEM) prepared by the Federal Transit Administration's (FTA) Altoona, Pennsylvania Bus Testing Center is attached to this certification and is a true and correct copy of the test report as prepared by the facility.

The undersigned understands that misrepresenting the testing status of a vehicle acquired with Federal financial assistance may subject the undersigned to civil penalties as outlined in the U.S. Department of Transportation's regulation on Program Fraud Civil Remedies, 49 CFR Part 31. In addition, the undersigned understands that FTA may suspend or debar a manufacturer under the procedures in 49 CFR Part 29.

Name of Bidder/Company Name: _____

Type or print name: _____

Signature of authorized representative: _____

Signature of notary and SEAL: _____

Date of Signature: _____ / _____ / _____

TRANSIT VEHICLE MANUFACTURER (TVM) CERTIFICATION

Pursuant to the provisions of Section 105(f) of the Surface Transportation Assistance Act of 1982, each bidder for this contract must certify that it has complied with the requirements of 49 CFR Part 26.49, regarding the participation of Disadvantaged Business Enterprises (DBE) in FTA assisted procurements of transit vehicles. Absent this certification, properly completed and signed, a bid shall be deemed non-responsive.

Certification'

I hereby certify, for the bidder named below, that it has complied with the provisions of 49 CFR Part 26.49 and that I am duly authorized by said bidder to make this certification.

BIDDER/COMPANY

Name of Bidder/Company _____

Signature of Representative _____

Type or Print Name _____

Title _____ Date ____/____/____

NOTARY

Type or Print Name _____

Signature of Notary _____

Place Notary SEAL Here:

[Back](#)

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★ IFB 6447-1

Vehicle: Transit Bus

| | |
|---------------|---|
| Status: | Open |
| Time Left: | 42 days |
| Closing: | 9/14/22 1:00 PM |
| Issued: | 8/2/22 1:10 PM |
| Last Amended: | |
| Buyer: | Pamela Copeland |
| | pamela.copeland@dgs.virginia.gov (mailto:pamela.copeland@dgs.virginia.gov?subject=Solicitation (IFB-6447)) |
| | (804) 786-4068 |

[Info](#) [Lines](#) [Amendment History](#) [Terms](#) [Events](#) [Reminders](#) [B2B](#)

NOTE : This public body does not discriminate against faith-based organizations in accordance with the Code of Virginia, § 2.2-4343.1 or against a bidder because of race, religion, color, sex, national origin, age, disability, sexual orientation, gender identity, political affiliation, or veteran status or any other basis prohibited by state law relating to discrimination in employment. Faith-based organizations may request that the issuing agency not include subparagraph 1.f in General Terms and Condition C. Such a request shall be in writing and explain why an exception should be made in that invitation for bid.

VENDORS MANUAL : This solicitation is subject to the provisions of the Commonwealth of Virginia Vendors Manual and any changes or revisions thereto, which are hereby incorporated into this contract in their entirety. The process for filing a complaint about this solicitation is in section 7.13 of the Vendors Manual. (Note section 7.13 does not apply to protests of awards or formal contractual claims.) The procedure for filing contractual claims is in section 7.19 of the Vendors Manual. A copy of the manual is normally available for review at the purchasing office and is accessible on the Internet at www.eva.virginia.gov under "I Sell To Virginia".

APPLICABLE LAWS AND COURTS : This solicitation and any resulting contract shall be governed in all respects by the laws of the Commonwealth of Virginia, without regard to its choice of law provisions, and any litigation with respect thereto shall be brought in the circuit courts of the Commonwealth. The agency and the contractor are encouraged to resolve any issues in controversy arising from the award of the contract or any contractual dispute using Alternative Dispute Resolution (ADR) procedures (Code of Virginia, § 2.2-4366). ADR procedures are described in Chapter 9 of the Vendors Manual. The contractor shall comply with all applicable federal, state and local laws, rules and regulations.

