

ARKANSAS STATE HIGHWAY COMMISSION

REQUEST FOR PROPOSALS (RFP)

FOR THE FOLLOWING ITEM:

HEAVY DUTY TRANSIT BUS

RFP No. 21-001R

Proposals must be submitted
no later than 2:00PM CDT
November 19, 2020

For further information regarding the RFP contact:

Danny Chidester
Public Trans Program Manager
Arkansas Department of Transportation
P.O. Box 2261
Little Rock, AR 72203

Danny Keene
Division Head
Equipment & Procurement
Arkansas Department of Transportation
11302 West Baseline Rd
Little Rock, AR 72209

Phone: 501-569-2478 or 501-569-4980
Danny.Chidester@ardot.gov

Phone: 501-569-2672
Danny.Keene@ardot.gov

NOTICE OF NONDISCRIMINATION

The Arkansas Department of Transportation (Department) complies with all civil rights provisions of federal statutes and related authorities that prohibit discrimination in programs and activities receiving federal financial assistance. Therefore, the Department does not discriminate on the basis of race, sex, color, age, national origin, religion (not applicable as a protected group under the Federal Motor Carrier Safety Administration Title VI Program), disability, Limited English Proficient (LEP), or low-income status in the admission, access to and treatment in the Department's programs and activities, as well as the Department's hiring or employment practices. Complaints of alleged discrimination and inquiries regarding the Department's nondiscrimination policies may be directed to Joanna P. McFadden, Section Head - EEO/DBE (ADA/504/Title VI Coordinator), P. O. Box 2261, Little Rock, AR 72203, (501) 569-2298, (Voice/TTY 711), or the following email address: joanna.mcfadden@ardot.gov

Free language assistance for Limited English Proficient individuals is available upon request.

This notice is available from the ADA/504/Title VI Coordinator in large print, on audiotape and in Braille.

ARKANSAS STATE HIGHWAY COMMISSION

ARKANSAS DEPARTMENT OF TRANSPORTATION - STANDARD PROPOSAL CONDITIONS

PART I – SOLICITATION PROVISIONS

1.1 Contract Type

This is an Indefinite Delivery / Indefinite Quantity (“IDIQ”) contract, with specific minimum and maximum quantities for the total number of heavy duty transit buses.

1.2 Background

Each participating agency has submitted their purchase forecast for the term of this contract.

1.3 Executive Agent

The Arkansas Department of Transportation (Department) is the Executive Agent on behalf of the Procuring Agencies listed for the procurement of heavy duty transit buses, acting as the Contract Agency authorized to award, modify and terminate this Contract. The Department is not responsible for any payments except when acting as a Procuring Agency.

1.4 Award

The Department intends to make a single contract award as a result of this Request for Proposals (“RFP”).

1.5 Procuring Agency

Authorized to issue individual purchase orders in accordance with the terms and conditions of the Contract and is responsible for inspection, acceptance, and payment.

1.6 Knowledge of Conditions

The Proposer shall examine the specifications carefully and remain thoroughly informed regarding any and all conditions and requirements that may in any manner affect the work to be performed under this Contract. No allowances will be made due to Proposers’ lack of knowledge of these specifications, conditions, or requirements.

1.7 Communications

All inquiries pertaining to the specifications or any other RFP documents must be emailed to Danny.Chidester@ardot.gov.

1.8 Pre-Proposal Meeting

A pre-proposal meeting will be held on September 9, 2020 at 2:00 PM CST. Participation is not mandatory but is recommended.

1.9 Questions

- A. All questions must be submitted via email no later than October 21, 2020.
- B. All requests are directed to Danny Chidester (501) 569-2478 or (501) 569-4980; Danny.Chidester@ardot.gov.
- C. Questions must be clear, concise, and provide the pertinent solicitation page number for each question.
- D. Questions will be answered at least seven (7) working days prior to the proposal due date. Answers will be provided to all firms who have downloaded a copy of this RFP.

1.10 Proposal Format / Content Requirements

- A. The following paragraphs detail the instructions and order to be followed in preparing a response to this RFP. Each part of the Proposal should be clearly labeled and tabbed for easy reference. The Proposal shall be submitted in 8 ½” X 11” format with foldouts utilized as necessary.
- B. To aid in timely, effective review of all Proposals, each respondent shall closely follow the format provided below. Additional information, such as company brochures and literature, may be included in the submittal but should be provided as attachments to the Proposal, not part of the Proposal text.
- C. The Proposal must address the items listed herein. Failure by a Proposer to respond to a specific requirement may be a basis for elimination from consideration during the responsiveness evaluation.
- D. Proposals shall be typed. Proposals should be prepared as simply and economically as possible while providing straightforward, concise information of the Proposer’s capabilities to satisfy the requirements of this RFP. Fancy binding, colored displays, and promotional material, etc. are neither required nor wanted. Technical literature about the Proposer’s experience and qualifications may be included. The emphasis should be on completeness

and clarity of content. In order to expedite the evaluations, it is essential that specifications and instructions contained in this RFP be followed as closely as possible.

- E. A cover letter transmitting the Proposal must be submitted, dated, and limited to one (1) page. The letter must indicate that the Proposer agrees to be bound by the Proposal without modifications, unless mutually agreed to upon further negotiations between the Department and the Proposer. The cover letter shall contain a statement that the Proposal is valid for one hundred fifty (150) calendar days. The cover letter shall also contain the company name, address, and phone number(s) as well as the name, title, mailing address, email address, and phone number of an individual with authority to bind the Proposer during the period in which the Proposal is being evaluated. The cover letter shall also identify the legal status of the Proposer. If the Proposer is a corporation, the cover letter shall identify the state of incorporation. If a consortium, joint venture or team approach is being proposed, provide the above information for all participating entities.
- F. Proposals shall include a "Table of Contents" identifying the page numbers of where to find the various sections included in the Proposal.

1.11 Conformity to Specifications / Approved Equals / Deviations

- A. Unless otherwise specifically provided in the specifications, reference to any equipment, material, article, or patented process by trade name, make or catalog number shall be regarded as establishing a standard of quality and shall not be construed as limiting competition.
- B. A proposer may, at its option, request approval of any equipment, material, article, or process as equal. All such requests shall be accompanied by supporting technical data and background information, or test results as may be required.
- C. All requests for equals must be submitted on the supplied form (Attachment L) and shall be included with the proposal. These requests will be evaluated as part of the Proposal.

1.12 Proposal Requirements

The proposal package shall consist of:

- A. Cover Letter
- B. Table of Contents
- C. Your Proposal (including all elements required in 1.18 for evaluation)
- D. Copy of Proposed Warranty
- E. Pricing of Optional Equipment and Accessories
- F. Attachment A – Proposer Questionnaire
- G. Attachment B – General Certifications
- H. Attachment C – Government-Wide Debarment and Suspension (Non-Procurement)
- I. Attachment D – Certification and Restrictions on Lobbying
- J. Attachment E – Buy America Certification of Compliance
- K. Attachment F – FMVSS Certification
- L. Attachment G – Certification of Compliance with FTA's Bus Testing Requirements
- M. Attachment H – Bus Testing Certification
- N. Attachment I – Transit Vehicle Manufacturer Certification
- O. Attachment J – Non-Collusion Certification
- P. Attachment K – Vehicle and Contractor Information Questionnaire
- Q. Attachment L – Request for Approved Equals
- R. Attachment M – Illegal Immigrant Certification
- S. Attachment N – Restriction of Boycott of Israel Certification
- T. Attachment O – Contract and Grant Disclosure Form
- U. Attachment P – Eligible Bidder Certification

1.13 Receipt of Proposals

The original proposal clearly marked "RFP-21-001R Heavy Duty Transit Buses" and six (6) copies plus a thumb drive containing a PDF copy of the proposal shall be received until November 19, 2020 at 2:00 PM CST.

Proposals may be hand delivered, mailed or sent via a carrier such as UPS/FedEx to the following address:

Technical Questions:
Arkansas Department of Transportation
Attn: Danny Chidester, Public Trans Program Manager

Procurement Questions:
Arkansas Department of Transportation
Attn: Danny Keene

The outside of the package containing the proposals shall be clearly marked with the RFP number and title.

Proposals delivered to any other address or received after the specified date and time may be considered late and may be returned unopened.

1.14 Proposal Postponement and Amendments

The Department reserves the right to revise or amend the RFP up to the time set for the receipt of proposals. Such revisions and amendments, if any, shall be announced by written solicitation amendments. Copies of such amendments shall be furnished only to all prospective Proposers. If the revisions and amendments are likely to require the revision of proposed prices, the date set for opening proposals may be postponed by a number of days determined by the Department to enable Proposers to revise their proposals. All amendments shall be acknowledged and returned with the proposal.

1.15 Proposal Withdrawal

Proposals must remain valid for not less than ninety (90) days after the time/date set for receipt of proposals. Prior to the due date and time listed in the RFP, proposals may be modified or withdrawn by the Proposer's authorized representative in person or by written notices or by email with scanned withdrawal letter signed by the authorized representative on company letter head, with original to follow via certified mail.

After the Proposal due date and time, proposals may not be withdrawn for ninety (90) calendar days. In the event of a protest, in no case will the running of the ninety (90) calendar day period be tolled for more than one hundred fifty (150) calendar days.

1.16 Proposal Rejection

The Department reserves the right to either:

- A. Waive any minor proposal informalities or irregularities which are not material to the proposal or which do not prejudice other Proposers; or
- B. To reject any and all proposals submitted. Conditional proposals or those which take exception to the specifications may be considered non-responsive and may be rejected.

1.17 Proposal Evaluation

All requirements in this RFP must be satisfied in order to ensure that a proposal will qualify for consideration. The evaluation committee may be comprised of Department staff and other procuring agencies' personnel as determined by the Department.

1.18 Evaluation Criteria

Proposals will be evaluated on the following criteria in descending order of importance, with the first criterion being the most important:

- A. Product (50%)
 - (1) Meets or Exceeds Performance Criteria
 - (2) Structural Integrity (Passenger Compartment Protection)
 - (3) Safety Features
 - (4) Comfort Features
 - (5) Fuel Efficiency
 - (6) Corrosion Protection
- B. Performance (30%)
 - (1) Quality Control / Quality Assurance
 - (2) Qualifications and Experience
 - (3) Organization Structure
 - (4) Delivery History
 - (5) Delivery Schedule
 - (6) Warranty Service
- C. Price (20%)
 - (1) Bus
 - (2) Options
 - (3) Progress Payments
 - (4) Prompt Payment Terms

1.19 Qualifications for Award

Award of this contract shall be made on a best value basis to a responsive and responsible firm. The Department may conduct written/oral negotiations and request proposers to make presentations. The Department reserves the right to award based on the initial proposal. The Department reserves the right to request a best and final offer from any firm(s) in the competitive range.

- A. The Proposer and its Subcontractors must demonstrate the capability to assure performance of work within the time specified under this contract.
- B. The Proposer and its Subcontractors must have the capability of providing personnel to satisfy any technical or service problems that may arise during the term of the contract.
- C. The Proposer must have the necessary facilities and financial resources to complete the contract in a satisfactory manner and within the required time.
- D. The Proposer must certify that it has not divulged to, discussed or compared its proposal with other Proposers and has not colluded with any Proposer or parties to a proposal whatsoever.

1.20 Award Procedure

Award of the Contract shall be made, if at all, to the Proposer whose proposal is determined to be most advantageous, price and other factors considered. However, the Department reserves the right to reject any or all Proposals if it is determined to be in the best interest of the Department to do so. The Department reserves the right to delete, add to or alter provisions of the Contract prior to execution and any amendments thereafter shall be mutually agreed upon in writing.

1.21 Next Most Qualified Proposer

In the event that the most qualified Proposer fails or refuses to enter into a contract with the Department, then the Department may award the RFP to the next most qualified Proposer. The next most qualified Proposer shall enter into a contract with the Department in accordance with the terms of its proposal.

1.22 Protest of Award Procedures

Protests will be processed in accordance with the procedures below:

A. Protest

A protest, if any, shall be submitted to the Proposal Evaluation Committee for review. A protest must be in writing and must be supported by sufficient information to enable the protest to be considered. A protest will not be considered if it is not sufficiently supported or if it is not received within the time limits set forth in Section B below. The protest may be submitted for the following reasons:

- (1) A protest relating to restrictive procedures, alleged improprieties or other similar situations arising prior to proposal opening;
- (2) A protest against making an award after receipt of proposals;
- (3) A protest of Award of Contract.

B. Timeliness

To be considered, a protest must be submitted so that it is received by the Proposal Evaluation Committee by the following deadlines:

- (1) A protest based upon restrictive procedures, alleged improprieties or other similar situations prior to proposal opening must be submitted so that it is received by the Proposal Evaluation Committee not less than five (5) working days prior to the proposal due date and may only be protested once.
- (2) A protest against making an award after receipt of proposals must be submitted so that it is received by the Proposal Evaluation Committee no later than fourteen (14) working days after the proposal due date.
- (3) A protest of Award of Contract must be submitted so that it is received by the Proposal Evaluation Committee no later than five (5) working days after notification of Award of Contract.

C. Proposal Protest Bond

A Proposal Protest Bond will not be required for this solicitation.

D. Final Determination

The Proposal Evaluation Committee will respond, in detail, to each substantive issue raised in a protest within five (5) working days of receipt of a protest. The Proposal Evaluation Committee's determination will be final.

E. Withdrawal

A proposer may withdraw its protest at any time prior to the Proposal Evaluation Committee issuing a Final Determination. There will be no further review by the Department of a protest after a withdrawal is made.

F. FTA Review

A proposer may only submit for review and resolutions by the Federal Transit Administration (FTA), the Department’s failure to follow its written protest procedures, or its failure to review a protest. An appeal to FTA must be received by the cognizant FTA Regional or Headquarters Office within five (5) working days of the date the protester knew or should have known of a violation. A copy of such submittal to FTA must be provided simultaneously to the Department.

The successful Contractor shall comply with the following required contract provisions and shall insert the substance of these provisions in all subcontracts when applicable and pursuant to this Contract.

1.23 Period of Performance

The term of this Contract will be for a period of five (5) years from date of award.

1.24 Procuring Agencies

The following named agencies are members of this procurement and are authorized to place orders against the contract:

Rock Region METRO – North Little Rock, AR

Razorback Transit – Fayetteville, AR

Fort Smith Transit – Fort Smith, AR

1.25 Minimum and Maximum Quantities

The minimum number of buses to be purchased is 51, which reflects one bus per consortium member. The maximum number of buses to be purchased is 76. There is no minimum or maximum number of each fuel type or bus size. The minimum and maximum are for the total number of buses to be purchased.

Rock Region METRO Anticipated Vehicle Ordering Schedule and Timeline			
Anticipated Order Date		Order Quantity	Delivery Timeline ARO
1 st Order Date:	March 2021	8 Buses	Delivery within 540 days
2 nd Order Date:	March 2022	10 Buses	Within 420 days
3 rd Order Date:	March 2023	6 Buses	Within 420 days
4 th Order Date:			
Anticipated Total Order		24 Buses	

Razorback Transit Anticipated Vehicle Ordering Schedule and Timeline			
Anticipated Order Date		Order Quantity	Delivery Timeline ARO
1 st Order Date:	March 2021	2 Buses	Delivery within 540 days
2 nd Order Date:	March 2022	2 Buses	Within 420 days
3 rd Order Date:	March 2023	3 Buses	Within 420 days
4 th Order Date:	March 2024	3 Buses	Within 420 days
5 th Order Date:	March 2025	3 Buses	Within 420 days
6 th Order Date:	March 2026	2 Buses	Within 420 days
Anticipated Total Order		15 Buses 15 replacement with 5-10 additions to fleet	

Fort Smith Transit Anticipated Vehicle Ordering Schedule and Timeline			
Anticipated Order Date		Order Quantity	Delivery Timeline ARO
1 st Order Date:	March 2021	2 Buses	Delivery within 540 days
2 nd Order Date:	Mach 2022	2 Buses	Within 420 days
3 rd Order Date:	Mach 2023	2 Buses	Within 420 days
4 th Order Date:			
Anticipated Total Order		7 Buses	

NOTE: The total number of buses to be purchased by the Procuring Agencies in this contract shall not exceed seventy-six (76) vehicles during the five (5) year contract.

1.26 Assignability

Assignability of rights to others for purchases under this contract may be unilaterally assigned by the agencies named in this procurement and only up to their listed total amount of buses. Agencies assigned contract rights under this agreement must comply with the FTA piggyback requirements contained in FTA Circular 4220.1F, as amended.

1.27 Ordering Instructions

Each Procuring Agency will work directly with the Contractor on their specific bus order and is responsible for inspection, acceptance, and payment.

1.28 Delivery Time

- A. Delivery of each Procuring Agency's initial order shall be no later than twelve (12) months after the Procuring Agency's purchase order is issued to the Contractor.
- B. All subsequent orders shall be delivered within fourteen (14) months after the Procuring Agency's purchase order is issued to the Contractor.
- C. Delivery shall be made Monday through Friday, Federal and State holidays excluded, between the hours of 8:00 AM and 5:00 PM CST or as negotiated between the Procuring Agency and the Contractor at time of delivery.

1.29 FOB Point

The FOB point shall be the delivery address indicated on the Procuring Agency's purchase order.

1.30 Acceptance

The Procuring Agency will provide the Contractor written notice of acceptance or rejection of each bus upon completion of acceptance testing and within a reasonable period after delivery to facilitate that testing. If the equipment is rejected, the notice shall state the discrepancy noted. The Procuring Agency reserves the right to conditionally or provisionally accept one or more buses subject to correction of minor discrepancies.

1.31 Assumption of Risk and Loss

The Procuring Agency shall assume risk of loss of the vehicle(s) only upon delivery of the bus.

1.32 Repairs by Contractor

If the Procuring Agency requires the Contractor to perform repairs after rejection or conditional acceptance of the equipment, the Contractor's representative will begin work within a mutually acceptable timeframe between the Contractor and Procuring Agency after receiving notification of failure of acceptance tests. The Procuring Agency shall make the equipment available to complete repairs timely within the Contractor's repair schedule.

1.33 License and Taxes

The Procuring Agencies are exempt from Federal and State taxation in regards to Heavy Duty Transit Buses. All applicable Federal taxes, State of Arkansas sales taxes, and any other taxes are the responsibility of the Contractor. The Contractor shall procure any and all licenses, permits, or certificates required by properly constituted authorities for the performance of the Contract.

1.34 Title

- A. Adequate documents for securing the bus title in the county of the individual Procuring Agency shall be provided to the Procuring Agency at least five (5) working days before each bus is released to the common carrier driveway.
- B. Following acceptance of each bus, the Contractor warrants that the title shall pass to the Procuring Agency free and clear of all liens, mortgages and encumbrances, financing statements, claims, and demands of any character.
- C. The Procuring Agency is responsible to provide the Contractor with the necessary information to title the vehicles and shall provide a point of contact for the delivery of the titles.

1.35 Payment Schedule

- A. Except for purchases under the progress payment terms, payment will be made within 45 days of receipt of a proper invoice and acceptance (final or provisional) of the bus.
- B. The Procuring Agency may withhold up to five percent (5%) of the total cost of each delivered and accepted bus to assure correction of minor deficiencies. The withheld funds shall be paid in full to the Contractor within thirty (30) days of bus acceptance, unless specific defects are found in the vehicle or it is subject to a fleet defect.
- C. The defect(s) found shall be described and submitted in writing, including the relevant specification requirement, to the Contractor when identified and within the 30-day withholding period. The withheld funds shall be paid in full to the Contractor upon repairs of the vehicle or receipt of a written commitment from the Contractor reflecting a mutual agreement to resolve the identified deficiency.

1.36 Invoice Terms

The invoice must contain at a minimum the following information:

- A. Purchase Order Number
- B. Description of the Item(s) Provided
- C. Quantity Delivered and Unit Price
- D. Delivery Charges
- E. Total Invoice Amount

1.37 Contract Modifications

- A. No change in this Contract shall be made unless the Department gives its prior written approval. Therefore, 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 Contractor and the Department.
- B. The Department may order changes within the general scope of work consisting of additions, deletions, or other revisions and the fixed price shall be adjusted accordingly. Any such changes shall be in writing.

1.38 Vendor Site Inspection and Evaluation

The Department reserves the right to inspect the manufacturer's facilities including sales, engineering, fabrication, manufacturing, parts, the resident inspector's facilities and production change order (PCO) process prior to award of the contract.

1.39 Omission

Notwithstanding the provisions of drawings, technical specifications or other data by the Department, the Contractor shall have the responsibility of supplying all details required to make an accurate proposal of services offered even though such details may not be specifically mentioned in the specifications.

1.40 Priority

In the event of any discrepancies or conflicts between the description of the item(s) and/or service(s) proposed in Part V, Technical Specifications, and other parts of this document, the Technical Specifications shall govern.

1.41 Material Safety Data Sheets

In compliance with federal and state law, the Contractor must submit any required Material Safety Data Sheets (MSDSs) on hazardous chemicals or substances supplied to the Procuring Agency. These sheets shall be provided upon delivery.

1.42 Cost or Price Analysis

The Contractor will be required to cooperate with the Department as necessary to conduct any required cost or price analysis, whether required by federal, state, or local laws or regulations.

1.43 Excusable Delays

- A. If the delivery of the item(s) under this Contract should be unavoidably delayed, the Department shall extend the time for completion of the Contract for the determined number of days of excusable delay. A delay is unavoidable only if the delay relates to a natural disaster, war, or strike, and was substantial and in fact caused the Contractor to miss delivery dates.
- B. The Contractor shall notify the Department as soon as the Contractor has, or should have, knowledge that an event has occurred which will delay deliveries. Within five (5) days, the Contractor shall confirm such notice in writing furnishing as much detail as is available.
- C. The Contractor agrees to supply, as soon as such data are available, any reasonable proofs that are required by the Department to make a decision on any request for extension. The Procuring Agency shall examine the request and any documents supplied by the Contractor and shall determine if the Contractor is entitled to an extension and the duration of the extension. The Procuring Agency shall notify the Contractor of its decision in writing.

1.44 Indemnification

The Contractor covenants and agrees with the Procuring Agencies that it shall defend, indemnify, save and hold harmless the Procuring Agencies, their agents, officers, directors and employees of, from and against any and all suits, proceedings, claims, causes of action, awards (including any punitive awards), damages (including any claim for property damage and/or injury to persons, including death and disease), decrees, judgments, liabilities, losses, demands and any and all costs, expenses, attorney's fees and any fees, charges and expenses of any expert witnesses or professionals incurred by the Procuring Agencies, I agents, officers, directors and employees (including any such costs, expenses, fees and charges incurred in the enforcement of this indemnification) arising out of, resulting from, related to or in any way connected to: (i) the Contractor's acts or omissions, including acts or omissions of its employees, servants and agents, (ii) the performance by the Contractor, its employees, servants and agents of the Contractor's obligations hereunder, (iii) the violation by the Contractor, its employees, servants and agents of proprietary rights, copyrights, or right of privacy, arising out of the publication, translation, reproduction, delivery, use, or disposition of any data furnished hereunder, (iv) the violation by the Contractor, its employees, servants and agents of any federal, state or local laws and regulations applicable to or relating to this Contract and (v) any alleged infringement of the United States Letters Patent or patent laws, regulations and rules covering any product, materials, supplies or equipment to be furnished hereunder.

In any and all claims against the Procuring Agencies or any of their agents or employees by any employee of the Contractor, any subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation under this paragraph shall not be limited in any way by any limitation on the amount or type of damages, compensation benefits payable by or for the Contractor, or any subcontractor under workers compensation acts, disability benefit acts or other employee benefit acts.

1.45 Materials and Accessories Responsibility

The Contractor shall be responsible for all materials and workmanship in the construction of the equipment and all accessories used whether the same are manufactured by the Contractor or obtained from the Contractor or Subcontractor.

1.46 Spare Parts

The Contractor shall guarantee the availability of replacement parts for this equipment for at least a twelve (12) year period after the date of acceptance. Spare parts shall be interchangeable with the original equipment and shall be manufactured in accordance with the quality assurance provisions of this contract.

1.47 Maintenance and Parts Manuals

The Contractor shall provide one (1) set of manuals for each three (3) buses ordered. This set will include a service manual, parts manual, electrical schematic manual and the same for all subsystems and subcomponents incorporated in the equipment. Additionally, the Contractor will provide all the aforementioned manuals on compact disc formatted in a searchable portable document format (PDF). The Contractor shall keep maintenance information available for a period of twelve (12) years after the date of acceptance of the equipment procured under this contract. The Contractor shall also keep all information up-to-date for a period of twelve (12) years.

1.48 Liquidated Damages

- A. The Procuring Agencies have determined that timely delivery of the equipment to be obtained through this Contract is of the essence and that failure to obtain timely delivery will cause financial and non-financial damages that would be difficult to calculate. Liquidated damages in the amount of fifty dollars (\$50) per calendar day, per bus are deemed a reasonable approximation of these damages and will be assessed for any late delivery, not as a penalty but as a means of compensating the Procuring Agencies for these damages.

- B. Liquidated damages are payable directly to the Procuring Agency purchasing the bus(es) involved and may, at the option of the Procuring Agency, be offset against any monies due, or which may thereafter become due, to the Contractor under this Contract.
- C. The Contractor shall provide, at its own expense, all spare parts, tools, and space required to complete repairs. If the equipment is removed from the Procuring Agency's property, repair procedures must be diligently pursued by the Contractor's representatives.

1.49 Warranty

- A. Warranties in this document are in addition to any statutory remedies or warranties imposed on the Supplier.
- B. The Supplier is individually and totally responsible to the Procuring Agency for all warranty claims. Consistent with this requirement, the Supplier warrants and guarantees to the Procuring Agency each complete Bus, including the subsystems and components below. All warranty dates will start from the in-service date of each Bus received.
 - (1) Complete Bus
One (1) year / fifty thousand (50,000) miles warranty coverage on parts and labor, whichever comes first. All warranties stated in this section apply, whichever comes first on coverage expiration.
 - (2) Subsystems and Components
 - (i.) Engine – Two (2) year / unlimited mileage warranty coverage on parts and labor.
As an option, the cost for a five (5) year / three hundred thousand (300,000) miles warranty coverage will be made available and priced separately.
 - (ii.) Transmission – two (2) year / unlimited mileage warranty coverage on parts and labor.
As an option, the cost for a five (5) year / three hundred thousand (300,000) miles warranty coverage will be made available and price separately.
 - (iii.) Differential – two (2) years / unlimited mileage warranty coverage on parts and labor.
 - (iv.) HVAC – three (3) years / unlimited mileage warranty coverage on parts and labor.
 - (v.) Basic Body Structure – three (3) years / unlimited mileage warranty coverage on parts and labor.
 - (vi.) Structure/Body Integrity – seven (7) years / unlimited mileage warranty coverage on parts and labor.
 - (vii.) Exterior Paint – three (3) years / unlimited mileage warranty coverage on parts and labor.
 - (viii.) Sub-Flooring and Rubber Flooring – twelve (12) years / unlimited mileage warranty coverage on parts and labor.
 - (ix.) All other components, subsystems or appurtenances are to carry the manufacturer's basic warranty, but in no event will any warranty be less than one (1) year on parts and labor.
- C. Voiding of Warranty
The warranty shall not apply to any part or component of the bus that has been subject to misuse, negligence, accident, or that has been repaired or altered in any way so as to adversely affect its performance or reliability, except insofar as such repairs were made in accordance with the Supplier's maintenance manuals and the workmanship was in accordance with recognized standards of the industry.
- D. Exceptions to Warranty
The warranty shall not apply to scheduled maintenance items such as filters. Consumable items are only fuel, oil, and lubricants. Items with progressive wear characteristics such as belts, wiper blades, etc. are not excluded from warranty coverage and should not be of poor quality that requires frequent replacement. The warranty shall not apply to tires, nor to any items furnished by the Procuring Agency such as radios, fareboxes, and other auxiliary equipment, except insofar as such equipment may be damaged by the failure of a part, component, or design for which the Supplier is responsible.
- E. Fleet Defects
A fleet defect is defined as the failure of identical items or subsystems covered by the warranties of this contract, in proportion to the total number of buses delivered. For deliveries of one (1) to twenty (20) buses, the proportion shall be fifty percent (50%). For deliveries of twenty (20) buses or more, the proportion shall be twenty five percent (25%).

F. Scope of Fleet Defect Provisions

- (1) The Supplier shall promptly, upon notification, correct all fleet defects as defined above and undertake a work program designed to prevent the occurrence and reoccurrence of the same defect in all buses purchased under this contract.
- (2) Detailed instructions for any work program must be submitted to the Procuring Agency, in writing, before any work commences.
- (3) The warranty on repairs to items or subsystems determined to be fleet defects shall be extended for one (1) year or fifty thousand (50,000) miles to assure the corrections made are not a temporary fix, beginning on the repair/replacement date for the correction on the last bus in the fleet covered by the warranty of this contract. If the fleet defect failure reoccurs during this period the fleet defect status will again be applied until there is no reoccurrence.
- (4) If the Supplier does not start the work program within thirty (30) calendar days after being notified of the fleet defect, the Procuring Agency reserves the right to start the repairs unless the Supplier has an understanding with the Procuring Agency that thirty (30) days is not sufficient and an agreement has been made on the time frame.
- (5) Fleet defect work performed by the Procuring Agency will be charged back to the Supplier at the labor rate of eighty five dollars (\$85.00) per hour.
- (6) The Supplier shall be totally responsible for the correction of all fleet defects. The Procuring Agency will make the bus available to the Supplier or Supplier's representative upon timely notice.

PART II – FEDERAL CLAUSES

2.1 Fly America Requirements

Applicability – all contracts involving transportation of persons or property, by air between the U.S. and/or places outside the U.S. These requirements do not apply to micro-purchases (\$10,000 or less, except for construction contracts over \$2,000). Contractor shall comply with 49 USC 40118 (the “Fly America” Act) in accordance with General Services Administration regulations 41 CFR 30110, stating that recipients and sub-recipients of Federal funds and their contractors are required to use US Flag air carriers for US 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. Contractor shall submit, if a foreign air carrier was used, an appropriate certification or memorandum adequately explaining why service by a US 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. Contractor shall include the requirements of this section in all subcontracts that may involve international air transportation.

2.2 Buy America Requirements

Applicability – Construction Contracts and Acquisition of Goods or Rolling Stock (valued at more than \$150,000) Contractor shall comply with 49 USC 5323(j) and 49 CFR 661, stating 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, and include software, microcomputer equipment and small purchases (currently less than \$150,000) made with capital, operating, or planning funds. Separate requirements for rolling stock are stated at 5323(j)(2)(C) and 49 CFR 661.11. Rolling stock must be manufactured in the US and have a minimum 60% domestic content for FY2016 and FY2017, a minimum 65% domestic content for FY2018 and FY2019 and a minimum 70% domestic content for FY2020 and beyond. A proposer or offer or shall submit appropriate Buy America certification to the recipient with all proposals on FTA funded contracts, except those subject to a general waiver. Proposals not accompanied by a completed Buy America certification shall be rejected as nonresponsive. This requirement does not apply to lower tier subcontractors.

2.3 Cargo Preference

Applicability – Contracts involving equipment, materials or commodities which may be transported by ocean vessels. These requirements do not apply to micro-purchases (\$10,000 or less, except for construction contracts over \$2,000). Contractor shall: a. use privately owned US Flag commercial vessels to ship at least 50% 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 US flag commercial vessels; b. furnish within 20 working days following the loading date of shipments originating within the US or within 30 working days following the loading date of shipments originating outside the US, a legible copy of a rated, "onboard" commercial bill-of-lading in English for each shipment of cargo described herein to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590 and to the recipient (through contractor in the case of a subcontractor's bill-of-lading.) c. include these requirements in all subcontracts issued pursuant to this contract when the subcontract involves the transport of equipment, material, or commodities by ocean vessel.

2.4 Energy Conservation

Applicability – All Contracts except micro-purchases (\$10,000 or less, except for construction contracts over \$2,000) Contractor shall comply with mandatory standards and policies relating to energy efficiency, stated in the state energy conservation plan issued in compliance with the Energy Policy & Conservation Act.

2.5 Clean Water

Applicability – All Contracts and Subcontracts over \$250,000. Contractor shall comply with all applicable standards, orders or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 USC 1251 et seq. Contractor shall report each violation to the Department and understands and agrees that the Department shall, in turn, report each violation as required to FTA and the appropriate EPA Regional Office. Contractor shall include these requirements in each subcontract exceeding \$250,000 financed in whole or in part with FTA assistance.

2.6 Bus Testing

Applicability – Rolling Stock/Turnkey Contractor [manufacturer] shall comply with 49 USC A5323(c) and FTA's implementing regulation 49 CFR 665 and shall perform the following:

- A. 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 prior to the recipient's final acceptance of the first vehicle.

- B. A manufacturer who releases a report under para. 1 above shall provide notice to the operator of the testing facility that the report is available to the public.
- C. 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 the recipient's final acceptance of the first vehicle. If 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.
- D. If the manufacturer represents that the vehicle is "grandfathered" (has been used in mass transit service in the US 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.

2.7 Pre-Award and Post-Delivery Audit Requirements

Applicability – Rolling Stock/Turnkey Contractor shall comply with 49 USC 5323(l) and FTA's implementing regulation 49 CFR 663 and submit the following certifications:

- A. Buy America Requirements: Contractor shall complete and submit a declaration certifying either compliance or noncompliance with Buy America. If contractor certifies compliance with Buy America, it shall submit documentation listing:
 - B. Component and subcomponent parts of the rolling stock to be purchased identified by manufacturer of the parts, their country of origin and costs; and
 - C. 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.
- D. Solicitation Specification Requirements: Contractor shall submit evidence that it will be capable of meeting the proposal specifications.
- E. Federal Motor Vehicle Safety Standards (FMVSS): 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 buses will not be subject to FMVSS regulations.

2.8 Lobbying

Applicability – Construction/Architectural and Engineering/Acquisition of Rolling Stock/Professional Service Contract/Operational Service Contract/Turnkey contracts over \$250,000 Byrd Anti-Lobbying Amendment, 31 U.S.C. 1352, as amended by the Lobbying Disclosure Act of 1995, P.L. 10465 [to be codified at 2 U.S.C. § 1601, et seq.] Contractors who apply or bid for an award of \$250,000 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, 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 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 U.S.C. 1352. Such disclosures are forwarded from tier to tier up to the recipient.

2.9 Access to Records and Reports

Applicability – As shown below. These requirements do not apply to micro-purchases (\$10,000 or less, except for construction contracts over \$2,000) The following access to records requirements apply to this Contract:

- A. Where the purchaser is not a State but a local government and is an FTA recipient or a sub-recipient of FTA recipient in accordance with 49 CFR 18.36(i), contractor shall provide the purchaser, the FTA, the US Comptroller General or their authorized representatives access to any books, documents, papers and contractor records which are pertinent to this contract for the purposes of making audits, examinations, excerpts and transcriptions. Contractor shall also, pursuant to 49 CFR 633.17, provide authorized FTA representatives, including any PMO contractor, access to contractor's records and construction sites pertaining to a capital project, defined at 49 USC 5302(a)1, which is receiving FTA assistance through the programs described at 49 USC 5307, 5309 or 5311.
- B. Where the purchaser is a State and is an FTA recipient or a sub-recipient of FTA recipient in accordance with 49 CFR 633.17, contractor shall provide the purchaser, authorized FTA representatives, including any PMO

Contractor, access to contractor's records and construction sites pertaining to a capital project, defined at 49 USC 5302(a) 1, which receives FTA assistance through the programs described at 49 USC 5307, 5309 or 5311. By definition, a capital project excludes contracts of less than the simplified acquisition threshold currently set at \$250,000.

- C. Where the purchaser enters into a negotiated contract for other than a small purchase or under the simplified acquisition threshold and is an institution of higher education, a hospital or other nonprofit organization and is an FTA recipient or a sub-recipient of FTA recipient in accordance with 49 CFR 19.48, contractor shall provide the purchaser, the FTA, the US Comptroller General or their authorized representatives, access to any books, documents, papers and record of the contractor which are directly pertinent to this contract for the purposes of making audits, examinations, excerpts and transcriptions.
- D. Where a purchaser which is an FTA recipient or a sub-recipient of FTA recipient in accordance with 49 USC 5325(a) enters into a contract for a capital project or improvement (defined at 49 USC 5302(a)1) through other than competitive bidding, contractor shall make available records related to the contract to the purchaser, the Secretary of USDOT and the US Comptroller General or any authorized officer or employee of any of them for the purposes of conducting an audit and inspection.
- E. Contractor shall permit any of the foregoing parties to reproduce by any means whatsoever or to copy excerpts and transcriptions as reasonably needed.
- F. Contractor shall maintain all books, records, accounts and reports required under this contract for a period of 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 contractor agrees to maintain same until the recipient, FTA Administrator, US Comptroller General, or any of their authorized representatives, have disposed of all such litigation, appeals, claims or exceptions related thereto. Re: 49 CFR 18.39(i)(11).

FTA does not require the inclusion of these requirements in subcontracts.

2.10 Federal Changes

Applicability – All Contracts except micro-purchases (\$10,000 or less, except for construction contracts over \$2,000) Contractor shall comply with all applicable FTA regulations, policies, procedures and directives, including without limitation those listed directly or by reference in the Master Agreement between the recipient and FTA, as they may be amended or promulgated from time to time during the term of the contract. Contractor's failure to comply shall constitute a material breach of the contract.

2.11 Clean Air

Applicability – All contracts over \$250,000. 1) Contractor shall comply with all applicable standards, orders or regulations pursuant to the Clean Air Act, 42 USC 7401 et seq. Contractor shall report each violation to the Department and understands and agrees that the Department will, in turn, report each violation as required to FTA and the appropriate EPA Regional Office. 2) Contractor shall include these requirements in each subcontract exceeding \$250,000 financed in whole or in part with FTA assistance.

2.12 Contract Work Hours and Safety Standards Act

Applicability – Contracts over \$250,000

- A. 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 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.
- B. Violation; liability for unpaid wages; liquidated damages In the event of any violation of the clause set forth in para. (1) of this section, contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable 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 para. (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 para. (1) of this section.
- C. Withholding for unpaid wages and liquidated damages the recipient shall upon its own action or upon written request of USDOL withhold or cause to be withheld, from any moneys payable on account of work performed by

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 & 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 para. (2) of this section.

- D. Subcontracts - Contractor or subcontractor shall insert in any subcontracts the clauses set forth in this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. Prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in this section.

2.13 No Federal Government Obligation to Third Parties

Applicability – All contracts except micro-purchases (\$10,000 or less, except for construction contracts over \$2,000)

- A. The recipient and contractor acknowledge and agree that, notwithstanding any concurrence by the US Government in or approval of the solicitation or award of the underlying contract, absent the express written consent by the US Government, the US Government is not a party to this contract and shall not be subject to any obligations or liabilities to the recipient, the contractor, or any other party (whether or not a party to that contract) pertaining to any matter resulting from the underlying contract.
- B. Contractor agrees to include the above clause in each subcontract financed in whole or in part with FTA assistance. It is further agreed that the clause shall not be modified, except to identify the subcontractor who will be subject to its provisions.

2.14 Program Fraud and False or Fraudulent Statements or Related Acts

Applicability – All contracts except micro-purchases (\$10,000 or less, except for construction contracts over \$2,000)

- A. Contractor acknowledges that the provisions of the Program Fraud Civil Remedies Act of 1986, as amended, 31 USC 3801 et seq. and USDOT regulations, "Program Fraud Civil Remedies," 49 CFR 31, apply to its actions pertaining to this project. Upon execution of the underlying contract, contractor certifies or affirms the truthfulness and accuracy of any statement it has made, it makes, it may make, or causes to be made, pertaining to the underlying contract or FTA assisted project for which this contract work is being performed. In addition to other penalties that may be applicable, contractor further acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submittal, or certification, the US Government reserves the right to impose the penalties of the Program Fraud Civil Remedies Act (1986) on contractor to the extent the US Government deems appropriate.
- B. If contractor makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submittal, or certification to the US Government under a contract connected with a project that is financed in whole or in part with FTA assistance 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 contractor, to the extent the US Government deems appropriate. (3) Contractor shall include the above two clauses in each subcontract financed in whole or in part with FTA assistance. The clauses shall not be modified, except to identify the subcontractor who will be subject to the provisions.

2.15 Termination

Applicability – All Contracts over \$10,000, except contracts with nonprofit organizations and institutions of higher learning, where the threshold is \$250,000.

- A. Termination for Convenience (General Provision) the recipient may terminate this contract, in whole or in part, at any time by written notice to contractor when it is in the recipient's best interest. Contractor shall be paid its costs, including contract closeout costs, and profit on work performed up to the time of termination. Contractor shall promptly submit its termination claim to the recipient. If contractor is in possession of any of the recipient's property, contractor shall account for same, and dispose of it as the recipient directs.
- B. Termination for Default [Breach or Cause] (General Provision) If contractor does not deliver items in accordance with the contract delivery schedule, or, if the contract is for services, and contractor fails to perform in the manner called for in the contract, or if contractor fails to comply with any other provisions of the contract, the recipient may terminate this contract for default. Termination shall be effected by serving a notice of termination to contractor setting forth the manner in which contractor is in default. Contractor shall only be paid the contract price for supplies delivered and accepted, or for services performed in accordance with the manner of performance set forth in the contract. If it is later determined by the recipient that 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 contractor, the recipient, after setting up a new delivery or performance schedule, may allow contractor to continue work, or treat the termination as a termination for convenience.