ANTI-DISCRIMINATION : By submitting their bids, bidders certify to the Commonwealth that they will conform to the provisions of the Federal Civil Rights Act of 1964, as amended, as well as the Virginia Fair Employment Contracting Act of 1975, as amended, where applicable, the Virginians With Disabilities Act, the Americans With Disabilities Act and § 2.2-4311 of the Virginia Public Procurement Act (VPPA). If the award is made to a faith-based organization, the organization shall not discriminate against any recipient of goods, services, or disbursements made pursuant to the contract on the basis of the recipient's religion, religious belief, refusal to participate in a religious practice, or on the basis of race, age, color, gender sexual orientation, gender identity, or national origin and shall be subject to the same rules as other organizations that contract with public bodies to account for the use of the funds provided; however, if the faith-based organization segregates public funds into separate accounts, only the accounts and programs funded with public funds shall be subject to audit by the public body. (Code of Virginia, § 2.2-4343.1E). In every contract over \$10,000 the provisions in 1. and 2. below apply: 1. During the performance of this contract, the contractor agrees as follows: a. The contractor will not discriminate against any employee or applicant for employment because of race, religion, color, sex, sexual orientation, gender identity, national origin, age, disability, or any other basis prohibited by state law relating to discrimination in employment, except where there is a bona fide occupational qualification reasonably necessary to the normal operation of the contractor. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause. b. The contractor, in all solicitations or advertisements for employees placed by or on behalf of the contractor, will state that such contractor is an equal opportunity employer. c. Notices, advertisements and solicitations placed in accordance with federal law, rule or regulation shall be deemed sufficient for the purpose of meeting the requirements of this section. d. If the contractor employs more than five employees, the contractor shall (i) provide annual training on the contractor's sexual harassment policy to all supervisors and employees providing services in the Commonwealth, except such supervisors or employees that are required to complete sexual harassment training provided by the Department of Human Resource Management, and (ii) post the contractor's sexual harassment policy in (a) a conspicuous public place in each building located in the Commonwealth that the contractor owns or leases for business purposes and (b) the contractor's employee handbook. e. The requirements of these provisions 1. and 2. are a material part of the contract. If the Contractor violates one of these provisions, the Commonwealth may terminate the affected part of this contract for breach, or at its option, the whole contract. Violation of one of these provisions may also result in debarment from State contracting regardless of whether the specific contract is terminated. f. In accordance with Executive Order 61 (2017), a prohibition on discrimination by the contractor, in its employment practices, subcontracting practices, and delivery of goods or services, on the basis of race, sex, color, national origin, religion, sexual orientation, gender identity, age, political affiliation, disability, or veteran status, is hereby incorporated in this contract. 2. The contractor will include the provisions of 1. above in every subcontract or purchase order over \$10,000, so that the provisions will be binding upon each subcontractor or vendor.

ETHICS IN PUBLIC CONTRACTING : By submitting their bids, bidders certify that their bids are made without collusion or fraud and that they have not offered or received any kickbacks or inducements from any other bidder, supplier, manufacturer or subcontractor in connection with their bid, and that they have not conferred on any public employee having official responsibility for this procurement transaction any payment, loan, subscription, advance, deposit of money, services or anything of more than nominal value, present or promised, unless consideration of substantially equal or greater value was exchanged.

IMMIGRATION REFORM : Applicable for all contracts over \$10,000: By entering into a written contract with the Commonwealth of Virginia, the Contractor certifies that the Contractor does not, and shall not during the performance of the contract for goods and services in the Commonwealth, knowingly employ an unauthorized alien as defined in the federal Immigration Reform and Control Act of 1986.

DEBARMENT STATUS : By participating in this procurement, the vendor certifies that they are not currently

debarred by the Commonwealth of Virginia from submitting a response for the type of goods and/or services covered by this solicitation. Vendor further certifies that they are not debarred from filling any order or accepting any resulting order, or that they are an agent of any person or entity that is currently debarred by the Commonwealth of Virginia. If a vendor is created or used for the purpose of circumventing a debarment decision against another vendor, the non-debarred vendor will be debarred for the same time period as the debarred vendor.

ANTITRUST : By entering into a contract, the contractor conveys, sells, assigns, and transfers to the Commonwealth of Virginia all rights, title and interest in and to all causes of action it may now have or hereafter acquire under the antitrust laws of the United States and the Commonwealth of Virginia, relating to the particular goods or services purchased or acquired by the Commonwealth of Virginia under said contract.

MANDATORY USE OF STATE FORM : Failure to submit a bid on the official state form provided for that purpose shall be a cause for rejection of the bid. Modification of or additions to any portion of the Invitation for Bids may be cause for rejection of the bid; however, the Commonwealth reserves the right to decide, on a case by case basis, in its sole discretion, whether to reject such a bid as nonresponsive. As a precondition to its acceptance, the Commonwealth may, in its sole discretion, request that the bidder withdraw or modify nonresponsive portions of a bid which do not affect quality, quantity, price, or delivery. No modification of or addition to the provisions of the contract shall be effective unless reduced to writing and signed by the parties.

CLARIFICATION OF TERMS : If any prospective bidder has questions about the specifications or other solicitation documents, the prospective bidder should contact the buyer whose name appears on the face of the solicitation no later than five working days before the due date. Any revisions to the solicitation will be made only by addendum issued by the buyer.

PAYMENT : 1. To Prime Contractor: a. Invoices for items ordered, delivered and accepted shall be submitted by the contractor directly to the payment address shown on the purchase order/contract. All invoices shall show the state contract number and/or purchase order number; social security number (for individual contractors) or the federal employer identification number (for proprietorships, partnerships, and corporations). b. Any payment terms requiring payment in less than 30 days will be regarded as requiring payment 30 days after invoice or delivery, whichever occurs last. This shall not affect offers of discounts for payment in less than 30 days, however. c. All goods or services provided under this contract or purchase order, that are to be paid for with public funds, shall be billed by the contractor at the contract price, regardless of which public agency is being billed. d. The following shall be deemed to be the date of payment: the date of postmark in all cases where payment is made by mail, or when offset proceedings have been instituted as authorized under the Virginia Debt Collection Act. e. Unreasonable Charges. Under certain emergency procurements and for most time and material purchases, final job costs cannot be accurately determined at the time orders are placed. In such cases, contractors should be put on notice that final payment in full is contingent on a determination of reasonableness with respect to all invoiced charges. Charges which appear to be unreasonable will be resolved in accordance with Code of Virginia, § 2.2-4363 and -4364. Upon determining that invoiced charges are not reasonable, the Commonwealth shall notify the contractor of defects or improprieties in invoices within fifteen (15) days as required in Code of Virginia, § 2.2-4351. The provisions of this section do not relieve an agency of its prompt payment obligations with respect to those charges which are not in dispute (Code of Virginia, § 2.2-4363). 2. To Subcontractors: a. Within seven (7) days of the contractor's receipt of payment from the Commonwealth, a contractor awarded a contract under this solicitation is hereby obligated: (1) To pay the subcontractor(s) for the proportionate share of the payment received for work performed by the subcontractor(s) under the contract; or (2) To notify the agency and the subcontractor(s), in writing, of the contractor's intention to withhold payment and the reason. b. The contractor is obligated to pay the subcontractor(s) interest at the rate of one percent per month (unless otherwise provided under the terms of the contract) on all amounts owed by the contractor that remain unpaid seven (7) days following receipt of payment from the Commonwealth, except for amounts withheld as stated in (2) above. The date of mailing of any payment by U. S. Mail is deemed to be payment to the addressee. These provisions apply to each sub-tier contractor performing under the primary contract. A contractor's obligation to pay an interest charge to a subcontractor may not be construed to be an obligation of the Commonwealth. 3. Each prime contractor who wins an award in which provision of a SWaM procurement plan is a condition to the award, shall deliver to the contracting agency or institution, on or before request for final payment, evidence and certification of compliance (subject only to insubstantial shortfalls and to shortfalls arising from subcontractor default) with the SWaM procurement plan. Final payment under the contract in question may be withheld until such certification is delivered and, if necessary, confirmed by the agency or institution, or other appropriate penalties may be assessed in lieu of withholding such payment. 4. The Commonwealth of Virginia encourages contractors and subcontractors to accept electronic and credit card payments.