- C. Termination for Opportunity to Cure (General Provision) the recipient in its sole discretion may, in the case of a termination for breach or default, allow contractor an appropriately short period of time in which to cure the defect. In such case, the notice of termination shall state the time period in which cure is permitted and other appropriate conditions. If contractor fails to remedy to the recipient's satisfaction the breach or default or any of the terms, covenants, or conditions of this Contract within ten (10) days after receipt by contractor or written notice from the recipient setting forth the nature of said breach or default, the recipient 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 the recipient from also pursuing all available remedies against contractor and its sureties for said breach or default.
- D. Waiver of Remedies for any Breach In the event that the recipient elects to waive its remedies for any breach by contractor of any covenant, term or condition of this Contract, such waiver by the recipient shall not limit its remedies for any succeeding breach of that or of any other term, covenant, or condition of this Contract.
- E. Termination for Convenience (Professional or Transit Service Contracts) the recipient, by written notice, may terminate this contract, in whole or in part, when it is in the recipient's interest. If the contract is terminated, the recipient shall be liable only for payment under the payment provisions of this contract for services rendered before the effective date of termination.
- F. Termination for Default (Supplies and Service) If 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 recipient may terminate this contract for default. The recipient shall terminate by delivering to contractor a notice of termination specifying the nature of default. Contractor shall 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 contractor was not in default, the rights and obligations of the parties shall be the same as if termination had been issued for the recipient's convenience.
- G. Termination for Default (Transportation Services) If 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 contractor fails to comply with any other provisions of this contract, the recipient may terminate this contract for default. The recipient shall terminate by delivering to contractor a notice of termination specifying the nature of default. Contractor shall 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 contractor has possession of the recipient goods, contractor shall, as directed by the recipient, protect and preserve the goods until surrendered to the recipient or its agent. Contractor and the recipient shall agree on payment for the preservation and protection of goods. Failure to agree on an amount shall be resolved under the Dispute clause. If, after termination for failure to fulfill contract obligations, it is determined that contractor was not in default, the rights and obligations of the parties shall be the same as if termination had been issued for the recipient's convenience.
- H. Termination for Default (Construction) If contractor refuses or fails to prosecute the work or any separable part, with the diligence that will insure its completion within the time specified, or any extension, or fails to complete the work within this time, or if contractor fails to comply with any other provisions of this contract, the recipient may terminate this contract for default. The recipient shall terminate by delivering to contractor a notice of termination specifying the nature of default. In this event, the recipient may take over the work and complete 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. Contractor and its sureties shall be liable for any damage to the recipient resulting from contractor's refusal or failure to complete the work within specified time, whether or not contractor's right to proceed with the work is terminated. This liability includes any increased costs incurred by the recipient in completing the work. Contractor's right to proceed shall not be terminated nor shall contractor be charged with damages under this clause if:
 - 1. Delay in completing the work arises from unforeseeable causes beyond the control and without the fault or negligence of contractor. Examples of such causes include: acts of God, acts of the recipient, acts of another contractor in the performance of a contract with the recipient, epidemics, quarantine restrictions, strikes, freight embargoes; and
 - 2. Contractor, within 10 days from the beginning of any delay, notifies the recipient in writing of the causes of delay. If in the recipient's judgment, delay is excusable, the time for completing the work shall be

extended. The recipient's judgment shall be final and conclusive on the parties, but subject to appeal under the Disputes clauses. If, after termination of contractor's right to proceed, it is determined that contractor was not in default, or that the delay was excusable, the rights and obligations of the parties will be the same as if termination had been issued for the recipient's convenience.

- I. Termination for Convenience or Default (Architect & Engineering) the recipient may terminate this contract in whole or in part, for the recipient's convenience or because of contractor's failure to fulfill contract obligations. The recipient shall terminate by delivering to contractor a notice of termination specifying the nature, extent, and effective date of termination. Upon receipt of the notice, contractor shall (1) immediately discontinue all services affected (unless the notice directs otherwise), and (2) deliver to the recipient all data, drawings, specifications, reports, estimates, summaries, and other information and materials accumulated in performing this contract, whether completed or in process. If termination is for the recipient's convenience, it shall make an equitable adjustment in the contract price but shall allow no anticipated profit on unperformed services. If termination is for contractor's failure to fulfill contract obligations, the recipient may complete the work by contract or otherwise and contractor shall be liable for any additional cost incurred by the recipient. If, after termination for failure to fulfill contract obligations, it is determined that contractor was not in default, the rights and obligations of the parties shall be the same as if termination had been issued for the recipient's convenience.
- J. Termination for Convenience or Default (Cost-Type Contracts) the recipient may terminate this contract, or any portion of it, by serving a notice of termination on contractor. The notice shall state whether termination is for convenience of the recipient or for default of contractor. If termination is for default, the notice shall state the manner in which contractor has failed to perform the requirements of the contract. Contractor shall account for any property in its possession paid for from funds received from the recipient, or property supplied to contractor by the recipient. If termination is for default, the recipient may fix the fee, if the contract provides for a fee, to be paid to contractor in proportion to the value, if any, of work performed up to the time of termination. Contractor shall promptly submit its termination claim to the recipient and the parties shall negotiate the termination settlement to be paid to contractor. If termination is for the recipient's convenience, contractor shall be paid its contract closeout 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 recipient determines that contractor has an excusable reason for not performing, such as strike, fire, flood, events which are not the fault of and are beyond the control of contractor, the recipient, after setting up a new work schedule, may allow contractor to continue work, or treat the termination as a termination for convenience. Contractor shall promptly submit its termination claim to the recipient and the parties shall negotiate the termination settlement to be paid to contractor. If termination is for the recipient's convenience, contractor shall be paid its contract closeout 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 recipient determines that contractor has an excusable reason for not performing, such as strike, fire, flood, events which are not the fault of and are beyond the control of contractor, the recipient, after setting up a new work schedule, may allow contractor to continue work, or treat the termination as a termination for convenience.

2.16 Government-Wide Debarment and Suspension (Nonprocurement)

Applicability – Contracts over \$25,000. The Recipient agrees to the following:

- (1) It will comply with the requirements of 2 C.F.R. part 180, subpart C, as adopted and supplemented by U.S. DOT regulations at 2 C.F.R. part 1200, which include the following: (a) It will not enter into any arrangement to participate in the development or implementation of the Project with any Third Party Participant that is debarred or suspended except as authorized by: 1 U.S. DOT regulations, "Non-procurement Suspension and Debarment," 2 C.F.R. part 1200, 2 U.S. OMB, "Guidelines to Agencies on Government wide Debarment and Suspension (Non-procurement)," 2 C.F.R. part 180, including any amendments thereto, and 3 Executive Orders Nos. 12549 and 12689, "Debarment and Suspension," 31 U.S.C. § 6101 note, (b) It will review the U.S. GSA "System for Award Management," [https:// www.sam.gov](https://www.sam.gov), if required by U.S. DOT regulations, 2 C.F.R. part 1200, and (c) It will include, and require each of its Third Party Participants to include, a similar provision in each lower tier covered transaction, ensuring that each lower tier Third Party Participant: 1 Will comply with Federal debarment and suspension requirements, and 2 Reviews the "System for Award Management" at <https://www.sam.gov>, if necessary to comply with U.S. DOT regulations, 2 C.F.R. part 1200, and (2) If the Recipient suspends, debars, or takes any similar action against a Third Party Participant or individual, the Recipient will provide immediate written notice to the: (a) FTA Regional Counsel for the Region in which the Recipient is located or implements the Project, (b) FTA Project Manager if the Project is administered by an FTA Headquarters Office, or (c) FTA Chief Counsel.

2.17 Contracts Involving Federal Privacy Act Requirements

Applicability – When a grantee maintains files on drug and alcohol enforcement activities for FTA and those files are organized so that information could be retrieved by personal identifier, the Privacy Act requirements apply to all

contracts except micro-purchases (\$10,000 or less, except for construction contracts over \$2,000). The following requirements apply to the Contractor and its employees that administer any system of records on behalf of the Federal Government under any contract:

A. The Contractor agrees to comply with, and assures the compliance of its employees with, the information restrictions and other applicable requirements of the Privacy Act of 1974, 5 U.S.C. § 552a. Among other things, the Contractor agrees to obtain the express consent of the Federal Government before the Contractor or its employees operate a system of records on behalf of the Federal Government. The Contractor understands that the requirements of the Privacy Act, including the civil and criminal penalties for violation of that Act, apply to those individuals involved, and that failure to comply with the terms of the Privacy Act may result in termination of the underlying contract.

B. The Contractor also agrees to include these requirements in each subcontract to administer any system of records on behalf of the Federal Government financed in whole or in part with Federal assistance provided by FTA.

2.18 Civil Rights Requirements

Applicability – All contracts except micro-purchases (\$10,000 or less, except for construction contracts over \$2,000) The following requirements apply to the underlying contract: The Recipient understands and agrees that it must comply with applicable Federal civil rights laws and regulations, and follow applicable Federal guidance, except as the Federal Government determines otherwise in writing. Therefore, unless a Recipient or Program, including an Indian Tribe or the Tribal Transit Program, is specifically exempted from a civil rights statute, FTA requires compliance with that civil rights statute, including compliance with equity in service:

- A. Nondiscrimination in Federal Public Transportation Programs. The Recipient agrees to, and assures that each Third Party Participant will, comply with Federal transit law, 49 U.S.C. § 5332 (FTA's "Nondiscrimination" statute): (1) FTA's "Nondiscrimination" statute prohibits discrimination on the basis of: (a) Race, (b) Color, (c) Religion, (d) National origin, (e) Sex, (f) Disability, (g) Age, or (h) Gender identity and (2) The FTA "Nondiscrimination" statute's prohibition against discrimination includes: (a) Exclusion from participation, (b) Denial of program benefits, or (c) Discrimination, including discrimination in employment or business opportunity, (3) Except as FTA determines otherwise in writing: (a) General. Follow: 1 The most recent edition of FTA Circular 4702.1, "Title VI Requirements and Guidelines for Federal Transit Administration Recipients," to the extent consistent with applicable Federal laws, regulations, and guidance, and 2 Other applicable Federal guidance that may be issued, but (b) Exception for the Tribal Transit Program. FTA does not require an Indian Tribe to comply with FTA program specific guidelines for Title VI when administering its projects funded under the Tribal Transit Program.
- B. Nondiscrimination – Title VI of the Civil Rights Act. The Recipient agrees to, and assures that each Third Party Participant will: (1) Prohibit discrimination based on: (a) Race, (b) Color, or (c) National origin, (2) Comply with: (a) Title VI of the Civil Rights Act of 1964, as amended, 42 U.S.C. § 2000d et seq., (b) U.S. DOT regulations, "Nondiscrimination in Federally Assisted Programs of the Department of Transportation – Effectuation of Title VI of the Civil Rights Act of 1964," 49 C.F.R. part 21, and (c) Federal transit law, specifically 49 U.S.C. § 5332, as stated in the preceding section a, and (3) Except as FTA determines otherwise in writing, follow: (a) The most recent edition of FTA Circular 4702.1, "Title VI and Title VI Dependent Guidelines for Federal Transit Administration Recipients," to the extent consistent with applicable Federal laws, regulations, and guidance. (b) U.S. DOJ, "Guidelines for the enforcement of Title VI, Civil Rights Act of 1964," 28 C.F.R. § 50.3, and (c) Other applicable Federal guidance that may be issued.
- C. Equal Employment Opportunity. (1) Federal Requirements and Guidance. The Recipient agrees to, and assures that each Third Party Participant will, prohibit discrimination on the basis of race, color, religion, sex, or national origin, and: (a) Comply with Title VII of the Civil Rights Act of 1964, as amended, 42 U.S.C. § 2000e et seq., (b) Facilitate compliance with Executive Order No. 11246, "Equal Employment Opportunity," as amended by Executive Order No. 11375, "Amending Executive Order No. 11246, Relating to Equal Employment Opportunity," 42 U.S.C. § 2000e note, (c) Comply with Federal transit law, specifically 49 U.S.C. § 5332, as stated in section a, and (d) Comply with FTA Circular 4704.1 other applicable EEO laws and regulations, as provided in Federal guidance, including laws and regulations prohibiting discrimination on the basis of disability, except as the Federal Government determines otherwise in writing, (2) General. The Recipient agrees to: (a) Ensure that applicants for employment are employed and employees are treated during employment without discrimination on the basis of their: 1 Race, 2 Color, 3 Religion, 4 Sex, 5 Disability, 6 Age, or 7 National origin, (b) Take affirmative action that includes, but is not limited to: 1 Recruitment advertising, 2 Recruitment, 3 Employment, 4 Rates of pay, 5 Other forms of compensation, 6 Selection for training, including apprenticeship, 7 Upgrading, 8 Transfers, 9 Demotions, 10 Layoffs, and 11 Terminations, but (b) Indian Tribe. Title VII of the Civil Rights Act of 1964, as amended, exempts Indian Tribes under the definition of "Employer". (3) Equal Employment Opportunity Requirements for Construction Activities. In addition to the foregoing, when undertaking "construction" as recognized by the U.S. Department of Labor (U.S. DOL), the Recipient agrees to comply, and assures the compliance of each Third

Party Participant, with: (a) U.S. DOL regulations, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor," 41 C.F.R. chapter 60, and (b) Executive Order No. 11246, "Equal Employment Opportunity," as amended by Executive Order No. 11375, "Amending Executive Order No. 11246, Relating to Equal Employment Opportunity," 42 U.S.C. § 2000e note.

- D. Disadvantaged Business Enterprise. To the extent authorized by applicable Federal law, the Recipient agrees to facilitate, and assures that each Third Party Participant will facilitate, participation by small business concerns owned and controlled by socially and economically disadvantaged individuals, also referred to as "Disadvantaged Business Enterprises" (DBEs), in the Project as follows: 1) Requirements. The Recipient agrees to comply with: (a) Section 1101(b) of Map21, 23 U.S.C. § 101 note, (b) U.S. DOT regulations, "Participation by Disadvantaged Business Enterprises in Department of Transportation financial Assistance Programs," 49 C.F.R. part 26, and (c) Federal transit law, specifically 49 U.S.C. § 5332, as stated in section a, (2) Assurance. As required by 49 C.F.R. § 26.13(a), (b) DBE Program Requirements. Recipients receiving planning, capital and/or operating assistance that will award prime third party contracts exceeding \$250,000 in a Federal fiscal year must: 1 Have a DBE program meeting the requirements of 49 C.F.R. part 26, 2 Implement a DBE program approved by FTA, and 3 Establish an annual DBE participation goal, (c) Special Requirements for a Transit Vehicle Manufacturer. The Recipient understands and agrees that each transit vehicle manufacturer, as a condition of being comply with: (a) Section 1101(b) of Map21, 23 U.S.C. § 101 note, (b) U.S. DOT regulations, "Participation by Disadvantaged Business Enterprises in Department of Transportation Financial Assistance Programs," 49 C.F.R. part 26, and (c) Federal transit law, specifically 49 U.S.C. § 5332, as stated in section a, (2) Assurance. As required by 49 C.F.R. § 26.13(a), (b) DBE Program Requirements. Recipients receiving planning, capital and/or operating assistance that will award prime third party contracts exceeding \$250,000 in a Federal fiscal year must: 1 Have a DBE program meeting the requirements of 49 C.F.R. part 26, 2 Implement a DBE program approved by FTA, and 3 Establish an annual DBE participation goal, (c) Special Requirements for a Transit Vehicle Manufacturer. The Recipient understands and agrees that each transit vehicle manufacturer, as a condition of being authorized to bid or propose on FTA assisted transit vehicle procurements, must certify that it has complied with the requirements of 49 C.F.R. part 26, (d) the Recipient provides assurance that: The Recipient shall not discriminate on the basis of race, color, national origin, or sex in the award and performance of any DOT assisted contract or in the administration of its DBE program or the requirements of 49 C.F.R. part 26. The Recipient shall take all necessary and reasonable steps under 49 C.F.R. part 26 to ensure nondiscrimination in the award and administration of DOT assisted contracts. The Recipient's DBE program, as required by 49 C.F.R. part 26 and as approved by DOT, is incorporated by reference in this agreement. Implementation of this program is a legal obligation and failure to carry out its terms shall be treated as a violation of this agreement. Upon notification to the Recipient of its failure to carry out its approved program, the Department may impose sanctions as provided for under 49 C.F.R. part 26 and may, in appropriate cases, refer the matter for enforcement under 18 U.S.C. § 1001 and/or the Program Fraud Civil Remedies Act of 1986, 31 U.S.C. § 3801 et seq., (2) Exception for the Tribal Transit Program. FTA exempts Indian tribes from the Disadvantaged Business Enterprise regulations at 49 C.F.R. part 26 under Map21 and previous legislation.
- E. Nondiscrimination on the Basis of Sex. The Recipient agrees to comply with Federal prohibitions against discrimination on the basis of sex, including: (1) Title IX of the Education Amendments of 1972, as amended, 20 U.S.C. § 1681 et seq., (2) U.S. DOT regulations, "Nondiscrimination on the Basis of Sex in Education Programs or Activities Receiving Federal Financial Assistance," 49 C.F.R. part 25, and (3) Federal transit law, specifically 49 U.S.C. § 5332, as stated in section a.
- F. Nondiscrimination on the Basis of Age. The Recipient agrees to comply with Federal prohibitions against discrimination on the basis of age, including: (1) The Age Discrimination in Employment Act (ADEA), 29 U.S.C. §§ 621 – 634, which prohibits discrimination on the basis of age, (2) U.S. Equal Employment Opportunity Commission (U.S. EEOC) regulations, "Age Discrimination in Employment Act," 29 C.F.R. part 1625, which implements the ADEA, (3) The Age Discrimination Act of 1975, as amended, 42 U.S.C. § 6101 et seq., which prohibits discrimination against individuals on the basis of age in the administration of programs or activities receiving Federal funds, (4) 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, which implements the Age Discrimination Act of 1975, and (5) Federal transit law, specifically 49 U.S.C. § 5332, as stated in section a.
- G. Nondiscrimination on the Basis of Disability. The Recipient agrees to comply with the following Federal prohibitions pertaining to discrimination against seniors or individuals with disabilities: (1) Federal laws, including: (a) Section 504 of the Rehabilitation Act of 1973, as amended, 29 U.S.C. § 794, which prohibits discrimination on the basis of disability in the administration of federally funded programs or activities, (b) 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 individuals with disabilities, 1 General. Titles I, II, and III of the ADA apply to FTA Recipients, but 2 Indian Tribes. While Titles II and III of the ADA apply to Indian Tribes, Title I of the ADA

exempts Indian Tribes from the definition of “employer,” (c) 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 individuals with disabilities, (d) Federal transit law, specifically 49 U.S.C. § 5332, which now includes disability as a prohibited basis for discrimination, and (e) Other applicable laws and amendments pertaining to access for elderly individuals or individuals with disabilities, (2) Federal regulations, including: (a) U.S. DOT regulations, “Transportation Services for Individuals with Disabilities (ADA),” 49 C.F.R. part 37, (b) U.S. DOT regulations, “Nondiscrimination on the Basis of Disability in Programs and Activities Receiving or Benefiting from Federal Financial Assistance,” 49 C.F.R. part 27, (c) U.S. DOT regulations, “Transportation for Individuals with Disabilities: Passenger Vessels,” 49 C.F.R. part 39, (d) Joint U.S. Architectural and Transportation Barriers Compliance Board (U.S. ATBCB) and U.S. DOT regulations, “Americans With Disabilities (ADA) Accessibility Specifications for Transportation Vehicles,” 36 C.F.R. part 1192 and 49 C.F.R. part 38, (e) U.S. DOJ regulations, “Nondiscrimination on the Basis of Disability in State and Local Government Services,” 28 C.F.R. part 35, (f) U.S. DOJ regulations, “Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities,” 28 C.F.R. part 36, (g) U.S. EEOC, “Regulations to Implement the Equal Employment Provisions of the Americans with Disabilities Act,” 29 C.F.R. part 1630, (h) U.S. Federal Communications Commission regulations, “Telecommunications Relay Services and Related Customer Premises Equipment for Persons with Disabilities,” 47 C.F.R. part 64, Subpart F, (i) U.S. ATBCB regulations, “Electronic and Information Technology Accessibility Standards,” 36 C.F.R. part 1194, and (j) FTA regulations, “Transportation for Elderly and Handicapped Persons,” 49 C.F.R. part 609, and (3) Other applicable Federal civil rights and nondiscrimination guidance.

- H. Drug or Alcohol Abuse Confidentiality and Other Civil Rights Protections. The Recipient agrees to comply with the confidentiality and civil rights protections of: (1) The Drug Abuse Office and Treatment Act of 1972, as amended, 21 U.S.C. § 1101 et seq., (2) The Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970, as amended, 42 U.S.C. § 4541 et seq., and (3) The Public Health Service Act, as amended, 42 U.S.C. §§ 290dd – 290dd2.
- I. Access to Services for People with Limited English Proficiency. Except as the Federal Government determines otherwise in writing, the Recipient agrees to promote accessibility of public transportation services to people whose understanding of English is limited by following: 1) Executive Order No. 13166, “Improving Access to Services for Persons with Limited English Proficiency,” August 11, 2000, 42 U.S.C. § 2000d1 note, and (2) U.S. DOT Notice, “DOT Policy Guidance Concerning Recipients’ Responsibilities to Limited English Proficiency (LEP) Persons,” 70 Fed. Reg. 74087, December 14, 2005.
- J. Other Nondiscrimination Laws. Except as the Federal Government determines otherwise in writing, the Recipient agrees to: (1) Comply with other applicable Federal nondiscrimination laws and regulations, and (2) Follow Federal guidance prohibiting discrimination.
- k. Remedies. Remedies for failure to comply with applicable Federal Civil Rights laws and Federal regulations may be enforced as provided in those Federal laws or Federal regulations.

2.19 Breaches and Dispute Resolution

Applicability – All contracts over \$250,000 Disputes arising in the performance of this contract which are not resolved by agreement of the parties shall be decided in writing by the recipient’s authorized representative. This decision shall be final and conclusive unless within ten days from the date of receipt of its copy, contractor mails or otherwise furnishes a written appeal to the recipient’s CEO. In connection with such appeal, contractor shall be afforded an opportunity to be heard and to offer evidence in support of its position. The decision of the recipient’s CEO shall be binding upon contractor and contractor shall abide by the decision. FTA has a vested interest in the settlement of any violation of Federal law including the False Claims Act, 31 U.S.C. § 3729.

- A. Performance during Dispute. Unless otherwise directed by the recipient, 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 his employees, agents or others for whose acts he is legally liable, a claim for damages therefore shall be made in writing to such other party within ten days after the first observance of such injury or damage.
- B. Remedies. Unless this contract provides otherwise, all claims, counterclaims, disputes and other matters in question between the recipient and contractor arising out of or relating to this agreement or its breach will be decided by arbitration if the parties mutually agree, or in a court of competent jurisdiction within the residing State. Remedies Unless this contract provides otherwise, all claims, counterclaims, disputes and other matters in question between the recipient and contractor arising out of or relating to this agreement or its breach will be decided by arbitration if the parties mutually agree, or in a court of competent jurisdiction within the residing State.

- C. Rights and Remedies. 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 recipient 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.