PRECEDENCE OF TERMS : The following General Terms and Conditions VENDORS MANUAL, APPLICABLE LAWS AND COURTS, ANTI-DISCRIMINATION, ETHICS IN PUBLIC CONTRACTING, IMMIGRATION REFORM AND CONTROL ACT OF 1986, DEBARMENT STATUS, ANTITRUST, MANDATORY USE OF STATE FORM AND TERMS AND CONDITIONS, CLARIFICATION OF TERMS, PAYMENT shall apply in all instances. In the event there is a conflict between any of the other General Terms and Conditions and any Special Terms and Conditions in this solicitation, the Special Terms and Conditions shall apply.

QUALIFICATIONS OF BIDDERS : The Commonwealth may make such reasonable investigations as deemed proper and necessary to determine the ability of the bidder to perform the services/furnish the goods and the bidder shall furnish to the Commonwealth all such information and data for this purpose as may be requested. The Commonwealth reserves the right to inspect bidder's physical facilities prior to award to satisfy questions regarding the bidder's capabilities. The Commonwealth further reserves the right to reject any bid if the evidence submitted by, or investigations of, such bidder fails to satisfy the Commonwealth that such bidder is properly qualified to carry out the obligations of the contract and to provide the services and/or furnish the goods contemplated therein.

TESTING AND INSPECTION : The Commonwealth reserves the right to conduct any test/inspection it may deem advisable to assure goods and services conform to the specifications.

ASSIGNMENT OF CONTRACT : A contract shall not be assignable by the contractor in whole or in part without the written consent of the Commonwealth.

CHANGES TO THE CONTRACT : Changes can be made to the contract in any of the following ways: 1. The parties may agree in writing to modify the terms, conditions, or scope of the contract. Any additional goods or services to be provided shall be of a sort that is ancillary to the contract goods or services, or within the same broad product or service categories as were included in the contract award. Any increase or decrease in the price of the contract resulting from such modification shall be agreed to by the parties as a part of their written agreement to modify the scope of the contract. 2. The Purchasing Agency may order changes within the general scope of the contract at any time by written notice to the contractor. Changes within the scope of the contract include, but are not limited to, things such as services to be performed, the method of packing or shipment, and the place of delivery or installation. The contractor shall comply with the notice upon receipt, unless the contractor intends to claim an adjustment to compensation, schedule, or other contractual impact that would be caused by complying with such notice, in which case the contractor shall, in writing, promptly notify the Purchasing Agency of the adjustment to be sought, and before proceeding to comply with the notice, shall await the Purchasing Agency's written decision affirming, modifying, or revoking the prior written notice. If the Purchasing Agency decides to issue a notice that requires an adjustment to compensation, the contractor shall be compensated for any additional costs incurred as the result of such order and shall give the Purchasing Agency a credit for any savings. Said compensation shall be determined by one of the following methods: a. By mutual agreement between the parties in writing; or b. By agreeing upon a unit price or using a unit price set forth in the contract, if the work to be done can be expressed in units, and the contractor accounts for the number of units of work performed, subject to the Purchasing Agency's right to audit the contractor's records and/or to determine the correct number of units independently; or c. By ordering the contractor to proceed with the work and keep a record of all costs incurred and savings realized. A markup for overhead and profit may be allowed if provided by the contract. The same markup shall be used for determining a decrease in price as the result of savings realized. The contractor shall present the Purchasing Agency with all vouchers and records of expenses incurred and savings realized. The Purchasing Agency shall have the right to audit the records of the contractor as it deems necessary to determine costs or savings. Any claim for an adjustment in price under this provision must be asserted by written notice to the Purchasing Agency within thirty (30) days from the date of receipt of the written order from the Purchasing Agency. If the parties fail to agree on an amount of adjustment, the question of an increase or decrease in the contract price or time for performance shall be resolved in accordance with the procedures for resolving disputes provided by the Disputes Clause of this contract or, if there is none, in accordance with the disputes provisions of the Commonwealth of Virginia Vendors Manual. Neither the existence of a claim nor a dispute resolution process, litigation or any other provision of this contract shall excuse the contractor from promptly complying with the changes ordered by the Purchasing Agency or with the performance of the contract generally.

DEFAULT : In case of failure to deliver goods or services in accordance with the contract terms and conditions, the Commonwealth, after due oral or written notice, may procure them from other sources and hold the contractor responsible for any resulting additional purchase and administrative costs. This remedy shall be in addition to any other remedies which the Commonwealth may have.

TAXES : Sales to the Commonwealth of Virginia are normally exempt from State sales tax. State sales and use tax certificates of exemption, Form ST-12, will be issued upon request. Deliveries against this contract shall usually be free of Federal excise and transportation taxes. The Commonwealth's excise tax exemption registration number is 54-73-0076K. If sales or deliveries against the contract are not exempt, the contractor shall be responsible for the payment of such taxes unless the tax law specifically imposes the tax upon the buying entity and prohibits the contractor from offering a tax-included price.

USE OF BRAND NAMES : Unless otherwise provided in this solicitation, the name of a certain brand, make or manufacturer does not restrict bidders to the specific brand, make or manufacturer named, but conveys the general style, type, character, and quality of the article desired. Any article which the public body, in its sole discretion, determines to be the equivalent of that specified, considering quality, workmanship, economy of operation, and suitability for the purpose intended, shall be accepted. The bidder is responsible to clearly and specifically identify the product being offered and to provide sufficient descriptive literature, catalog cuts and technical detail to enable the Commonwealth to determine if the product offered meets the requirements of the solicitation. This is required even if offering the exact brand, make or manufacturer specified. Normally in competitive sealed bidding only the information furnished with the bid will be considered in the evaluation. Failure to furnish adequate data for evaluation purposes may result in declaring a bid nonresponsive. Unless the bidder clearly indicates in its bid that the product offered is an equivalent product, such bid will be considered to offer the brand name product referenced in the solicitation.

TRANSPORTATION AND PACKAGING : By submitting their bids, all bidders certify and warrant that the price offered for FOB destination includes only the actual freight rate costs at the lowest and best rate and is based upon the actual weight of the goods to be shipped. Except as otherwise specified herein, standard commercial packaging, packing and shipping containers shall be used. All shipping containers shall be legibly marked or labeled on the outside with purchase order number, commodity description, and quantity.

INSURANCE : By signing and submitting a bid under this solicitation, the bidder certifies that if awarded the contract, it will have the following insurance coverage at the time the contract is awarded. For construction contracts, if any subcontractors are involved, the subcontractor will have workers' compensation insurance in accordance with §§ 2.2-4332 and 65.2-800 et seq. of the Code of Virginia. The bidder further certifies that the contractor and any subcontractors will maintain these insurance coverages during the entire term of the contract and that all coverage will be provided by companies authorized to sell insurance in Virginia by the Virginia State Corporation Commission. **MINIMUM INSURANCE COVERAGES AND LIMITS:** 1. Workers' Compensation - Statutory requirements and benefits. Coverage is compulsory for employers of three or more employees, to include the employer. Contractors who fail to notify the Commonwealth of increases in the number of employees that change their workers' compensation requirements under the Code of Virginia during the course of the contract shall be in noncompliance with the contract. 2. Employer's Liability -