2.20 Disadvantaged Business Enterprises (DBE)

- A. 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 national goal for participation of Disadvantaged Business Enterprises (DBE) is 10%. The Department's overall goal for DBE participation for FY 2017-2019 is 8.58%. No DBE goal has been established for this project.
- B. The Contractor shall not discriminate on the basis of race, color, religion, 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 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 the Department deems appropriate. Each subcontract the Contractor signs with a subcontractor must include the assurance in this paragraph (see 49 CFR 26.13(b)).
- C. If a separate contract goal has been established, bidders/offerors are required to document sufficient DBE participation to meet these goals or, alternatively, document adequate good faith efforts to do so, as provided for in 49 CFR 26.53.
- D. If no separate contract goal has been established, the successful bidder/offeror will be required to report its DBE participation obtained through race-neutral means throughout the period of performance.
- E. 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 after the Contractor's receipt of payment for that work from the recipient. In addition, the Contractor may not hold retainage from its subcontractors or must return any retainage payments to those subcontractors within 30 days after the subcontractor's work related to this contract is satisfactorily completed or must return any retainage payments to those subcontractors within 30 days after incremental acceptance of the subcontractor's work by the recipient and Contractor's receipt of the partial retainage payment related to the subcontractor's work.
- F. The Contractor must promptly notify the Department whenever a DBE performing subcontracting 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 Department.

The Department utilizes the most recent copy of the Arkansas Department of Transportation's DBE Directory, which identifies all firms eligible to participate as DBEs. The directory lists the firm's name, address, phone number, date of the most recent certification, and the type of work the firm has been certified to perform as a DBE. The directory is available online at www.ardot.gov/ProgCon/letting/dbedirectory.pdf

2.21 Prompt Payment

Applicability – All contracts except micro-purchases (\$3,500 or less, except for construction contracts over \$2,000)
The prime Contractor agrees to pay each subcontractor under this prime contract for satisfactory performance of its contract no later than thirty (30) days from the receipt of each payment the prime Contractor receives from the Department. The prime Contractor agrees further to return retainage payments to each subcontractor within thirty (30) days after the subcontractors work is satisfactorily completed. Any delay or postponement of payment from the above referenced time frame may occur only for good cause following the written approval from the Department. This clause applies to both DBE and non-DBE subcontracts.

2.22 Incorporation of Federal Transit Administration (FTA) Terms

Applicability – All contracts except micro-purchases (\$10,000 or less, except for construction contracts over \$2,000)
The preceding provisions include, in part, certain Standard Terms & Conditions required by USDOT, whether or not expressly stated in the preceding contract provisions. All USDOT required contractual provisions, as stated in FTA Circular 4220.1F, 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 request that would cause the recipient to be in violation of FTA terms and conditions.

OTHER FEDERAL REQUIREMENTS

2.23 Full and Open Competition

In accordance with 49 U.S.C. § 5325(h) all procurement transactions shall be conducted in a manner that provides full and open competition.

2.24 Prohibition Against Exclusionary or Discriminatory Specifications

Apart from inconsistent requirements imposed by Federal statute or regulations, the contractor shall comply with the requirements of 49 USC 5323(h)(2) by refraining from using any FTA assistance to support procurements using exclusionary or discriminatory specifications.

2.25 Conformance with ITS National Architecture

Contractor shall conform, to the extent applicable, to the National Intelligent Transportation Standards architecture as required by SAFETEA-LU Section 5307(c), 23 U.S.C. Section 512 note and follow the provisions of FTA Notice, "FTA National Architecture Policy on Transit Projects," 66 Fed. Reg. 1455 et seq., January 8, 2001, and any other implementing directives FTA may issue at a later date, except to the extent FTA determines otherwise in writing.

2.26 Access Requirements for Persons with Disabilities

Contractor shall comply with 49 USC 5301(d), stating Federal policy that the elderly and persons with disabilities have the same rights as other persons to use mass transportation services and facilities and that special efforts shall be made in planning and designing those services and facilities to implement that policy. Contractor shall also comply with all applicable requirements of Sec. 504 of the Rehabilitation Act (1973), as amended, 29 USC 794, which prohibits discrimination on the basis of handicaps, and the Americans with Disabilities Act of 1990 (ADA), as amended, 42 USC 12101 et seq., which requires that accessible facilities and services be made available to persons with disabilities, including any subsequent amendments thereto.

2.27 Notification of Federal Participation

To the extent required by law, in the announcement of any third party contract award for goods and services (including construction services) having an aggregate value of \$500,000 or more, contractor shall specify the amount of Federal assistance to be used in financing that acquisition of goods and services and to express that amount of Federal assistance as a percentage of the total cost of the third party contract.

2.28 Interest of Members of or Delegates to Congress

No member of, or delegate to, the Congress of the United States shall be admitted to any share or part of this contract or to any benefit arising therefrom.

2.29 Ineligible Contractors and Subcontractors

Any name appearing upon the Comptroller General's list of ineligible contractors for federally assisted contracts shall be ineligible to act as a subcontractor for contractor pursuant to this contract. If contractor is on the Comptroller General's list of ineligible contractors for federally financed or assisted construction, the recipient shall cancel, terminate or suspend this contract.

2.30 Other Contract Requirements

To the extent not inconsistent with the foregoing Federal requirements, this contract shall also include those standard clauses attached hereto, and shall comply with the recipient's Procurement Guidelines, available upon request from the recipient.

2.31 Compliance With Federal Regulations

Any contract entered pursuant to this solicitation shall contain the following provisions: All USDOT required contractual provisions, as set forth in FTA Circular 4220.1F, are incorporated by reference. Anything to the contrary herein notwithstanding, FTA mandated terms shall control in the event of a conflict with other provisions contained in this Agreement. Contractor shall not perform any act, fail to perform any act, or refuse to comply with any grantee request that would cause the recipient to be in violation of FTA terms and conditions. Contractor shall comply with all applicable FTA regulations, policies, procedures and directives, including, without limitation, those listed directly or incorporated by reference in the Master Agreement between the recipient and FTA, as 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.

2.32 Real Property

Any contract entered into shall contain the following provisions: Contractor shall at all times comply with all applicable statutes and USDOT regulations, policies, procedures and directives governing the acquisition, use and disposal of real property, including, but not limited to, 49 CFR 18.3118.34, 49 CFR 19.3019.37, 49 CFR Part 24, 49 CFR 5326 as amended by Map21, 49 CFR part 18 or 19, 49 USC 5334, applicable FTA Circular 5010, and FTA Master Agreement, as they may be amended or promulgated during the term of this contract. Contractor's failure to so comply shall constitute a material breach of this contract.

2.33 Access to Services for Persons with Limited English Proficiency

To the extent applicable and except to the extent that FTA determines otherwise in writing, the Recipient agrees to comply with the policies of Executive Order No. 13166, "Improving Access to Services for Persons with Limited English Proficiency," 42 U.S.C. § 2000d 1 note, and with the provisions of U.S. DOT Notice, "DOT Guidance to Recipients on Special Language Services to Limited English Proficient (LEP) Beneficiaries," 70 Fed. Reg. 74087, December 14, 2005.

2.34 Environmental Justice

Except as the Federal Government determines otherwise in writing, the Recipient agrees to promote environmental justice by following: (1) Executive Order No. 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations," February 11, 1994, 42 U.S.C. § 4321 note, as well as facilitating compliance with that Executive Order, and (2) DOT Order 5610.2, "Department of Transportation Actions To Address Environmental Justice in Minority Populations and Low Income Populations," 62 Fed. Reg. 18377, April 15, 1997, and (3) The most recent and applicable edition of FTA Circular 4703.1, "Environmental Justice Policy Guidance for Federal Transit Administration Recipients," August 15, 2012, to the extent consistent with applicable Federal laws, regulations, and guidance,

2.35 Environmental Protections

Compliance is required with any applicable Federal laws imposing environmental and resource conservation requirements for the project. Some, but not all, of the major Federal laws that may affect the project include: the National Environmental Policy Act of 1969; the Clean Air Act; the Resource Conservation and Recovery Act; the comprehensive Environmental response, Compensation and Liability Act; as well as environmental provisions with Title 23 U.S.C., and 49 U.C. chapter 53. The U.S. EPA, FHWA and other federal agencies may issue other federal regulations and directives that may affect the project. Compliance is required with any applicable Federal laws and regulations in effect now or that become effective in the future.

2.36 Geographic Information and Related Spatial Data

(NOT APPLICABLE TO THE TRIBAL TRANSIT PROGRAM) Any project activities involving spatial data or geographic information systems activities financed with Federal assistance are required to be consistent with the National Spatial Data Infrastructure promulgated by the Federal Geographic Data Committee, except to the extent that FTA determines otherwise in writing.

2.37 Geographic Preference

All project activities must be advertised without geographic preference, (except in A/E under certain circumstances, preference for hiring veterans on transit construction projects and geographic-based hiring preferences as proposed to be amended in 2 CFR Part 1201).

2.38 Federal Single Audit Requirements

For State Administered Federally Aid Funded Projects Only Non Federal entities that expend \$750,000 or more in a year in Federal awards from all sources are required to comply with the Federal Single Audit Act provisions contained in U.S. Office of Management and Budget (OMB) Circular No. A 133, "Audits of States, Local Governments, and Non Profit Organizations" (replaced with 2 CFR Part 200, "Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards" effective December 26, 2014 as applicable). Non Federal entities that expend Federal awards from a single source may provide a program specific audit, as defined in the Circular. Non Federal entities that expend less than the amount above in a year in Federal awards from all sources are exempt from Federal audit requirements for that year, except as noted in Sec. 215 (a) of OMB Circular A133 Subpart BAudits, records must be available for review or audit by appropriate officials of the cognizant Federal agency the New York State Department of Transportation, the New York State Comptrollers Office and the U.S. Governmental Accountability Office (GAO). Non Federal entities are required to submit a copy of all audits, as described above, within 30 days of issuance of audit report, but no later than 9 months after the end of the entity's fiscal year, to the New York State Department of Transportation, Contract Audit Bureau, 50 Wolf Road, Albany, NY 12232. Unless a time extension has been granted by the cognizant Federal Agency and has been filed with the New York State Department of Transportation's Contract Audit Bureau, failure to comply with the requirements of OMB Circular A133 may result in suspension or termination of Federal award payments. Catalog of Federal Domestic Assistance (CFDA) Identification

Number The municipal project sponsor is required to identify in its accounts all Federal awards received and expended, and the Federal programs under which they were received. Federal program and award identification shall include, as applicable, the CFDA title and number, award number and year, name of the Federal agency, and name of the pass through entity.

2.39 Veterans Preference

As provided by 49 U.S.C. 5325(k), to the extent practicable, the Recipient agrees and assures that each of its Sub-recipients: (1) Will give a hiring preference to veterans, as defined in 5 U.S.C. § 2108, who have the skills and abilities required to perform construction work required under a third party contract in connection with a Capital Project supported with federal assistance appropriated or made available for 49 U.S.C. chapter 53, and (2) Will not require an employer to give a preference to any veteran over any equally qualified applicant who is a member of any racial or ethnic minority, female, an individual with a disability, or a former employee.

2.40 Safe Operation of Motor Vehicles

a. Seat Belt Use. The Recipient agrees to implement Executive Order No. 13043, "Increasing Seat Belt Use in the United States," April 16, 1997, 23 U.S.C. § 402 note, (62 Fed. Reg. 19217), by: (1) Adopting and promoting 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, and (2) Including a "Seat Belt Use" provision in each third party agreement related to the Award. b. Distracted Driving, Including Text Messaging While Driving. The Recipient agrees to comply with: (1) Executive Order No. 13513, "Federal Leadership on Reducing Text Messaging While Driving," October 1, 2009, 23 U.S.C. § 402 note, (74 Fed. Reg. 51225), (2) U.S. DOT Order 3902.10, "Text Messaging While Driving," December 30, 2009, and (3) The following U.S. DOT Special Provision pertaining to Distracted Driving: (a) Safety. The Recipient 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 Recipient owns, leases, or rents, or a privately-owned vehicle when on official business in connection with the Award, or when performing any work for or on behalf of the Award, (b) Recipient Size. The Recipient agrees to conduct workplace safety initiatives in a manner commensurate with its size, such as establishing new rules and programs to prohibit text messaging while driving, reevaluating the existing programs to prohibit text messaging while driving, and providing education, awareness, and other outreach to employees about the safety risks associated with texting while driving, and (c) Extension of Provision. The Recipient agrees to include the preceding Special Provision of section 34.b(3)(a) – (b) of this Master Agreement in its third party agreements, and encourage its Third Party Participants to comply with this Special Provision, and include this Special Provision in each third party subagreement at each tier supported with federal assistance.

2.41 Catalog of Federal Domestic Assistance (CFDA) Identification Number

The municipal project sponsor is required to identify in its accounts all Federal awards received and expended, and the Federal programs under which they were received. Federal program and award identification shall include, as applicable, the CFDA title and number, award number and year, name of the Federal agency, and name of the pass through entity.

2.42 The CFDA number for the Federal Transit Administration

Rural Area Formula (Section 5311) is 20.509. A Recipient covered by the Single Audit Act Amendments of 1996 and OMB Circular A133, "Audits of States, Local Governments, and Non-Profit Organizations," (replaced with 2 CFR Part 200, "Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards" effective December 26, 2014 as applicable) agrees to separately identify the expenditures for Federal awards under the Recovery Act on the Schedule of Expenditures of Federal Awards (SEFA) and the Data Collection Form (SFSAC) required by OMB Circular A133. The Recipient agrees to accomplish this by identifying expenditures for Federal awards made under Recovery Act separately on the SEFA, and as separate rows under Item 9 of Part III on the SFSAC by CFDA number, and inclusion of the prefix "ARRA" in identifying the name of the Federal program on the SEFA and as the first characters in Item 9d of Part III on the SFSAC.

2.43 Organizational Conflicts of Interest

The Recipient agrees that it will not enter into a procurement that involves a real or apparent organizational conflict of interest described as follows: (1) When It Occurs. An organizational conflict of interest occurs when the Project work, without appropriate restrictions on certain future activities, results in an unfair competitive advantage: (a) To that Third Party Participant or another Third Party Participant performing the Project work, and (b) That impairs that Third Party Participant's objectivity in performing the Project work, or (2) Other. An organizational conflict of interest may involve other situations resulting in fundamentally unfair competitive conditions, (3) Disclosure Requirements.

Consistent with FTA policies, the Recipient must disclose to FTA, and each of its Sub-recipients must disclose to the Recipient: (a) Any instances of organizational conflict of interest, or (b) Violations of federal criminal law, involving

fraud, bribery, or gratuity violations potentially affecting the federal award, and (4) Failure to Disclose. Failure to make required disclosures can result in remedies for noncompliance, including debarment or suspension.

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**PART III – REQUIRED PRICE PROPOSAL FORM
RETURN WITH YOUR PROPOSAL**

The Procuring Agencies reserve the right to order buses and equipment over the five (5) year period beginning upon the date of contract execution. The prices of such buses and equipment shall be the prices quoted below. These prices shall remain fixed for any orders issued by the Procuring Agency within a period of ninety (90) days of contract award. The price(s) of any buses or equipment ordered by the Procuring Agency after the initial ninety (90) days firm fixed price period shall be that quoted (Base Order Prices) plus any escalation which will be calculated based on the following formula which utilizes the U.S. Department of Labor / Bureau of Labor Statistics Producer Price Index (“PPI”) Category 1413, “Trucks and Bus Bodies”. The escalation in this index will be used to adjust the Base Order Prices. However, in no event will the prices for any purchase order release exceed, by more than 5%, the price(s) that would have been in effect twelve (12) months prior to the date of the release if the base price of the date of the purchase order release is less than twelve (12) months after the initial contract award.

FORMULA EXAMPLE:

PPI Index: Future Award Month	141.1
Less PPI Index: Base Award Month	137.6
Equals Index Point Change	3.5
Divided by PPI Index: Base Award Month	137.6
Equals	.0254
Results Multiplied by 100	.0254 * 100
Equals Percent Change	2.54%
Base Order Price	\$1,000.00
Plus Percent Change (2.54% * \$1,000.00)	\$25.40
Revised Price for Future Order	\$1,025.40

**PART III – REQUIRED PRICE PROPOSAL FORM
RETURN WITH YOUR PROPOSAL**

Significant Equipment Modifications. If any significant equipment modifications are made, in compliance with Section 2.14 (entitled “Contract Modifications”), under the Terms and Conditions of this contract, the Department and Contractor will enter into negotiations to determine the price of the equipment modification(s) and the impact of the modification(s) on the Base Order Price(s).

The following calculations will be used to convert the then current price of the modification(s) to the value of the modification(s) on the date of the Base Order Price:

FORMULA EXAMPLE:

PPI Index: Future Equipment Modification Month	141.1
Less PPI Index: Base Award Month	137.6
Equals Index Point Change	3.5
Divided by PPI Index: Base Award Month	137.6
Equals	.0254
Results Multiplied by 100	.0254 * 100
Equals Percent Change	2.54%
Future Equipment Modification Price	\$200.00
Less Percentage Change (2.54% * \$200.00)	\$5.08
Value of Equipment Modification During Base Award Month	\$194.92
Base Award Price	\$1,000.00
Plus Equipment Modification Cost	\$194.92
Equals Revised Base Order Price	\$1,194.92

All future releases, including the equipment modification(s) will be priced based upon the new revised Base Order Price.

**PART III – REQUIRED PRICE PROPOSAL FORM
RETURN WITH YOUR PROPOSAL**

Major Component Equipment Items

Each Proposer shall furnish a detailed pricing sheet for each major Contract Line Item Number (CLIN). Please indicate the manufacturer and model number of the major components included in your base price (reflected in the CLIN's above) and the available options on a per bus add/delete cost.

CLIN	Description	Cost
1	Bus, CNG, 35 Foot Low Floor, 102" Wide	\$
2	Bus, CNG, 40 Foot Low Floor, 102" Wide	\$
3	Bus, Diesel, 35 Foot Low Floor, 102" Wide	\$
4	Bus, Diesel, 40 Foot Low Floor, 102" Wide	\$
5	Weighted Delivery Charge for Arkansas Agencies	\$
Company Name		
Printed or Typed Name of Authorized Official		
Signature		
Date		

Optional Equipment

Each Proposer shall include with the proposal response pricing on a per-bus add/delete cost basis for the optional equipment listed in the RFP and any other equipment available.

**PART IV – ADDITIONAL REQUIRED PROPOSAL FORMS
ATTACHMENT A – PROPOSER QUESTIONNAIRE
RETURN WITH YOUR PROPOSAL**

1. SUBMITTING BUSINESS ENTITY IDENTIFICATION & OWNERSHIP DISCLOSURE

Company: _____

DUNS Number: _____

Contact Person: _____

Title: _____

Address: _____

Phone: _____

Email: _____

Organized under the laws of the State of _____

Principal place of business located at _____

Taxpayer Identification Number: _____

DUNS Number: _____

Indicate which the following apply:

- Corporation
- Partnership
- Sole Proprietor
- Small Business
- Disadvantaged Business Enterprise (DBE)

Certified By Arkansas Unified Certification Program (Yes/No)? _____

2. OTHER INFORMATION

1. General character of work performed by your firm:

2. Has your firm ever failed to complete any work awarded to you? If yes, explain.

**PART IV – ADDITIONAL REQUIRED PROPOSAL FORMS
ATTACHMENT A – PROPOSER QUESTIONNAIRE
RETURN WITH YOUR PROPOSAL**

3. Has your firm ever defaulted on a contract? If yes, explain.

4. Indicate the names of subcontractors, if any, proposed for this project and whether the subcontractor is a certified Disadvantaged Business Enterprise (DBE) and by whom they are certified.

5. Please indicate if your firm, subcontractor or any persons associated therewith in the capacity of owner, partner, director, officer or any other position involving the administration of federal funds:

- is currently under suspension, debarment, voluntary exclusion, or determination of ineligibility of any federal agency;
- Has been suspended, debarred, voluntarily excluded, or determined ineligible by any federal agency within the last three (3) years;
- Has a proposed debarment pending; or
- Has been indicted, convicted, or had a civil judgment rendered against it or them by a court of competent jurisdiction in any matter involving fraud or official misconduct within the last three (3) years.

CERTIFICATION

I certify that this proposal is made without prior understanding, agreement, or connection with any corporation, firm or person submitting a proposal for the same services, materials, supplies or equipment, and is in all respects fair and without collusion or fraud. I understand collusive bidding is a violation of State and Federal law and can result in fines, prison sentences, and civil damage awards.

I hereby certify that the responses to the above representations, certifications, and other statements are accurate and complete. I agree to abide by all conditions of the Request for Proposals and certify that I am authorized to sign for the Proposer.

Signature _____ Date _____

Printed Name _____ Title _____

**PART IV – ADDITIONAL REQUIRED PROPOSAL FORMS
ATTACHMENT B – GENERAL CERTIFICATIONS
RETURN WITH YOUR PROPOSAL**

In submitting this proposal, the undersigned certifies on behalf of its firm and any proposed subcontractors as follows:

Eligible Proposer:

The proposer warrants and represents that neither the proposer nor its subcontractors: (1) 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 of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property; (2) 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 item (1) of this certification; and (3) 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.

Proposal Validity:

If this offer is accepted within ninety (90) calendar days from the due date, to furnish any or all services upon which prices are offered at the designated point within the time specified.

Non-Collusion:

The proposer has made this offer independently, without consultation, communication, or agreement for the purpose of restricting competition as to any matter relating to this RFP with any other firm or with any other competitor.

Non-Conflict:

The proposer presents and warrants that no employee, official, board member or family member of the Department/Procuring Agencies is or will be pecuniary benefited directly or indirectly in this Contract.

Covenant Against Gratuities:

The proposer nor any of its employees, representatives, or agents have offered or given gratuities (in the form of entertainment, gifts, or otherwise) to any director, officer, or employee of the Department/Procuring Agencies with the view toward securing favorable treatment in the awarding, amending, or the making of any determination with respect to the performance of this Contract.