\$100,000. 3. Commercial General Liability - \$1,000,000 per occurrence and \$2,000,000 in the aggregate. Commercial General Liability is to include bodily injury and property damage, personal injury and advertising injury, products and completed operations coverage. The Commonwealth of Virginia shall be added as an additional insured to the policy by an endorsement. 4. Automobile Liability - \$1,000,000 combined single limit. (Required only if a motor vehicle not owned by the Commonwealth is to be used in the contract. Contractor must assure that the required coverage is maintained by the Contractor (or third party owner of such motor vehicle.) Profession/Service Limits Accounting \$1,000,000 per occurrence, \$3,000,000 aggregate Architecture \$2,000,000 per occurrence, \$6,000,000 aggregate Asbestos Design, Inspection or Abatement Contractors \$1,000,000 per occurrence, \$3,000,000 aggregate Health Care Practitioner (to include Dentists, Licensed Dental Hygienists, Optometrists, Registered or Licensed Practical Nurses, Pharmacists, Physicians, Podiatrists, Chiropractors, Physical Therapists, Physical Therapist Assistants, Clinical Psychologists, Clinical Social Workers, Professional Counselors, Hospitals, or Health Maintenance Organizations.) Code of Virginia § 8.01-581.15 <https://law.lis.virginia.gov/vacode/title8.01/chapter21.1/section8.01-581.15/> Insurance/Risk Management \$1,000,000 per occurrence, \$3,000,000 aggregate Landscape/Architecture \$1,000,000 per occurrence, \$1,000,000 aggregate Legal \$1,000,000 per occurrence, \$5,000,000 aggregate Professional Engineer \$2,000,000 per occurrence, \$6,000,000 aggregate Surveying \$1,000,000 per occurrence, \$1,000,000 aggregate

ANNOUNCEMENT OF AWARD : Upon the award or the announcement of the decision to award a contract as a result of this solicitation, the purchasing agency will publicly post such notice in eVA (www.eva.virginia.gov) for a minimum of 10 days.

DRUG-FREE WORKPLACE : Applicable for all contracts over \$10,000: During the performance of this contract, the contractor agrees to (i) provide a drug-free workplace for the contractor's employees; (ii) post in conspicuous places, available to employees and applicants for employment, a statement notifying employees that the unlawful manufacture, sale, distribution, dispensation, possession, or use of a controlled substance or marijuana is prohibited in the contractor's workplace and specifying the actions that will be taken against employees for violations of such prohibition; (iii) state in all solicitations or advertisements for employees placed by or on behalf of the contractor that the contractor maintains a drug-free workplace; and (iv) include the provisions of the foregoing clauses in every subcontract or purchase order of over \$10,000, so that the provisions will be binding upon each subcontractor or vendor. For the purposes of this section, "drug-free workplace" means a site for the performance of work done in connection with a specific contract awarded to a contractor, the employees of whom are prohibited from engaging in the unlawful manufacture, sale, distribution, dispensation, possession or use of any controlled substance or marijuana during the performance of the contract.

NONDISCRIMINATION : A bidder or contractor shall not be discriminated against in the solicitation or award of this contract because of race, religion, color, sex, sexual orientation, gender identity, national origin, age, disability, faith-based organizational status, any other basis prohibited by state law relating to discrimination in employment or because the bidder employs ex-offenders unless the state agency, department or institution has made a written determination that employing ex-offenders on the specific contract is not in its best interest. If the award of this contract is made to a faith-based organization and an individual, who applies for or receives goods, services, or disbursements provided pursuant to this contract objects to the religious character of the faith-based organization from which the individual receives or would receive the goods, services, or disbursements, the public body shall offer the individual, within a reasonable period of time after the date of his objection, access to equivalent goods, services, or disbursements from an alternative provider.

eVA VENDOR REGISTRATION : The eVA Internet electronic procurement solution, web site portal www.eVA.virginia.gov, streamlines and automates government purchasing activities in the Commonwealth. The eVA portal is the gateway for vendors to conduct business with state agencies and public bodies. All vendors desiring to provide goods and/or services to the Commonwealth shall participate in the eVA Internet e-procurement solution by completing the free eVA Vendor Registration. All bidders must register in eVA and pay the Vendor Transaction Fees specified below; failure to register will result in the bid being rejected. Vendor transaction fees are determined by the date the original purchase order is issued and the current fees are as follows: a. For orders issued July 1, 2014, and after, the Vendor Transaction Fee is: (i) DSBSD-certified Small Businesses: 1%, capped at \$500 per order. (ii) Businesses that are not DSBSD-certified Small Businesses: 1%, capped at \$1,500 per order. b. Refer to Special Term and Condition "eVA Orders and Contracts" to identify the number of purchase orders that will be issued as a result of this solicitation with the eVA transaction fee specified above assessed for each order. For orders issued prior to July 1, 2014, the vendor transaction fees can be found at www.eVA.virginia.gov. The specified vendor transaction fee will be invoiced, by the Commonwealth of Virginia Department of General Services, typically within 60 days of the order issue date. Any adjustments (increases/decreases) will be handled through purchase order changes.

AVAILABILITY OF FUNDS : It is understood and agreed between the parties herein that the agency shall be bound hereunder only to the extent that the legislature has appropriated funds that are legally available or may hereafter become legally available for the purpose of this agreement.

SET-ASIDES AWARD PRIORITY : This solicitation is set-aside for award priority to DSBSD-certified micro businesses or small businesses when designated as "Micro Business Set-Aside Award Priority" or "Small Business Set-Aside Award Priority" accordingly in the solicitation. DSBSD-certified micro businesses or small businesses also includes DSBSD-certified women-owned and minority-owned businesses when they have received the DSBSD small business certification. For purposes of award, bidders shall be deemed micro businesses or small businesses if and only if they are certified as such by DSBSD on the due date for receipt of bids.

BID PRICE CURRENCY : Unless stated otherwise in the solicitation, bidders shall state bid prices in US dollars.

AUTHORIZATION TO CONDUCT BUS. : A contractor organized as a stock or nonstock corporation, limited liability company, business trust, or limited partnership or registered as a registered limited liability partnership shall be authorized to transact business in the Commonwealth as a domestic or foreign business entity if so required by Title 13.1 or Title 50 of the Code of Virginia or as otherwise required by law. Any

business entity described above that enters into a contract with a public body pursuant to the Virginia Public Procurement Act shall not allow its existence to lapse or its certificate of authority or registration to transact business in the Commonwealth, if so required under Title 13.1 or Title 50, to be revoked or cancelled at any time during the term of the contract. A public body may void any contract with a business entity if the business entity fails to remain in compliance with the provisions of this section.

CIVILITY IN STATE WORKPLACES : The contractor shall take all reasonable steps to ensure that no individual, while performing work on behalf of the contractor or any subcontractor in connection with this agreement (each, a "Contract Worker"), shall engage in 1) harassment (including sexual harassment), bullying, cyber-bullying, or threatening or violent conduct, or 2) discriminatory behavior on the basis of race, sex, color, national origin, religious belief, sexual orientation, gender identity or expression, age, political affiliation, veteran status, or disability. The contractor shall provide each Contract Worker with a copy of this Section and will require Contract Workers to participate in agency training on civility in the State workplace if contractor's (and any subcontractor's) regular mandatory training programs do not already encompass equivalent or greater expectations. Upon request, the contractor shall provide documentation that each Contract Worker has received such training. For purposes of this Section, "State workplace" includes any location, permanent or temporary, where a Commonwealth employee performs any work-related duty or is representing his or her agency, as well as surrounding perimeters, parking lots, outside meeting locations, and means of travel to and from these locations. Communications are deemed to occur in a State workplace if the Contract Worker reasonably should know that the phone number, email, or other method of communication is associated with a State workplace or is associated with a person who is a State employee. The Commonwealth of Virginia may require, at its sole discretion, the removal and replacement of any Contract Worker who the Commonwealth reasonably believes to have violated this Section. This Section creates obligations solely on the part of the contractor. Employees or other third parties may benefit incidentally from this Section and from training materials or other communications distributed on this topic , but the Parties to this agreement intend this Section to be enforceable solely by the Commonwealth and not by employees or other third parties.

[Bid Tab](#) [Intent](#) [Award](#) [No Award](#)

No public Bid Information to display