Integrity and Ethics:

The proposer has a satisfactory record of integrity and business ethics, in compliance with 49 U.S.C. Section 5325(j)(2)(A).

Public Policy:

The proposer is in compliance with the public policies of the Federal Government, as required by 49 U.S.C. Section 5325(j)(2)(B).

Administrative and Technical Capacity:

The proposer has the necessary organization, experience, accounting, and operational controls, and technical skills, or the ability to obtain them, in compliance with 49 U.S.C. Section 5325(j)(2)(D).

Licensing and Taxes:

The proposer is in compliance with applicable licensing and tax laws and regulations.

Financial Resources:

The proposer has, or can obtain, sufficient financial resources to perform the contract, as required by 49 U. S. C. Section 5325 (j)(2)(D).

**PART IV – ADDITIONAL REQUIRED PROPOSAL FORMS
ATTACHMENT B – GENERAL CERTIFICATIONS
RETURN WITH YOUR PROPOSAL**

Timeliness:

The proposer is able to comply with the required delivery or performance schedule, taking into consideration all existing commercial and governmental business commitments.

Performance Record:

The proposer is able to provide a satisfactory current and past performance record.

Employment of Illegal Immigrants:

The proposer certifies that they will not employ or contract with any illegal immigrants in their contracts with the Authority, as required by ACA § 19-11-105.

Certification Signature:

The proposer attests to these certifications by signature of this document.

Signature

Printed Name

Title

Date

PART IV – ADDITIONAL REQUIRED PROPOSAL FORMS
ATTACHMENT C – GOVERNMENT-WIDE DEBARMENT AND SUSPENSION (NONPROCUREMENT)
RETURN WITH YOUR PROPOSAL

Instructions for Certification: By signing and submitting this bid or proposal, the prospective participant is providing the signed certification set out below.

The Contractor agrees:

- (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 Government-wide Debarment and Suspension (Nonprocurement),” 2 CFR part 180.
- (2) To the best of its knowledge and belief, that its Principals or Sub-recipients at the first tier:
 - a. Are eligible to participate in covered transactions of any federal department agency and are not presently:
 - i. Debarred
 - ii. Suspended
 - iii. Proposed for debarment
 - iv. Declared ineligible
 - v. Voluntarily excluded or
 - vi. Disqualified.
 - b. Its management has not within the last three-year period preceding its latest application or proposal been convicted of or had a civil judgment rendered against any of them for:
 - i. 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;
 - ii. Violation of any federal or state antitrust statute; or
 - iii. 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 2b 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 2a – 2d 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:
 - i. Equals or exceeds \$25,000;
 - ii. Is for audit services, or;
 - iii. Requires the consent of a federal official, and;
 - g. It will require that each covered lower tier contractor and subcontractor:
 - i. Comply and facilitate compliance with the federal requirements of 2 CFR parts 180 and 1200, and;
 - ii. Assure that each lower tier participant in its project is not presently declared by any federal department or agency to be:
 1. Debarred;
 2. Suspended;
 3. Proposed for debarment;
 4. Declared ineligible;
 5. Voluntarily excluded; or
 6. Disqualified.

PART IV – ADDITIONAL REQUIRED PROPOSAL FORMS
ATTACHMENT C – GOVERNMENT-WIDE DEBARMENT AND SUSPENSION (NONPROCUREMENT)
RETURN WITH YOUR PROPOSAL

(3) It will provide a written explanation as indicated on a page attached in FTA's TrAMS Website or the Signature Page if it or any of its principals, including any of its first tier Sub-recipients or its Third Party Participants at a lower tier, is unable to certify compliance with the preceding statements in this Certification Group.

Contractor _____

Type or Print Name of Authorized Official: _____

Signature of Authorized Official _____ Date _____

Name and Title of Contractor's Authorized Official _____

**PART IV – ADDITIONAL REQUIRED PROPOSAL FORMS
ATTACHMENT D – CERTIFICATION AND RESTRICTIONS ON LOBBYING
RETURN WITH YOUR PROPOSAL**

I, _____, hereby certify (Name and Title of Official)

On behalf of _____ (Name of Bidder/Company Name) that:

The undersigned certifies, to the best of his or her 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 an agency, a member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with the awarding of any federal contract, the making of any federal grant, the making of any federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any federal contract, grant, loan, or cooperative agreement.
2. 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, an 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.
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 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. § 3801, et seq., are applicable thereto.

Name of Bidder/Company Name: _____

Type or Print Name of Authorized Official: _____

Signature of Authorized Official: _____ Date _____

Title of Authorized Official: _____

Signature of Notary and SEAL: _____

**PART IV – ADDITIONAL REQUIRED PROPOSAL FORMS
ATTACHMENT E – BUY AMERICA CERTIFICATION OF COMPLIANCE
RETURN WITH YOUR PROPOSAL**

Certification of **Compliance** with Rolling Stock Buy America Requirements

The bidder or offeror hereby certifies that it will comply with the requirements of 49 U.S.C. 5323(j)(2)I, and the applicable regulations in 49 CFR Part 661.

Company _____

Name _____ Title _____

Signature _____ Date _____

Certificate of **Non-Compliance** with Rolling Stock Buy America Requirements

The bidder or offeror hereby certifies that it cannot comply with the requirements of 49 U.S.C. 5323(j)(2)I, but may qualify for an exception pursuant to 49 U.S.C. § 5323(j)(2)(B) or (j)(2)(D), as amended, and the applicable regulations in 49 CFR 661.7.

Company _____

Name _____ Title _____

Signature _____ Date _____

**PART IV – ADDITIONAL REQUIRED PROPOSAL FORMS
ATTACHMENT F – FMVSS CERTIFICATION
RETURN WITH YOUR PROPOSAL**

The Proposer and (if selected) Contractor shall submit one (1) manufacturer’s FMVSS self-certification sticker information proving that the vehicle complies with relevant FMVSS or (2) manufacturer’s certified statement that the contracted buses will not be subject to FMVSS regulations.

Name of Organization _____

Signature of Authorized Official _____ Date _____

Name and Title of Authorized Official _____

PART IV – ADDITIONAL REQUIRED PROPOSAL FORMS
ATTACHMENT G – CERTIFICATION OF COMPLIANCE WITH FTA’S BUS TESTING REQUIREMENTS
RETURN WITH YOUR PROPOSAL

The undersigned (Contractor/Manufacturer) certifies that the vehicle model or models offered in this proposal 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 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 Organization _____

Type or Print Name of Authorized Official _____

Signature of Authorized Official _____ Date _____

Signature of Notary and SEAL _____

Date of Notary Signature _____

**PART IV – ADDITIONAL REQUIRED PROPOSAL FORMS
ATTACHMENT H – BUS TESTING CERTIFICATION
RETURN WITH YOUR PROPOSAL**

The undersigned hereby certifies that the model of bus(es) being offered in this proposal has met the requirements imposed by 49 CFR Part 665, Bus Testing, including the following two (2) conditions:

- (1) A model of the bus(es) has been tested at the bus testing facility in Altoona, Pennsylvania; and
- (2) The proposal includes a copy of the Test Report prepared on the bus model(s) offered.

Name of Organization _____

Type or Print Name of Authorized Official _____

Signature of Authorized Official _____ Date _____

Signature of Notary and SEAL _____

Date of Notary Signature _____

PART IV – ADDITIONAL REQUIRED PROPOSAL FORMS
ATTACHMENT I – TRANSIT VEHICLE MANUFACTURER CERTIFICATION
RETURN WITH YOUR PROPOSAL
(Bus or Rail Car Purchases Only)

CERTIFICATION OF DISADVANTAGED BUSINESS ENTERPRISES (DBE) COMPLIANCE

The Proposer, a Primary Transit Vehicle Manufacturer, hereby certifies that it has complied with the requirements of 49 CFR Section 26.49, as amended, by submitting an annual DBE goal to the Federal Transit Administration (FTA). The goal has either been approved or not disapproved by the FTA.

Name of Organization _____

Signature of Authorized Official _____ Date _____

Name and Title of Authorized Official _____

**PART IV – ADDITIONAL REQUIRED PROPOSAL FORMS
ATTACHMENT J – NON-COLLUSION CERTIFICATION
RETURN WITH YOUR PROPOSAL**

By submission of this proposal, the undersigned Offeror affirms under penalty of perjury that:

- (1) The prices in this proposal have been arrived at independently without collusion, consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other Offeror or with any competitor;
- (2) Unless otherwise required by law, the prices which have been quoted in this proposal have not been knowingly disclosed by the Offeror and will not knowingly be disclosed by the Offeror prior to opening, directly or indirectly, to any other Offeror or to any competitor; and
- (3) No attempt has been made or will be made by the Offeror to induce any other person, partnership or corporation to submit or not submit a proposal for the purpose of restricting competition.
- (4) The proposal was not made in the interest of or on behalf of any undisclosed person, partnership, company, organization or corporation.
- (5) Each person signing the proposal certifies that:
 - a. He is the person in the Proposer's organization responsible within that organization for the decision as to prices being offered in the proposal and that he has not participated and will not participate in any action contrary to (1-4) above; or
 - b. He is not the person in the Proposer's organization responsible within that organization for the decision as to prices being offered in the proposal but that he has been authorized in writing to act as agent for the persons responsible for such decisions in certifying that such persons have not participated, and will not participate, in any action contrary to (1-4) above, and that as their agent, does hereby so certify; and that he has not participated, and will not participate in any action contrary to (1-4) above.

Name of Organization _____

Signature of Authorized Official _____ Date _____

Name and Title of Authorized Official _____

**PART IV – ADDITIONAL REQUIRED PROPOSAL FORMS
ATTACHMENT K – VEHICLE AND CONTRACTOR INFORMATION QUESTIONNAIRE
RETURN WITH YOUR PROPOSAL**

The proposer shall attach to this form:

- (1) A listing of current clients, including references with contact information including:
 - a. Name
 - b. Address
 - c. Phone Number
 - d. Email
 - e. Type and quantities of buses purchased in the last 3 years
- (2) A listing of staff that will be assigned to the contract (sales, customer service, technical assistance), along with information demonstrating their experience and capabilities.
- (3) The address of the manufacturing facilities where the buses will be constructed.
- (4) The technical sheets below for each size/model bus proposed.

Bus Manufacturer: _____

Bus Model Number: _____

Basic Body Construction Type: _____

General Dimensions

Overall length	Over bumpers	<input type="text"/>	feet	<input type="text"/>	inches
	Over body	<input type="text"/>	feet	<input type="text"/>	inches
Overall width	Over body excluding mirrors and lights	<input type="text"/>	feet	<input type="text"/>	inches
	Over body including mirrors	<input type="text"/>	feet	<input type="text"/>	inches
	Over tires	<input type="text"/>	feet	<input type="text"/>	inches
Overall height (maximum)		<input type="text"/>	feet	<input type="text"/>	inches

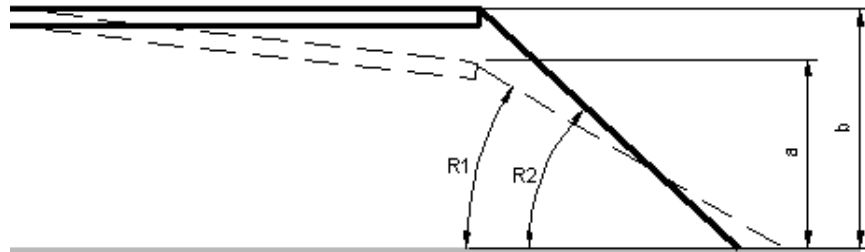
Angle of approach	<input type="text"/>	degrees
Angle of departure	<input type="text"/>	degrees
Breakover angle 1	<input type="text"/>	degrees
Breakover angle 2	<input type="text"/>	degrees

Doorway clear opening (at widest point) inches

	Width with grab handles	Width without grab handles	Height
Front door	<input type="text"/> inches	<input type="text"/> inches	<input type="text"/> inches
Center door (1)	<input type="text"/> inches	<input type="text"/> inches	<input type="text"/> inches
Center door (2)	<input type="text"/> inches	<input type="text"/> inches	<input type="text"/> inches

Rear door inches inches inches

Front axle floor height above ground (centerline of bus) inches
 Center axle floor height above ground (centerline of bus) inches
 Rear axle floor height above ground (centerline of bus) inches
 Step height from ground (measured at center of doorway) inches



	Front doorway	Center doorway	Ramp angle	Rear doorway
Kneeled	<input type="text"/> inches (a)	<input type="text"/> inches (a)	<input type="text"/> degrees (R1)	<input type="text"/> inches (a)
Unkneeled	<input type="text"/> inches (b)	<input type="text"/> inches (b)	<input type="text"/> degrees (R2)	<input type="text"/> inches (b)

Interior head room (floor to ceiling at center of aisle)

First axle location inches
 Center of articulation inches
 Rear axle location inches
 Rear settee (in front of seat) inches

Aisle width

Minimum width on floor between first axle wheel housings inches
 Minimum width on floor between center axle (1) wheel housings inches
 Minimum width on floor between center axle (2) wheel housings inches
 Minimum width on floor between rear axle wheel housings inches

Minimum ground clearance

Outside axles zones inches
 Inside axles zones inches

Horizontal turning envelope (see diagram below)

Outside body turning radius, TR0 (including bumper) feet inches
 Inside Body Turning Radius innermost point, TR4 (including bumper) feet inches

Wheel base

First axle to center/rear axle inches
 Center axle to rear axle inches

Overhang, centerline of axle over bumper

Front inches
 Rear inches

Floor

Maximum interior floor slope (from horizontal) degrees

Capacity

Total number of passenger sittings
 Passenger seating manufacturer/model number
 Total number of standing passengers (1 per 1.5 sq. ft.)
 Minimum hip to knee space inches
 Maximum hip to knee space inches
 Restraint system type and model number

Bus weight

	Curb weight		Curb weight plus seated load*		GVWR	
First axle	<input type="text"/>	lbs	<input type="text"/>	lbs	<input type="text"/>	lbs
Center axle	<input type="text"/>	lbs	<input type="text"/>	lbs	<input type="text"/>	lbs
Rear axle	<input type="text"/>	lbs	<input type="text"/>	lbs	<input type="text"/>	lbs
Total	<input type="text"/>	lbs	<input type="text"/>	lbs	<input type="text"/>	lbs

* Including operator and passengers at 150 lbs per person

Steering Axles

Manufacturer
 Type and weight rating
 Model number

Drive axle (Center Rear)

Manufacturer
 Type and weight rating
 Model number

Drive axle ratio

Differential ratio
 Hub reduction ratio (if used)
 Final axle ratio (if hub reduction is used)

Brake system

Make/type of fundamental system
 First axle brake chamber model
 Center axle brake chamber model
 Rear axle brake chamber model

First axle slack adjuster

Manufacturer

Model number

Center axle slack adjuster

Manufacturer

Model number

Rear axle slack adjuster

Manufacturer

Model number

First axle brake drum/rotor

Manufacturer

Center axle brake drum/rotor

Manufacturer

Rear axle brake drum/rotor

Manufacturer

Air compressor

Manufacturer

Type

Model number

Rated capacity cfm

Capacity at idle cfm

Maximum warranted speed rpm

Idle speed rpm

Drive type

Governor cut-in pressure psi

Governor cut-out pressure psi

Air Reservoir Capacity

Manufacturer

Supply reservoir number and size / cubic inches total

Primary reservoir number and size / cubic inches total

Secondary reservoir number and size / cubic inches total

Parking reservoir number and size / cubic inches total

Accessory reservoir number and size / cubic inches total

Other reservoir number and size / cubic inches total

Cooling System

	Radiator	Charge air cooler
Manufacturer	<input type="text"/>	<input type="text"/>
Type	<input type="text"/>	<input type="text"/>
Model number	<input type="text"/>	<input type="text"/>
Number of tubes	<input type="text"/>	<input type="text"/>

Fins per inch		
Fin thickness (inches)		
Fin construction		

Total cooling system capacity (gallons)		gallons
Radiator fan manufacturer		
Fan speed/control type (mech/elect/hyb)		
Surge tank capacity		gallons
Surge tank material		
Overheat alarm temperature		degrees F
Shutdown temperature settings		degrees F

Electrical

Primary interior lighting system

Manufacturer	
Type	
Model number	

Alternator

Manufacturer		
Type		
Model number		
Output at idle		amps

Voltage regulator

Manufacturer		
Model number		

Voltage equalizer

Manufacturer		
Model number		

Auxiliary inverter (120/240)

Manufacturer		
Model number		
Inverter technology		
Output voltage(s)		

Starter motor

Manufacturer		
Voltage		
Model number		

Batteries/energy storage – low voltage

Manufacturer		
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Type	
Model number	
Cold cranking amps	

Batteries/energy storage – high voltage

Manufacturer	
Type	
Model number	
Energy density	
Specific power	
Operating temperature range	
Cooling/heating system	

Engine

Manufacturer	
Model number/version	
Horsepower/torque rating	

Fire Suppression/Methane Detection System

Manufacturer		
Model number		
Number of detectors	<input type="text"/> fire	<input type="text"/> methane
Type of detector	<input type="checkbox"/> Thermal <input type="checkbox"/> Optical	
Battery backup	<input type="checkbox"/> Yes <input type="checkbox"/> No	

Bumpers

Manufacturer	
Type	

Fuel and Exhaust System

Fuel type	
Operating range and route profile	

Fuel tanks (liquid fuels)

Manufacturer			
Capacity (total and usable)	<input type="text"/> Gallons	/	<input type="text"/> Gallons
Construction material			
Quantity and location of tanks			

Fuel tanks (gaseous fuels)

Manufacturer			
Capacity (total and usable)	<input type="text"/> SCF	/	<input type="text"/> SCF
Construction material			
Quantity and location of tanks			

Bolt circle diameter

Protective coating

Tires

Manufacturer

Type

Size

Load range/air pressure

Door System

Door panels

Manufacturer

Type

Front door

Center door (1)

Center door (2)

Rear door

	Manufacturer	Type
Front door		
Center door (1)		
Center door (2)		
Rear door		

Heating and Ventilating Equipment

Heating system capacity

Air conditioning system capacity

Ventilating capacity

Manufacturer and model

Refrigerant type

	Btu
	Btu
	CFM per passenger

Driving heater

Manufacturer

Type

Model number

Capacity

Auxiliary heater

Manufacturer

Type

Model number

Capacity

Floor heaters

Manufacturer

Type/number

Model number

Capacity

Passenger Loading System

Manufacturer

Type (hydraulic, electric or both)

Model number

Capacity (lbs.)

Dimensions

Width of ramp inches

Length of ramp Inches

Cycle times

Normal idle

Fast idle

Stowed to ground Seconds

seconds

Ground to stow Seconds

seconds

Electronics

Video system manufacturer

Video system model number

Number of cameras

Multiplex system manufacturer

Multiplex system model number

Automatic passenger counter system manufacturer

Automatic passenger counter system model number

Destination sign manufacturer

Destination sign model number

AVL/AVM system manufacturer

AVL/AVM system model number

Passenger information system manufacturer

Passenger information system model number

Coach Body Fittings

Passenger windows manufacturer

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Exterior/interior mirrors

Size

Manufacturer

Model number

Manufacturer part numbers

Bicycle racks

Manufacturer

Model number

Paint system

Manufacturer

Type

**PART IV – ADDITIONAL REQUIRED PROPOSAL FORMS
ATTACHMENT L – REQUEST FOR APPROVED EQUALS
RETURN WITH YOUR PROPOSAL**

Company Name:

Specification Section Number:

Component Item Listed:

Proposed Item:

Note: A separate form must be submitted for each request for an approved equal. Proposers are required to submit technical information for each item. Any request received without the necessary technical information will be returned.

**PART IV – ADDITIONAL REQUIRED PROPOSAL FORMS
ATTACHMENT M – ILLEGAL IMMIGRANT CERTIFICATION
RETURN WITH YOUR PROPOSAL**

Pursuant to Arkansas Code Annotated § 19-11-105, Contractor(s) shall certify with OSP that they do not employ or contract with illegal immigrants.

By signing below, the Contractor agrees and certifies that they do not employ illegal immigrants and will not employ illegal immigrants during the remaining aggregate term of the contract.

Contract Number	
AASIS Number	N/A
Description	
Contractor	

Name of Organization _____

Signature of Authorized Official _____ Date _____

Name and Title of Authorized Official _____

**PART IV – ADDITIONAL REQUIRED PROPOSAL FORMS
ATTACHMENT N – RESTRICTION OF BOYCOTT OF ISRAEL CERTIFICATION
RETURN WITH YOUR PROPOSAL**

Pursuant to Arkansas Code Annotated § 25-1-503, a public entity shall not enter into a contract valued at \$1,000 or greater with a company unless the contract includes a written certification that the person or company is not currently engaged in, and agrees for the duration of the contract not to engage in, a boycott of Israel.

By signing below, the Contractor agrees and certifies that they do not boycott Israel and will not boycott Israel during the remaining aggregate term of the contract.

If a company does boycott Israel, see Arkansas Code Annotated § 25-1-503.

Bid Number/Contract Number	
Description of product or service	
Contractor name	

Name of Organization _____

Signature of Authorized Official _____ Date _____

Name and Title of Authorized Official _____

**PART IV – ADDITIONAL REQUIRED PROPOSAL FORMS
ATTACHMENT O – CONTRACT AND GRANT DISCLOSURE FORM
RETURN WITH YOUR PROPOSAL**

CONTRACT AND GRANT DISCLOSURE AND CERTIFICATION FORM

Failure to complete all of the following information may result in a delay in obtaining a contract, lease, purchase agreement, or grant award with any Arkansas State Agency.

SUBCONTRACTOR: Yes No SUBCONTRACTOR NAME: _____

IS THIS FOR: _____

TAXPAYER ID NAME: _____ Goods? Services? Both?

YOUR LAST NAME: _____ FIRST NAME: _____ M.I.: _____

ADDRESS: _____

CITY: _____ STATE: _____ ZIP CODE: _____ COUNTY: _____

AS A CONDITION OF OBTAINING, EXTENDING, AMENDING, OR RENEWING A CONTRACT, LEASE, PURCHASE AGREEMENT, OR GRANT AWARD WITH ANY ARKANSAS STATE AGENCY, THE FOLLOWING INFORMATION MUST BE DISCLOSED:

FOR INDIVIDUALS*

Indicate below if: you, your spouse or the brother, sister, parent, or child of you or your spouse is a current or former: member of the General Assembly, Constitutional Officer, State Board or Commission Member, or State Employee:

Position Held	Mark (✓)		Name of Position of Job Held <small>(senator, representative, name of board/ commission, data entry, etc.)</small>	For How Long?		What is the person(s) name and how are they related to you? <small>(i.e., Jane Q. Public, spouse, John Q. Public, Jr., child, etc.)</small>	
	Current	Former		From MM/YY	To MM/YY	Person's Name(s)	Relation
General Assembly							
Constitutional Officer							
State Board or Commission Member							
State Employee							

None of the above applies

FOR AN ENTITY (BUSINESS)*

Indicate below If any of the following persons, current or former, hold any position of control or hold any ownership interest of 10% or greater in the entity: member of the General Assembly, Constitutional Officer, State Board or Commission Member, State Employee, or the spouse, brother, sister, parent, or child of a member of the General Assembly, Constitutional Officer, State Board or Commission Member, or State Employee. Position of control means the power to direct the purchasing policies or influence the management of the entity.

Position Held	Mark (✓)		Name of Position of Job Held <small>(senator, representative, name of board/ commission, data entry, etc.)</small>	For How Long?		What is the person(s) name and what is his/her % of ownership interest and/or what is his/her position of control?		
	Current	Former		From MM/YY	To MM/YY	Person's Name(s)	Ownership Interest (%)	Position of Control
General Assembly								
Constitutional Officer								

State Board or Commission Member								
State Employee								

None of the above applies

Contract and Grant Disclosure and Certification Form

Failure to make any disclosure required by Governor's Executive Order 98-04, or any violation of any rule, regulation, or policy adopted pursuant to that Order, shall be a material breach of the terms of this contract. Any contractor, whether an individual or entity, who fails to make the required disclosure or who violates any rule, regulation, or policy shall be subject to all legal remedies available to the agency.

As an additional condition of obtaining, extending, amending, or renewing a contract with a state agency I agree as follows:

1. Prior to entering into any agreement with any subcontractor, prior or subsequent to the contract date, I will require the subcontractor to complete a **CONTRACT AND GRANT DISCLOSURE AND CERTIFICATION FORM**. Subcontractor shall mean any person or entity with whom I enter an agreement whereby I assign or otherwise delegate to the person or entity, for consideration, all, or any part, of the performance required of me under the terms of my contract with the state agency.

2. I will include the following language as a part of any agreement with a subcontractor:
 Failure to make any disclosure required by Governor's Executive Order 98-04, or any violation of any rule, regulation, or policy adopted pursuant to that Order, shall be a material breach of the terms of this subcontract. The party who fails to make the required disclosure or who violates any rule, regulation, or policy shall be subject to all legal remedies available to the contractor.

3. No later than ten (10) days after entering into any agreement with a subcontractor, whether prior or subsequent to the contract date, I will mail a copy of the **CONTRACT AND GRANT DISCLOSURE AND CERTIFICATION FORM** completed by the subcontractor and a statement containing the dollar amount of the subcontract to the state agency.

Signature _____	Title _____	Date _____
Vendor Contact Person _____	Title _____	Phone No. _____

Agency Use Only				
Agency Number _____	Agency Name _____	Agency Contact Person _____	Contact Phone No. _____	Contract or Grant No. _____

PART V – TECHNICAL SPECIFICATIONS

The Procuring Agencies seek to purchase the most modern heavy duty transit buses available that will provide maximum reliability, dependability, economy of operation, comfort, and safety. Heavy duty transit buses ordered under this contract will be low-floor diesel power or as an alternative to the base diesel, compressed natural gas (CNG). Buses shall have a minimum expected life of twelve (12) years or five hundred thousand (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.

Attached to this specification is a listing of optional equipment. All items listed shall be priced and included as part of the proposal. The Procuring Agencies reserve the right to select alternative equipment from this listing without incurring cost for additional engineering hours for any changes in optional equipment.

2.66 Definitions

ADA – Americans with Disabilities Act

Alternative – An alternative specification condition to the default bus configuration. The Procuring 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. Analog signals are used to represent the state of variable devices such as rheostats, potentiometers, temperature probes, etc.

APTA – American Public Transportation Association – a nonprofit organization which serves as the primary advocate in Washington, D.C. for the advancement of public transportation programs and initiatives in the United States.

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).

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

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).

Cells – Individual components (i.e. battery or capacitor cells).

CGA – Compressed Gas Association – develops and promotes safety standards, regulations and safe practices in the industrial gas industry.

Code – A legal requirement.

CNG – Compressed Natural Gas

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 operator.

dBA – Decibels – with reference to 0.0002 microbar as measured on the “A” scale.

DC to DC Converter – A module which converts a source of direct current (DC) 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 Procuring Agency.

Defueling – The process of removing fuel from a tank.

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

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

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).

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 (125%) of service pressure.

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

FMCSR – Federal Motor Vehicle Safety Regulations – guidelines issued by the Federal Motor Carrier Safety Administration whose primary mission is to prevent commercial motor vehicle-related crashes, fatalities and injuries through enactment and enforcement of safety regulations.

FMVSS – Federal Motor Vehicle Safety Standards – U.S. federal regulations specifying design, construction, performance, and durability requirements for motor vehicles and regulated safety-related components, systems, and design features that are developed and enforced by the National Highway Traffic Safety Administration (NHTSA).

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

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.

Free Floor Space – Floor area available to standees, excluding the area under seats, area occupied by feet of seated passengers, the vestibule area forward of the standee line, and any floor space indicated by manufacturer as non-standee areas such as, the floor space “swept” by passenger doors during operation. Floor area of 1.5 square feet shall be allocated for the feet of each seated passenger that protrudes into the standee area.

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).

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

GAWR (Gross Axle Weight Rating) – The maximum total weight as determined by the axle manufacturer, at which the axle can be safely and reliably operated for its intended purpose.

Gross Load – 150 pounds for every designed passenger seating position, for the operator, and for each 1.5 square feet of free floor space.

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

GVWR (Gross Vehicle Weight Rating) – 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 volts (AC and DC).

Hose – Flexible line.

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 crack or defect. 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 volts or less (AC or 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 – Assembly of individual components.

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

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

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

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.

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 a natural gas vehicle (NGV) fuel container/cylinder, when subjected to a standard fire test as required by fuel container/cylinder standards.

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.

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

Rejectable Damage – In terms of natural gas vehicle (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*.

SAE – SAE International – formally known as the Society of Automotive Engineers; organization comprised of transport industries engineering professionals who devise technical standards and recommend best practices for the design, development, construction and characteristics of motor vehicle components.

Seated Load – 150 pounds for every designed passenger seating position and for the operator.

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.

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 volt 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 Procuring 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 “Part V: 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.

Stress Loops – The “pig tails” commonly used to absorb flexing in piping.

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

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

Wheelchair – A mobility aid belonging to any class of three- or four-wheeled devices, usable indoors, designed for and used by individuals with mobility impairments, whether operated manually or powered. A “common wheelchair” is such a device that does not exceed 30 inches in width and 48 inches in length measured 2 inches above the ground, and does not weigh more than 600 pounds when occupied.

2.67 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 APTA issuance of this specification.

2.68 Legal Requirements

- A. The Contractor shall comply with all applicable federal, state and local regulations. These shall include but not be limited to ADA, as well as state and local accessibility, safety and security requirements. Local regulations are defined as those below the state level.
- B. Buses shall meet all applicable FMVSS and shall accommodate all applicable FMCSR regulations in effect at the location of the Procuring Agency and the date of manufacture.
- C. 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.

2.69 Overall Requirements

- A. 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. Components used in the vehicle shall be of heavy-duty design and proven in transit service.

- B. The buses shall afford features essential for safe, efficient and comfortable operation by the operator. This implies the utmost in road and traffic visibility under all driving conditions and adequate means for safe passenger movement. The bus must be maneuvered easily in normal and heavy traffic.
- C. All Proposers must conform to these specifications and the product they furnish shall be of first-class quality, and workmanship, and shall be of the best obtainable in the various trades. The design of the body, chassis, and equipment, which the manufacturer proposes to furnish, shall be such as to produce a vehicle of substantial and durable construction in all respects.
- D. All systems, subsystems, and components shall be individually and permanently labeled with manufacturer, part number, and serial number. Label is to be located, in each instance, for easiest access for reading while installed for use in the bus. List of all systems, subsystems, and components shall accompany each bus either on paper or USB flash drive. This shall include an OEM to vendor cross-reference listing.
- E. The manufacturer shall use FC-300 and FC-195 hoses **or approved equal** for all flexible lines except A/C and discharge from the air compressor to the wet tank.
- F. The manufacturer shall be responsible for providing all parts or details which make each bus complete and ready for service, even though such part(s) or detail(s) are not mentioned in these specifications.
- G. All buses shall be in compliance with the Americans for Disabilities Act (ADA). These buses shall be new, unused, current model specifically designed for intra-city service and substantially manufactured in the United States (in accordance with "Buy America" requirements). These units must meet all federal requirements applicable to this type of vehicle.
- H. Buses provided under this contract shall be 35-foot and 40-foot in length **(excluding bumpers)**, 102 inches wide **(excluding mirrors and rubber fenders)**, with a low floor standard transit design.

2.70 Worker and Protective Measures

- A. All bolts or rods passing through wood shall be sealed with zinc chromate or other approved sealing compound. Where wood and wood are placed together, all outer edges of wood, as well as the edges of holes, cutouts and notches shall be coated with a linseed oil and titanium dioxide sealer or zinc chromate or other appropriate sealing compound.
- B. All exterior light fixtures shall be fitted to the contour of the bus body and adequately sealed to prevent entrance of water.
- C. All rubber seals on ventilator doors and compartment cabinet doors shall be placed in "U" shaped channels to firmly hold the rubber in place. Equally, self-adhering closed cell neoprene seals may be used, without "U" channels.
- D. All burrs and sharp edges shall be dressed so as to prevent injury to passengers and employees, or damage to their clothing.

2.71 Water Testing

- A. All buses shall be subjected to water tests simulating the severe rain conditions experienced in Arkansas. Windows, escape hatches, doors, etc. are subject to an approved water test to be conducted at the manufacturer's facility by the manufacturer and shall be observed by the Resident Inspector(s).
- B. Water testing may be verified by further testing at the Procuring Agency's maintenance facility prior to the acceptance of each bus if test observation or verification of leak repair is missed on or not observed by the Resident Inspector on any bus built. Any bus that fails to pass the water test shall be corrected by the Contractor. The retest/corrective repair cycle shall repeat until the leak(s) have been eliminated to the Procuring Agency's satisfaction.
- C. The roof, roof hatches, front cap, rear cap, sidewalls, passenger windows, operator's windows, destination sign windows, windshields, wheel wells and all doors of all buses shall be water tested prior to the delivery of each unit as follows:
 - (1) The water test shall consist of a series of nozzles which are strategically located around the perimeter of the vehicle so as to spray water over the entire surface of the vehicle.
 - (2) The nozzles shall eject a volume of water no less than 2.6 gallons per minute per nozzle under a pressure of no less than 22 pounds per minute measured at the nozzle tip.
 - (3) The Contractor shall be required to water test each vehicle under the conditions described above for no less than 15 minutes to ensure there are no water leaks in the bus.

(4) Bus road testing shall be conducted immediately after the water test.

- D. Contractor shall take the necessary steps of corrective action to repair any leaks found as a result of the described test and shall repeat the 15 minute water test to ensure that corrective steps have been successful. This process shall be repeated until no leaks are found. Documentation of each bus shall be kept by the manufacturer as to the location of the leak, what caused the leak to occur and shall describe the repair action taken to prevent the leak from reoccurring.
- E. If the Contractor's bus manufacturing process water test differs from the water test process and criteria described above, any deviations must be approved by the Procuring Agency.

2.72 Total Bus Operation

- A. 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 twenty five (25) miles during the road tests. The plan shall be submitted to the Procuring Agency for approval.
- B. All zerk grease testing fittings shall be accessible from a pit location with a standard straight nose grease gun.
- C. All vehicles will be road tested and dyno tested.

2.73 Weight

- A. It shall be a design goal to construct each bus as light in weight as possible without degradation of safety, appearance, comfort, traction or performance.
- B. Buses at a capacity load shall not exceed the tire factor limits, brake test criteria or structural design criteria.

2.74 Capacity

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

2.75 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.

2.76 Maintenance and Inspection

- A. Scheduled maintenance tasks shall be related and shall be, in accordance with the manufacturer's recommended preventive maintenance schedule (along with routine daily service performed during the fueling operations).
- B. Test ports shall be provided for commonly checked functions on the bus, such as air intake, exhaust, hydraulic, pneumatic, charge air and engine cooling systems, engine, transmission, etc.
- C. All engine and transmission components will have the fluid sampling valves (or equivalents) installed that are easy to access: device and location selection to be made at pre-production meeting.
- D. The manufacturer shall give prime consideration to the routine problems of maintaining the vehicle. All bus components and systems, both mechanical and electrical, which 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 the disassembly, reassembly, servicing or maintenance, using tools and equipment that are normally available as standard commercial items.
- E. Requirements for the use of unique specialized tools will be minimized. The body and structure of the bus shall be designed for ease of maintenance and repair. Individual panels or other equipment which 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.
- F. Contractor shall provide a list of all special tools and pricing required for maintaining this equipment. Said list shall be submitted as a supplement to the Pricing Schedule.

2.77 Interchangeability

- A. 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 separate 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.

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

2.78 Training

- A. Along with the purchase of new buses, the Procuring Agency reserves the right to require the Contractor to provide an appropriate program of instruction targeted to operators, servicing, and maintenance personnel. This will be accomplished through a combination of Agency onsite and Contractor and/or supplier site training.
- B. All training instructors shall be competent to teach the course area they are instructing. Further, all instructors shall speak English and have a complete understanding of the English language. If the instructor or vendor presenter lacks the skill or knowledge to provide instruction, or cannot communicate with the students, the Procuring Agency reserves the right to request that the instructor be replaced and the area of training to be repeated.
- C. **All training will be priced as an option and separately from the base bus price.**

2.79 Operator Orientation

The Contractor shall provide an 8-hour course of instruction for the Procuring Agency's Operations personnel. Class size is not to exceed 10 employees per session. The program shall include, but not be limited to the following:

Operator Compartment, Controls and Switches, Warning Indicators and Gauges, Seat Adjustment, Door Control, Walk Around Inspection, Compartment-by-Compartment Explanation, Mirror Adjustments, Climate Control System, Wheelchair Ramp, Wheelchair Securement, Safety Equipment, and Emergency Procedures.

2.80 Maintenance Orientation

The Contractor shall provide an 8-hour course of instruction for the Procuring Agency's Maintenance personnel on Vehicle Servicing. Class size is not to exceed 10 employees per session. At a minimum, the course shall cover the following areas:

Chassis, Suspension, Steering, Axles, Brakes, Air, Body, Doors, Electrical, Engine, Fuel, Transmission, HVAC, Fire Suppression, and Towing/Jacking.

2.81 Technical Training

- A. The Contractor shall provide a structured program of technical training which will consist of specific and identifiably separate curriculum for each subject area. Each subject area training session shall be between eight (8) and forty (40) classroom/hands-on hours based on subject area, with class size being no more than ten (10) participants. The training will be delivered at the Procuring Agency's location on a schedule coordinated by the Procuring Agency's Maintenance department and the Contractor.
- B. The following subject areas will be offered:
 - Body and Chassis, Suspension and Steering, Electrical and Electronics, Air and Brake System, HVAC/Climate Controls, Engine, Transmission, Wheelchair Ramp System, Destination Signs, Doors, Axles and Tires, Fuel System, and Fire Suppression.
- C. The technical training shall be delivered on a schedule coordinated between the Procuring Agency's Maintenance department and the Contractor. The subject area of sessions to be provided will be negotiated between the Procuring Agency's Maintenance department and the Contractor, with the base requirement being 96 hours.

2.82 Operating Environment

The bus shall achieve normal operation in ambient temperature ranges of 10°F to 115°F, at relative humidity between 5 percent and 100 percent, or at altitudes up to 3,000 feet 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 3,000 feet.

2.83 Noise

A. Interior Noise

- (1) 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 less at any point inside the bus. These conditions shall prevail with all openings, including doors and windows, closed and with the engine and accessories switched off.
- (2) The bus-generated noise level experienced by a passenger at any seat location in the bus shall not exceed 80 dBA. The operator area shall not experience a noise level of more than 75.5 dBA.

B. Exterior Noise

- (1) Airborne noise generated by the bus and measured from either side shall not exceed 80 dBA under full power acceleration when operated 0 to 35 mph at curb weight. The maximum noise level generated by the bus pulling away from a stop at full power shall not exceed 83 dBA. The bus-generated noise at curb idle shall not exceed 65 dBA. If the noise contains an audible discrete frequency, a penalty of 5 dBA shall be added to the sound level measured.
- (2) All noise readings shall be taken fifty (50) feet from, and perpendicular to, the centerline of the bus with all accessories operating. The Contractor shall comply with the exterior noise requirements defined in local laws and ordinances identified by the Procuring Agency and SAE J366.

2.84 Fire Safety

- A. The bus shall be designed and manufactured in accordance with all applicable fire safety and smoke emission regulations. These provisions shall include the use of fire-retardant/low-smoke materials, fire detection systems, bulkheads and facilitation of passenger evacuation.
- B. 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, dated October 20, 1993. Materials entirely enclosed from the passenger compartment, such as insulation within the sidewalls and subfloor, need not comply. In addition, smaller components and items, such as seat grab rails, switch knobs and small light lenses shall be exempt from this requirement.

2.85 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.

2.86 Bus Dimensions

A. 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 rub rails, the bus shall have the following overall dimensions.

B. Bus Length

35 Foot Bus (35' to 39' 11")

40 Foot Bus (40' to 44' 11")

C. Bus Width

Body width shall be 102 inches (+0, -1 inch)

D. Bus Height

Maximum overall height shall be 140 inches, including all rigid, roof-mounted items.

E. Step Height

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

F. Underbody Clearance

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

G. Ramp Clearances

- (1) 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.
- (2) 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.
- (3) 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 BREAKOVER ANGLE	
Angle	35- to 45-Foot Bus
Approach	8.6 degrees (min.)
Front Breakover	8 degrees (min.)
Departure	8.1 degrees (min.)

H. Ground Clearance

- (1) Ground clearance shall be no less than 9 inches (8 inches at jacking pad), except within the axle zone and wheel area.
- (2) Axle zone clearance, which is the projected area between the tires and wheels on the same axial centerline, shall be no less than 5.4 inches.
- (3) Wheel area clearance shall be no less than 8 inches for parts fixed to the bus body and 6 inches for parts that move vertically with the axles.

I. Floor Height

- (1) Height of the step above the street shall be no more than 16 inches measured at the centerline of the front and rear doorway.
- (2) The floor may be inclined along the longitudinal axis of the bus, and the incline shall not exceed 3.5 degrees off the horizontal except locally at the doors where a 2 degree slope toward the door is allowed.
- (3) All floor measurements shall be with the bus at the design running height and on a level surface and with the standard installed tires.
- (4) A maximum of two steps is allowed to accommodate a raised aisle floor in the rear of the bus.

J. Interior Headroom

- (1) Headroom above the aisle and at the centerline of the aisle seats shall be no less than 78 inches in the forward half of the bus tapering to no less than 74 inches forward of the rear settee.
- (2) At the centerline of the window seats, headroom shall be no lower than 65 inches, except for parcel racks and reading lights, if specified.
- (3) Headroom at the back of the rear bench seat may be reduced to a minimum of 56 inches, but it shall increase to the ceiling height at the front of the seat cushion.
- (4) 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.

K. Aisle Width

- (1) The minimum clear aisle width between pairs of transverse seats with all attached hardware shall be at least 22 inches.
- (2) The aisle width between the front wheelhouses shall be at least 35.5 inches, and the entire area between the front wheelhouses shall be available for passengers and mobility aid devices.

2.87 Vehicle Performance

A. Power Requirements

The propulsion system shall be sized to provide sufficient power to enable the bus to meet the defined acceleration, top speed, and gradability requirements, and operate all propulsion-driven accessories using actual road test results and computerized vehicle performance data.

B. Top Speed

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.

C. Gradability

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

D. Default

The propulsion system and drivetrain shall enable the bus to achieve and maintain a speed of 40 mph on a 2½ percent ascending grade and 15 mph on a 10 percent ascending grade continuous. NOTE: Values are assumed to be sustained. Manufacturer shall supply the Procuring Agency with data if there is a variance between peak performance and sustained vehicle performance.

E. Acceleration

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

Maximum Start Acceleration Times on a Level Surface ¹	
Speed (mph)	Maximum Time (seconds)
10	5
20	10
30	18
40	30
50	60
Top Speed	

1. Vehicle Weight = GVWR

F. Operating Range

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

G. Diesel

The operating range of the bus when run on the Altoona Test cycle shall be at least 350 miles with full fuel capacity.

H. CNG

The operating range of the bus when run on the Altoona Test cycle shall be at least 350 miles with an initial gas settled pressure of 3600 psi at 70°F.

2.88 Powerplant

A. Engine

(1) A Cummins ISL-G engine capable of providing the performance to satisfy the operating conditions in geographical areas throughout the state of Arkansas shall be provided. The engine shall meet all regulatory requirements when operating on fuel equal to CARB Specifications for Compressed Natural Gas #2292.5. The engine shall have a minimum design life of 12 years or 500,000 miles, whichever comes first, and it shall be designed to require no more than one (1) major overhaul to achieve this lifetime. The engine and transmission shall be compatible with each other in that the electronic controls of the engine shall interface with the transmission and vice versa, if controls are used. Engine shall meet all current federal EPA requirements. A copy of the certification shall be supplied with the proposal.

As an option, a Cummins L9N engine capable of providing the performance to satisfy the operating conditions in geographical areas throughout the state of Arkansas shall be made available and priced separately. The engine shall meet all regulatory requirements when operating on fuel equal to CARB Specifications for Compressed Natural Gas #2292.5. The engine shall have a minimum design life of 12 years or 500,000 miles, whichever comes first, and it shall be designed to require no more than one (1) major overhaul to achieve this lifetime. The engine and the transmission shall be compatible with each other in that the electronic controls of the engine shall interface with the transmission and vice versa, if controls are used.

Engine shall meet all current Federal EPA requirements. A copy of the engine certification shall be supplied with the proposal.

As an option, a Cummins ISL 280HP diesel engine capable of providing the performance to satisfy the operating conditions in geographical areas throughout the state of Arkansas shall be made available and priced separately. The engine shall have a minimum design life of 12 years or 500,000 miles, whichever comes first, and it shall be designed to require no more than one (1) major overhaul to achieve this lifetime. The engine and the transmission shall be compatible with each other in that the electronic controls of the engine shall interface with the transmission and vice versa, if controls are used. Engine shall meet all current Federal EPA requirements. A copy of the engine certification shall be supplied with the proposal.

As an option, a Cummins L9 diesel engine capable of providing the performance to satisfy the operating conditions in geographical areas throughout the state of Arkansas shall be made available and priced separately. The engine shall have a minimum design life of 12 years or 500,000 miles, whichever comes first, and it shall be designed to require no more than one (1) major overhaul to achieve this lifetime. The engine and the transmission shall be compatible with each other in that the electronic controls of the engine shall interface with the transmission and vice versa, if controls are used. Engine shall meet all current Federal EPA requirements. A copy of the engine certification shall be supplied with the proposal.

As an option, a Phillips & Temro engine block heater shall be made available and priced separately.

- (2) The engine shall comply with applicable local, state, and/or federal emissions and useful life requirements. Components of the fuel management and/or control system shall have a design life of not less than 150,000 miles without replacement or major service. The lifetime estimate is based on the design operating profile.
- (3) The engine shall be equipped with an electronically controlled management system, compatible with either 12- or 24-volt 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.
- (4) 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 less than 30°F for a minimum of four hours without the engine in operation. All cold weather starting aids, engine heating devices and procedures shall be of the type recommended by the engine manufacturer and approved by the Procuring 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 Procuring Agency.

B. Automatic Engine Protection / Shutdown Override Feature

- (1) The engine control system shall protect the engine against progressive damage. The system shall monitor conditions critical for safe operation and automatically de-rate power and/or speed and initiate engine shutdown as needed. The onboard diagnostic system shall trigger an audible alarm and warning light to signal the operator when the engine control unit detects a malfunction and the engine protection system is activated.
- (2) Automatic shutdown shall occur when parameters established for the functions below are exceeded:
 - (i.) Coolant Level
 - (ii.) Coolant Temperature
 - (iii.) Oil Pressure
 - (iv.) Oil Temperature
 - (v.) 15 minutes of idling
 - (vi.) Exhaust Temperature
 - (vii.) Fire Suppression
- (3) The automatic shutdown for the fire suppression feature shall occur when the fire suppression system is discharged.
- (4) A control shall be available to the operator, to allow temporary override (30-45 seconds) of the engine protection/shutdown system if engine power is required to move the bus in emergency conditions. Override action shall be recorded. This data shall be retrievable by the Agency.
- (5) The fast idle device shall be activated and controlled automatically by the engine control system. This device will operate only when the transmission is in neutral.

- (6) The integration of all systems on the vehicle relative to engine idle speed shall be the responsibility of the vehicle manufacturer and shall meet the requirements of the Procuring Agency.
- (7) The engine starting system shall be protected by an interlock that prevents its engagement when the engine is running.
- (8) Engine throttle operation shall be inhibited, through interlocks, whenever:
 - (i.) Front or rear door open (front door optional; selection made by agency)
 - (ii.) The vehicle is kneeled
 - (iii.) Wheelchair ramp is in operation
 - (iv.) Rear door emergency release
 - (v.) Fast idle operation
- (9) Failure of the engine throttle control shall not result in an unsafe condition. Loss of air or electrical throttle control shall inhibit throttle.
- (10) A rear mounted engine speed control (hand throttle) will be provided.
- (11) The engine shall have onboard diagnostic capabilities, able to monitor vital functions, store out-of-parameter conditions in memory, and communicate faults and vital conditions to service personnel. Diagnostic reader device ports, suitably protected against dirt and moisture, shall be provided in operator's area and near or inside 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. All removable caps shall be tethered including the caps for the diagnostic connector ports in the operator's area and in the engine compartment.

C. Standard Requirements for a Fast Idle Device

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

D. Cooling Systems

- (1) The cooling systems shall be of sufficient size to maintain all engine and transmission fluids and engine intake air at safe, continuous operating temperatures during the most severe operations possible and in accordance with engine and transmission manufacturers' cooling system requirements. The cooling system fan controls should sense the temperatures of the operating fluids and the intake air, and if either is above safe operating conditions the cooling fan should be engaged. The fan control system shall meet the requirements stated in the operating environment.
- (2) The engine shall be cooled by a water-based, pressure type, cooling system that does not permit boiling or coolant loss during the operations described above. Engine thermostats shall be easily accessible for replacement. Shutoff valves shall allow filter replacement without coolant loss. Valves shall permit complete shutoff of lines for the heating and defroster units, and water booster pump. The water booster pump shall be a long life brushless design. All low points in the water-based cooling system shall be equipped with a standard 1/4" MPT brass hex plug or equivalent. Air vent valves shall be fitted at high points in the cooling system unless it can be demonstrated that the system is self-purging.
- (3) An EMP electric fan system will be provided. Electric fans shall be brushless, variable speed, reversible and have a corrosion resistant metal shroud with finger guards that meet SAE J1308_200808. The fans should provide electronic feedback control and have diagnostics capability through the standard SAE J1939 diagnostics port. The cooling system shall consist of multiple electric DC brushless pusher type variable speed fans with electronic feedback controls. Electric fan motor speeds shall have a minimum operating range of 0-5500 rpm with capability of manual or automatic reverse operation in order to assist debris removal. The cooling system shall be equipped with a master controller with the capability to automatically reduce fan speed when the vehicle stops to minimize noise.

As an option, a Modine E-Fan electric fan system will be made available and priced separately.

As an option, corrosion-resistant coating for the radiator will be made available and priced separately.

- (4) A means of determining satisfactory engine 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 inches above the ground. Radiator and charge air cooler fan(s) shall be electrically driven and capable of a manual reverse operation for periodic self-cleaning of the radiator and charge air cooler.

E. Charge Air Cooling

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.

F. Transmission Cooling

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

G. Transmission – Conventional Powertrain

(1) The transmission shall be an Allison B400R automatic shift with torque converter, retarder and electronic controls. Gross input power, gross input torque and rated input speed shall be compatible with the engine. 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.

As an option, the Voith 864.5 transmission will be made available and priced separately.

(2) The electronic controls 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. Electronic controls shall be compatible with either 12- or 24-volt power distribution, provide consistent shift quality and compensate for changing conditions such as variations in vehicle weight and engine power.

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

(4) 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 operator when the electronic control unit detects a malfunction.

As an option, an electronic transmission fluid level monitoring and protection system will be made available and priced separately.

(5) Models with remote mounted transmission vents shall have vents mounted to prevent plugging and/or the entry of foreign materials.

H. Retarder

(1) 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.

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

I. 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 Procuring Agency will work with the OEM/drive system manufacturer to determine retarder performance settings. A retarder disable switch shall be accessible to the seated operator. Disabling retarder shall be recorded for Agency data collection.

J. Mounting

All powerplant mounting shall be mechanically isolated to minimize the transfer of vibration to the body structure and provide a minimum clearance of 0.75 inches. Mounts shall control the movement of the powerplant so as not to affect performance of belt-driven accessories or cause strain in piping and wiring connections to the powerplant.

K. Engine / Transmission Oil Fill / Filters

Engine oil and 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 to help ensure that correct fluid is added. All fillers shall be easily accessible with standard funnels, pour spouts and automatic dispensing equipment. 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.

As an option, the FEMCO oil drain will be made available and priced separately.

L. Engine Compartment Gauges

Engine oil pressure, transmission and coolant temperature gauges are required in the engine compartment.

M. Engine Air Cleaner

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 air filter.

N. Hydraulic Systems

(1) Hydraulic system service tasks shall be minimized and scheduled no more frequently than those of other major bus 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 tamper-proof priority system shall prevent the loss of power steering during operation of the bus if other devices are also powered by the hydraulic system.

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

O. Fluid Lines

(1) 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 hold 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.

(2) 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.

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

P. Fittings and Clamps

(1) 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.

(2) 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.

Q. Charge Air Piping

(1) 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.

(2) Charge air piping shall be constructed of stainless steel, aluminized steel or anodized aluminum, except between the air filter and turbocharger inlet, where piping may be constructed of fiberglass or rubber. 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-degree seal.

R. Radiator Piping

Radiator piping shall be stainless steel or brass tubing, and if 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-degree 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.

S. Oil and Hydraulic Lines

Oil and hydraulic lines shall be compatible with the substances they carry. The 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. Lines within the engine compartment shall be composed of steel tubing where practicable, except in locations where flexible lines are required.

2.89 Fuel

A. Fuel Lines

- (1) 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.
- (2) 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.
- (3) 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.

B. Fuel Lines – CNG

- (1) Fuel lines shall comply with NFPA-52. All tubing shall be a minimum of seamless 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 utilized as required. Fuel lines shall be identifiable as fuel lines only.
- (2) High pressure CNG lines shall be pressure tested to 3600 psi 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.
- (3) 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.).
- (4) Manifolds connecting fuel containers shall be designed and fabricated to minimize vibration and shall be installed in protected location(s) to prevent line or manifold damage from unsecured objects or road debris.
- (5) Fuel hose connections, where possible, shall be less than 60 inches 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 inches.

C. 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).

2.90 Diesel Fuel Tank(s)

A. Design and Construction

- (1) The fuel tank(s) shall be made of corrosion resistant stainless steel. The fuel tank(s) shall be made of 3CR12 structural stainless steel. The fuel tank(s) shall be securely mounted to the bus to prevent movement during bus maneuvers.
- (2) The fuel tank(s) shall be equipped with an external, hex head, drain plug. It shall be at least 3/8” 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 noise regardless of fill level. The baffles or fuel pickup location shall assure continuous full power operation on a 6 percent upgrade for 15 minutes starting

with no more than 25 gallons 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 gallons of fuel over the unusable amount in the tank(s). All systems/engines on all model buses will be compatible with all blends of biodiesel fuel based on manufacturer's recommendations.

- (3) 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.

B. 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.

C. Fuel Filler

- (1) The fuel filler shall be located 7 to 32 feet 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.
- (2) The fuel lines forward of the engine bulkhead shall be in conformance to SAE standards.

D. Dry-Break Fuel Filler

- (1) The fuel filler shall accommodate an EMCO/Wheaton Posi-Lok filling adapter 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 gallons 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 Procuring Agency's system. The fuel filler cap shall be hinged. Equipment will be finalized at the pre-production meeting.

As an option, a gravity fuel fill system will be made available and priced separately.

2.91 CNG Fuel Containers/Cylinders

A. Design and Construction

- (1) CNG fuel containers/cylinders must be designed, constructed, manufactured, and tested in accordance with at least one of the following:
 - (i.) NFPA 52 – Standard for Compressed Natural Gas
 - (ii.) Vehicular Fuel Systems FMVSS 304
 - (iii.) Any local standard(s) specifically intended for CNG fuel containers
- (2) The design and construction of the fuel system supplied by the OEM shall comply with federal and local regulations.

B. Installation

- (1) Fuel cylinders shall be installed in accordance with ANSI/IAS NGV2-2012, Basic Requirements for Compressed Natural Gas Vehicles (NGV) Fuel Containers and NFPA 52, Compressed Natural Gas (CNG) Vehicular Fuel Systems Code, 2019. The placement of tanks shall be limited to the roof of the vehicle.
- (2) 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 debris or collision.
- (3) For safety purposes, the roof mounted tanks must be accessible to maintenance personnel without the requirement to walk on top of the closed tank enclosure to open the enclosure doors. The enclosure doors shall be secured with non-keyed twist latches and shall incorporate hand holds to assist in opening the enclosure doors once unlatched. When opened, the enclosure doors shall be secured to prevent from over-extension. The open enclosure doors shall also provide a certain degree of fall prevention. Once the tanks are exposed, for safety purposes, access should be provided in the middle of the roof line without having to walk on top of or over the tanks in order to inspect or service the tanks, valves, regulators or pressure relief devices. This access shall be constructed in a manner that avoids the need to walk on the actual roof covering. Access to the roof mounted tanks shall be through the rear roof hatch.

C. Labeling

CNG fuel systems shall be labeled in accordance with NFPA 52, "Compressed Natural Gas (CNG) Vehicular Fuel Systems Code," 2019 edition.

D. 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." All natural gas fuel system piping, including the PRD vent line, shall be stainless steel. All PRDs must be vented to outside.

E. Valves

Valves must be installed in accordance with ANSI/IAS NGV2-2012, "Basic Requirements for Compressed Natural Gas Vehicle (NGV) Fuel Containers" and NFPA 52, "Standard for Compressed Natural Gas (CNG) Vehicular Fuel Systems."

F. Fuel Filler

(1) The fuel filler shall be located 7 to 38 feet (on a 30-, 35- and 40-foot bus) 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.

(2) 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.

G. Fueling System

(1) The CNG fueling port receptacle shall be an ANSI/AGA NGV1 or NGV2 certified receptacle as designated by the Procuring Agency. The bus shall be capable of being fueled by a nozzle determined by the Procuring 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 bus will not start.

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

H. Defueling System

(1) The CNG defueling port shall be an NGV1-P36 certified receptacle. The CNG defueling port shall be located on the curbside of the bus, in a location that is compatible with the Procuring Agency's defueling station operation.

(2) The defueling system shall incorporate the following characteristics:

(i.) Dust cap permanently "tethered" to the defueling port.

(ii.) Device(s) to prevent inadvertent defueling. Specifications to be provided by the Procuring Agency. Components compatible with Procuring Agency's defueling operation.

2.92 Emissions and Exhaust

A. Exhaust Emissions

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

B. Exhaust System

Exhaust gases and waste heat shall be discharged from the roadside rear corner of the roof. 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 aftertreatment 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 and causing damage to the aftertreatment. An exhaust aftertreatment system will be provided to ensure compliance to all applicable EPA regulations in effect.

C. Diesel Exhaust Fluid (DEF) 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. 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.

D. 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.

E. Fire Suppression System

- (1) An Amerex V25 automatic fire suppression system will be provided to ensure adequate coverage in the engine compartment and main electrical box areas should a fire event occur. The system shall incorporate a telltale, dash mounted operator warning light, audible indicator and switch, automatically shutting off all fans and climate control systems in the event of a discharge.
- (2) The system installed shall be certified by the vehicle manufacturer that it is suitable for use in the proposed vehicle in case the unit fails to function during an onboard vehicle event or fire. Each vehicle shall be delivered with a certificate identifying the vehicle identification number (VIN) for which it applies. The system shall be U.L., U.C.L., and F.M. listed and meet all U.S. DOT and FMVSS and be certified by the vehicle and equipment manufacturer.
- (3) Fire suppression shall be mandatory on all CNG buses and shall be included in the price of each respective fuel alternative.

As an option, a delete for the Fire Suppression System for diesel buses will be priced separately.

2.93 Structure

A. Design

The structure of the bus shall be designed to withstand the transit service conditions typical of an urban 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 Procuring Agency shall be considered for this purpose.

B. Altoona Testing

Prior to acceptance of the first bus, the vehicle must have completed any 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 any and all such failures will not occur shall be submitted to the Procuring Agency.

C. 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 the assembly of the first bus, the OEM shall provide the Procuring 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.

2.94 Structural Validation Baseline

A. Structural Analysis

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

B. 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 inch curb or in a 6 inch deep hole.

C. 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.

D. Engine Compartment Bulkheads

The passenger and engine compartment shall be separated by fire-resistant bulkheads. The engine compartment shall include areas where the engine and exhaust system are housed. This bulkhead shall preclude or retard propagation of an engine compartment fire into the passenger compartment. 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.

E. Crashworthiness

- (1) 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 inch 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.
- (2) The bus shall withstand a 25 mph impact by a 4000-pound automobile at any side, excluding doorways, along either side of the bus with no more than 3 inches of permanent structural deformation at seated passenger hip height. This impact shall not result in sharp edges or protrusions in the bus interior.
- (3) Exterior panels below 35 inches from ground level shall withstand a static load of 2000 pounds applied perpendicular to the bus by a pad no larger than 5 square inches. This load shall not result in deformation that prevents installation of new exterior panels to restore the original appearance of the bus. The transit bus, at GVWR and under static conditions, shall not exhibit deformation or deflection that impairs operation of doors, windows, or other mechanical elements. Static conditions include the vehicle at rest with any one wheel or dual set of wheels on a 6 inch curb or in a 6 inch deep hole.
- (4) The sidewall structure shall be capable of withstanding impacts of 200 foot pounds of energy from a steel faced spherical missile no less than 9 inches in diameter and of a 500 pound load applied anywhere along their length by a rigid plate 1 foot in length with no visible damage to the supporting structure. A damaged portion of the supporting structure shall be replaceable without requiring removal or replacement of the entire structure.
- (5) The bus chassis shall be stainless steel with an integrated side impact barrier **or approved equal** to provide additional safety to the passengers in the low floor area.

F. Corrosion

- (1) 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.
- (2) 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.

G. Corrosion-Resistance Requirements for Exposed and Interior Surfaces of Tubing Below Lower Window Level

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.

H. Towing

- (1) Each towing device shall withstand, without permanent deformation, tension loads up to 1.2 times the curb weight of the bus within 20 degrees of the longitudinal axis of the bus. 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.
- (2) 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. 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 connector shall facilitate towing operations.

I. Lifted (Supported) Front Axle and Flat Towing Capability

- (1) 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.

- (2) 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 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 pounds should have means to maneuver or allow for ease of use and application. Each towing device shall accommodate a crane hook with a 1 inch throat.

J. Jacking

It shall be possible to safely jack up the bus, at curb weight, with a common 10-ton floor jack with or without a 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 inch 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.

K. Hoisting

The bus axles or jacking plates shall accommodate the lifting pads of a two-post 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.

2.95 Floor

A. Design

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 1/4 inch 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 degrees to allow for drainage.

B. Strength

(1) 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 bus. 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.

(2) 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 inches 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 pounds applied through the flat end of a 1/2 inch diameter rod, with 1/32 radius, without permanent visible deformation.

C. 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.

D. 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, manufactured with exterior glue, satisfy the requirement of a Group I Western panel as defined in PS 1-95 (Voluntary Product Standard PS 1-95, "Construction and Industrial Plywood") and be of a grade that is manufactured with a solid face and back. Plywood 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 utilize 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.

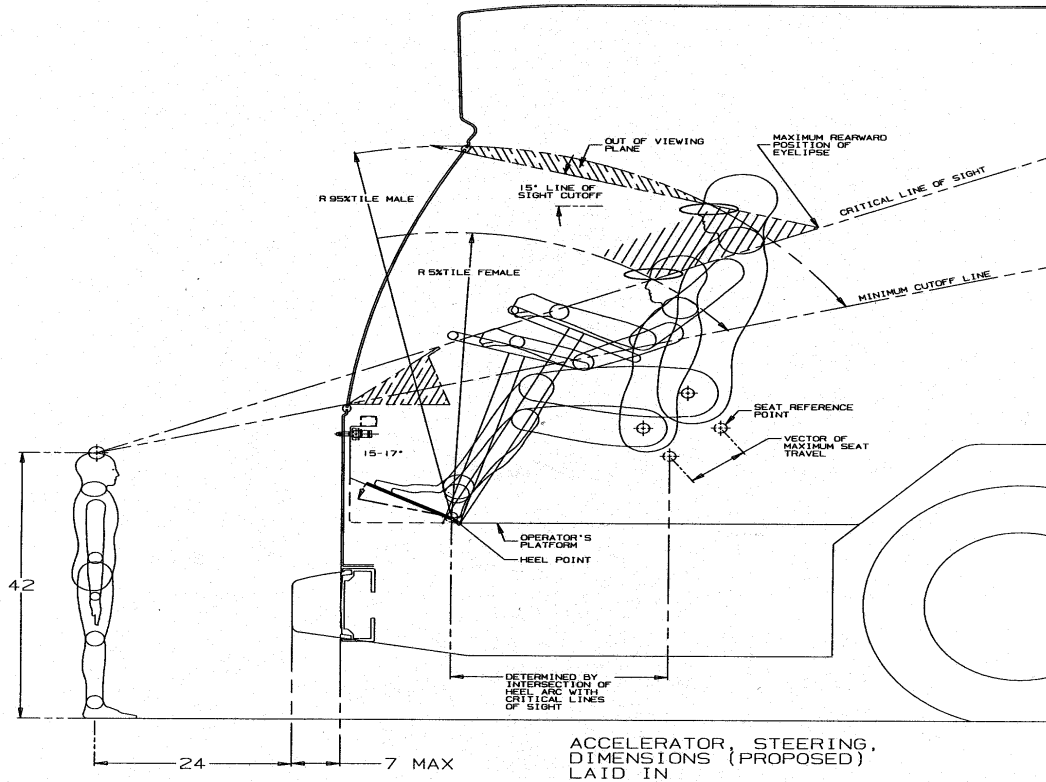
2.96 Platforms

A. Operator'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.

B. Operator's Platform

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



C. Farebox

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

D. Rear Step Area to Rear Area

If the vehicle is of a bi-level floor design, 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 inches 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.

2.97 Wheel Housing

A. Design and Construction

- (1) 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 stainless steel.
- (2) 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.
- (3) 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.

- (4) 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 inches above floor shall be equipped with scuff-resistant coating or stainless steel trim.
- (5) Wheel housings, as installed and trimmed, shall withstand impacts of a 2 inch steel ball with at least 200 foot-pounds of energy without penetration.
- (6) 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 inches higher than the wheel well housing.

2.98 Chassis

A. Suspension

(1) General Requirements

The front and rear 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 disconnection of the components.

(2) Alignment

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

B. Springs and Shock Absorbers

(1) Suspension Travel

The suspension system shall permit a minimum wheel travel of 2.75 inch jounce-upward travel of a wheel when the bus hits a bump (higher than street surface), and 2.75 inch rebound-downward travel when the bus comes off a bump and the wheels fall relative to the body. Urethane bumpers shall be provided at the limit of jounce travel. Rebound travel may be limited by urethane 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 1/2 inch at any point from the height required. The safe operation of a bus cannot be impacted by ride height up to 1 inch from design normal ride height.

(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 bus motion to three cycles or less after hitting road perturbations. The shock absorber bushing shall be made of urethane material that will last the life of the shock absorber. The damper shall incorporate a secondary hydraulic rebound stop.

C. Lubrication

(1) Standard Grease Fittings

All elements of steering, suspension and drive systems requiring scheduled lubrication shall be provided with grease fittings conforming to SAE Standard J534. These fittings shall be located for ease of inspection and shall be accessible with a standard grease gun 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 less than every 6,000 miles.

D. Kneeling

(1) A kneeling system shall lower the entrance(s) of the bus a minimum of 2.0 inches during loading and unloading operations regardless of load up to GVWR, measured at the longitudinal centerline of the entrance door(s) by the operator. The kneeling control shall provide the following functions:

(i.) Downward control must be held to allow downward kneeling movement.

(ii.) Release of the control during downward movement must completely stop the lowering motion and hold the height of the bus at that position.

(iii.) Upward control actuation must allow the bus to return to normal floor height without the operator having to hold the control.

(2) The brake and throttle interlock shall prevent movement when the bus is kneeled. The kneeling control shall be disabled when the bus is in motion. The bus shall kneel at a maximum rate of 1.25 inches per second at essentially a constant rate. After kneeling, the bus shall rise within 3 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/second.

- (3) An indicator visible to the operator 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 of 2.5 inches 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.

2.99 Wheels and Tires

A. Wheels

All wheels shall be interchangeable and shall be removed 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.

B. Painted Steel

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

As an option, Alcoa full polish aluminum wheels will be made available and priced separately.

C. Tires

- (1) 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. 35' and 40' buses will have 305/85/22.5 or 12R22.5 tires.
- (2) If Procuring Agency has a tire supplier, either purchase or lease, arrangements will be made for the supplier to furnish tires. Tires will be approved for transit application with a load range appropriate to bus weight and size.

As an option, Contractor supplied tires will be made available and priced separately.

2.100 Steering

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. An engine-driven hydraulic pump shall be provided for power steering.

As an option, a TRW electrically assisted steering system will be made available and priced separately. It shall provide electric powered assistance to the hydraulic power steering system. Approved equals must have similar performance, durability, housing size, height and telescoping range. Any failure of the electric powered assist shall result in the system defaulting to standard hydraulic power steering with no loss of steering control. The System shall be wired so that the controlling ECU correctly recognizes straight wheel position even after the bus has been shut off.

As an option, electrically assisted steering will be made available and priced separately.

As an option, the Protran Safe Turn Alert (STA) System will be made available and priced separately.

2.101 Steering Axle

A. Solid Beam Axle and Grease-Type Front Bearings and Seals

- (1) The front axle shall be a Meritor 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. All friction points on the front axle shall be equipped with replaceable bushings or inserts and lubrication fittings easily accessible from a pit or hoist.
- (2) 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.
- (3) The steering geometry of the outside (frontlock) wheel shall be within 2 degrees of true Ackerman up to 50 percent lock measured at the inside (backlock) wheel. The steering geometry shall be within 3 degrees of true Ackerman for the remaining 100 percent lock measured at the inside (backlock) wheel.

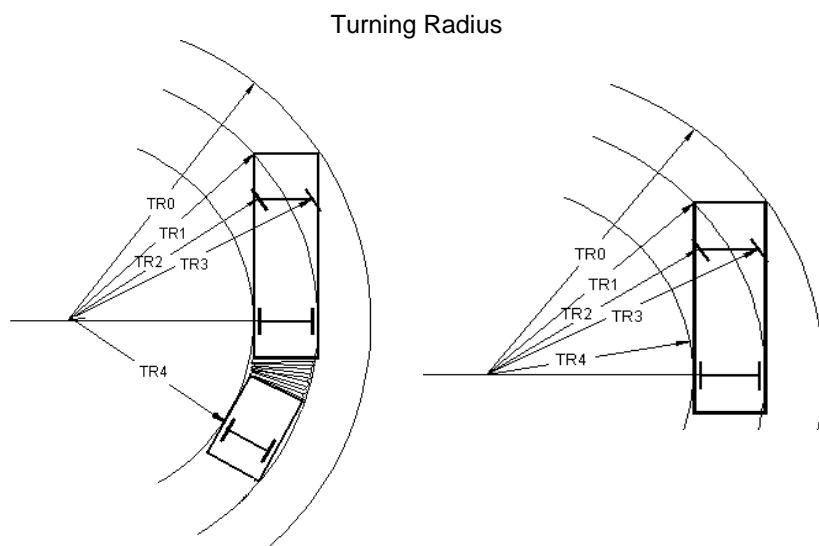
As an option, oil seals will be made available and priced separately.

2.102 Steering Wheel

A. Turning Effort

- (1) 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.
- (2) Under these conditions, the torque required to turn the steering wheel 10 degrees shall be no less than 5 foot-pounds and no more than 10 foot-pounds. Steering torque may increase to 70 foot-pounds when the wheels are approaching the steering stops, as the relief valve activates.
- (3) Power steering failure shall not result in loss of steering control. With the bus in operation, the steering effort shall not exceed 55 pounds 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.
- (4) 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 operator.

Bus Length	Maximum Turning Radius
35 ft.	39 ft. (TR0)
40 ft.	44 ft. (TR0)



B. Steering Wheel, General

- (1) The steering wheel diameter shall be approximately 18-20 inches; the rim diameter shall be 7/8 inch to 1-1/4 inches and shaped for firm grip with comfort for long periods of time.
- (2) Steering wheel spokes and wheel thickness shall ensure visibility of the dashboard so that vital instrumentation is clearly visible at center neutral position (within 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.

C. Steering Column Tilt

The steering column shall have full tilt capability with an adjustment range of no less than 40 degrees from the vertical and easily adjustable by the operator.

D. Steering Wheel Telescopic Adjustment

The steering wheel shall have full telescoping capability and have a minimum telescopic range of 1.8 inches and a minimum low-end adjustment of 28 inches, measured from the top of the steering wheel rim in the horizontal position to the cab floor at the heel point.

E. Drive Axle

- (1) The bus shall be driven by a heavy duty Meritor single reduction 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, 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. The retardation duty cycle can be more aggressive than propulsion.

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

2.103 Brakes

A. Service Brakes

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

B. Actuation

(1) Air-Actuated Brakes

- (i.) 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 70 pounds at a point 7 inches above the heel point of the pedal to achieve maximum braking. The heel point is the location of the operator'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.

(2) Automatic Traction Control

Microprocessor controlled automatic traction control (ATC) shall be provided.

C. 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 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.

D. Hubs

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.

As an option, a Stemco hubodometer will be made available and priced separately.

E. Drum Brakes

- (1) The service brakes shall be two (2) shoe, internal-expanding, air operated S-cam type brakes at each wheel. The brakes must be capable of stopping the vehicle in accordance with the performance requirements of state and federal regulations in effect at the time of manufacture. The parking brake shall be spring applied, air released chamber mounted on the rear axle assembly. All brake linings shall be 3/4 inch thick. Brake shoe return springs shall be the heaviest available.
- (2) Front and rear spring brake chambers shall be provided, and shall comply with the requirements of state and federal regulations in effect at the time of manufacture. At a minimum, the front chamber shall be size 24 and the rear shall be size 36. The emergency air tank shall be piped to a service valve at the left front corner of the bus to fill the tank for towing the vehicle.
- (3) Brake shoe effective area shall total a minimum of 932 square inches. Brake shoes shall be operated by cams which in return are operated by automatic slack adjusters. Slack adjusters shall be equipped with grease fittings and be capable of automatic adjustments throughout the life of the lining and drum assembly. Brake lines shall be installed so that the possibility of damage is minimized.
- (4) Lines and hoses shall be clamped and supported in a manner which minimizes long, unsupported hose lengths and precludes rubbing against any part of the bus.
- (5) The parking and emergency brakes shall be with a 40 PSI setting, controlled by a manual valve located convenient to the operator for safe, convenient access. Valve operation shall be "pull to set brakes" and "push to release" type brake system.
- (6) This brake shall have stopping ability that is equal to or better than required by federal and state regulations. It shall automatically apply if air system pressure falls below half the normal value or such other value as is recommended by the manufacturer. The parking / emergency brake shall be of spring brake design. The manufacturer will provide in their proposal a statement of brake efficiency at empty and loaded capacity.

As an option, a brake stroke and wear monitoring system shall be made available and priced separately.

As an option, four (4) wheel disc brakes will be made available and priced separately.

F. Parking/Emergency Brake

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.

2.104 Interlocks

A. Passenger Door Interlocks

- (1) To prevent opening 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.
- (2) 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 operator's door control is moved to a rear door enable or open position, or a rear door panel is opened more than 3 inches 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 engine at idle and 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.
- (3) All door systems employing brake and accelerator interlocks shall be supplied with supporting failure mode effects analysis documentation (FEMA), 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.
- (4) 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. Selection to be made by the Procuring Agency at the pre-production meeting.

2.105 Pneumatic System

A. General

- (1) 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.
- (2) 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 the 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.

B. Air Compressor

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

C. Air Lines and Fittings

- (1) Air lines, except necessary flexible lines, shall conform to the installation and material requirements of SAE Standard J1149 for copper tubing with standard, brass, flared or ball sleeve fittings, or SAE Standard J844 for nylon tubing if not subject to temperatures over 200°F. The air on the delivery side of the compressor where it enters the nylon housing shall not be above the maximum limits as stated in SAE 844. Nylon tubing shall be installed in accordance with the following color-coding standards:

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

- (2) 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-foot intervals. Nylon lines may be grouped and shall be supported at 30-inch intervals or less.

- (3) The compressor discharge line between powerplant 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-foot intervals or less.
- (4) 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.

D. Air Reservoirs

All air reservoirs shall meet the requirements of FMVSS Standard 121 and SAE Standard J10. 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.

E. 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. The air system shall be equipped with an air dryer located before the #1 air tank and as far from the compressor as possible to allow air to cool prior to entering the air dryer.

2.106 Electrical, Electronic and Data Communication Systems

A. Overview

- (1) 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.
- (2) Electronic devices are individual systems and components that process and store data, integrate electronic information or perform other specific functions.
- (3) The data communication system consists of the bi-directional 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.
- (4) Information level systems that require vehicle information for their operations or provide information shall adhere to J1939 data standard.
- (5) Data communications systems are divided into three levels to reflect the use of multiple data networks:
 - (i.) Drivetrain level: Components related to the drivetrain including the propulsion system components (engine, transmission and hybrid units), and anti-lock braking system (ABS), which may include traction control.
 - (ii.) 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.
 - (iii.) 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; and gateway devices.

B. Modular Design

- (1) 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.
- (2) Powerplant wiring shall be an independent wiring harness. Replacement of the engine compartment wiring harness(es) shall not require pulling wires through any bulkhead or removing any terminals from the wires.

C. Environmental and Mounting Requirements

- (1) 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.

- (2) 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. As a recommendation, no vehicle component shall generate, or be affected by, electromagnetic interference or radio frequency interference (EMI/RFI) that can disturb the performance of electrical/electronic equipment as defined in SAE J1113 and UNECE Council Directive 95/54 (R-10).
- (3) 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.
- (4) All electrical/electronic hardware mounted in the interior of the vehicle shall be inaccessible to passengers and hidden from view unless intended to be viewed. The hardware shall be mounted in such a manner as to protect it from splash or spray.
- (5) 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 sealed enclosure.
- (6) All electrical/electronic hardware and its mounting shall comply with the shock and vibration requirements of SAE J1455.
- (7) Electrical cables and wiring shall be adequate for all anticipated loads. The main wiring harness shall, to the maximum extent practical, be installed inside the bus body passenger compartment and, where that is not practical, shall be secured in frame rail raceways. The Contractor shall route and secure all wiring so that it does not rub anywhere. Routing of step well light wiring shall be such as to avoid rubbing door posts, etc. When wires or looms pass through metal, the wires shall be protected by a rubber grommet.
- (8) Each electrical panel, i.e. front and exit door panels, battery compartment, and front electrical panel shall provide an explanation of the respective electrical circuits and components contained within and shall be furnished in a silk-screened or water/oil proof diagram on the inside of the door panel.
- (9) All engine compartment wiring and light wiring shall be insulated from heat and be resistant to oil and grease. Electrical equipment, junction boxes and connectors shall not be placed where they are subjected to excessive heat, oil, grease, or road spray. All multiple terminal connectors shall be military (cannon plug) type, fully sealed and protected with a potting compound to prevent outside dirt and corrosives from entering the wiring, connectors, or plugs.
- (10) All main power supply terminals shall be covered with electric post rubber cover.
- (11) All electrical end plugs shall be covered. The wiring harnesses shall incorporate ten percent (10%) spare wires. Wiring located in the engine compartment shall be routed away from high-heat sources or shielded and/or insulated from temperatures exceeding the wiring and connector operating requirements. All cables and harnesses shall be secured to prevent chafing or shorting against each other or any part of the vehicle.
- (12) Clamps shall be rubber or PVC clad aircraft type. Grommets or other protective material shall be installed at points where wiring penetrates metal structures.
- (13) All wiring shall start and end at a junction block or component.
- (14) All inline and bulkhead connectors are to be of the weather pack sealed type.
- (15) Multi-pin connectors shall be protected internally from corrosion with silicone dielectric grease (Dow Corning #4 or equivalent). All circuits except the engine emergency shutoff and speedometer circuits must be protected by manual reset circuit breakers that clearly indicate their position when tripped. Each breaker must be labeled. Circuit breakers must have plastic dust caps.
- (16) Provide constant power for powering systems, including but not limited to fire suppression, radio, farebox, and DC-DC converter that require constant power when battery cutoff switch is off.
- (17) The windshield wiper and headlamps electric circuit shall be protected by modified auto-reset circuit breakers sized to the requirement of the load.
- (18) Rubber covers shall be provided for all electric posts.
- (19) All junction boxes located in the engine compartment shall be designed to allow thorough steam cleaning of the engine compartment area without intrusion of water.
- (20) Major junction panels shall be readily accessible for maintenance, not located behind or alongside seat or other fixed/semi-fixed obstructions. Access panels and junction box covers shall have seals which will preclude entry of rain, wash water, road debris, etc. All wiring and junction panel terminals shall be numbered and color coded for easy identification. A diagram showing the coding as the bus was built shall be furnished.

(21) The Contractor shall supply at least two spare circuits in the main harness between the front and rear of the bus. The main harness from the engine compartment shall be equipped with multiple circuit cannon type connectors.

D. Hardware Mounting

- (1) The mounting of the hardware shall not be used to provide the sole source ground, and all hardware shall be isolated from potential EMI/RFI, as referenced in SAE J1113.
- (2) All electrical/electronic hardware mounted in the interior of the vehicle shall be inaccessible to passengers and hidden from view unless intended to be viewed. The hardware shall be mounted in such a manner as to protect it from splash or spray.
- (3) 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 sealed enclosure.
- (4) All electrical/electronic hardware and its mounting shall comply with the shock and vibration requirements of SAE J1455.

2.107 General Electrical Requirements

A. Batteries

(1) Low-Voltage Batteries (24V)

Two (2) twelve volt (12V) lead acid filled thermal battery units, size 8D with side post connectors, with minimum 1300 cold cranking amps at 0°F with a reserve capacity of 425 minutes or greater will be required.

As an option, four (4) group 31 batteries will be made available and priced separately.

B. Battery Cables

The battery terminal ends and cables 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, be flexible and 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 shall be continuous cables with connections secured by bolted terminals and shall conform to specification requirements of SAE Standard J1127 – Type SGT, SGX or GXL and SAE Recommended Practice J541.

C. Master Battery Switch

- (1) A single master switch shall be provided near the battery compartment for the disconnecting of all battery positives (12V and 24V), except for safety devices such as the fire suppression system and other systems as specified. 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 access door shall be labeled “Battery Emergency Shutoff Switch.”
- (2) Turning the master switch off with the powerplant operating shall shut off the engine and shall not damage any component of the electrical system. The master switch shall be capable of carrying and interrupting the total circuit load.

D. Jump-Start Connector

A jump-start connector, red for 24V and blue for 12V, shall be provided at a location determined at the pre-production meeting and shall be equipped with a dust cap and adequately protected from moisture, dirt and debris. **As an option, the KBI KSM Cold Start Capacitor System will be made available and priced separately.**

E. Battery Compartment

- (1) The battery compartment must be well-ventilated to prevent hydrogen buildup while protecting the compartment from road spray, water intrusion and deicing chemicals. Batteries shall be mounted in a stainless steel slide out tray on rollers, with less than 50 pounds of effort. The battery tray shall have drain holes. The batteries shall not be located in the engine compartment.
- (2) The vehicle shall be equipped with a 12VDC and 24VDC quick disconnect switch(es). The battery compartment door shall conveniently accommodate operation of the 12VDC and 24VDC quick disconnect switch(es).

F. Alternator/Regulator

A Niehoff 803 alternator shall supply the entire nighttime operating electrical load of the vehicle while providing at least twenty percent (20%) of its current output for battery charging when the battery is fully discharged.

As an option, the Niehoff 703 alternator will be made available and priced as an option.

As an option, the Delco 450 DN will be made available and priced separately.

G. Circuit Protection

- (1) 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. Electronic circuit protection for the cranking motor shall be provided to prevent engaging of the motor for more than 30 seconds at a time to prevent overheating. The circuit breakers or 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 in-line 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.
- (2) 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 fifteen percent (15%) 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.

H. 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 four ground ring/spade terminal connections shall be made per ground stud. Electronic equipment requiring an isolated ground to the battery (i.e. electronic ground) shall not be grounded through the chassis.

I. Low Voltage/Low Current Wiring and Terminals

- (1) All power and ground wiring shall conform to specification requirements of SAE Recommended Practice J1127, J1128 and J1292. Double insulation shall be maintained as close to the junction box, electrical compartment or terminals as possible. The requirement for double insulation shall be met by wrapping the harness with plastic electrical tape or by sheathing all wires and harnesses with non-conductive, rigid or flexible conduit.
- (2) 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 present in the harness. Kinking, grounding at multiple points, stretching, and exceeding the minimum bend radius shall be prevented.
- (3) 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 non-conductive at areas of wire contact and shall not be damaged by heat, water, solvents or chafing.
- (4) 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.
- (5) All wiring harnesses over 5 feet long and containing at least five wires shall include ten percent (10%) (minimum one wire) excess wires for spares. This requirement for spare wires does not apply to data links and communication cables. Wiring harness length shall allow end terminals to be replaced twice without pulling, stretching or replacing the wire.
- (6) 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 either use different inserts or different insert orientations to prevent incorrect connections.
- (7) 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 inch, 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.

- (8) Ultrasonic and T-splices may be used with 7 AWG or smaller wire. When a T-splice is used, it shall meet these additional requirements:
 - (i.) It shall include a mechanical clamp in addition to solder on the splice.
 - (ii.) The wire shall support no mechanical load in the area of the splice.
 - (iii.) The wire shall be supported to prevent flexing.
- (9) All splicing shall be staggered in the harness so that no two splices are positioned in the same location within the harness.
- (10) Wiring located in the engine compartment shall be routed away from high-heat sources or shielded and/or insulated from temperatures exceeding the wiring and connector operating requirements.
- (11) The instrument panel and wiring shall be easily accessible for service from the operator'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.

J. Electrical Components

- (1) 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.
- (2) All electric motors shall be heavy-duty brushless type where practical, and have a continuous duty rating of no less than 40,000 hours (except cranking motors, washer pumps and wiper motors). All electric motors shall be easily accessible for servicing.

K. Electrical Compartments

- (1) 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.
- (2) The front compartment shall be completely serviceable from the operator's seat, vestibule or from the outside. Rear start and run controls shall be mounted in an accessible location in the engine compartment and shall be protected from the environment.

L. General Electrical Requirements

- (1) 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.
- (2) 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 32VDC on a 24VDC nominal voltage rating with a maximum of 50VDC) 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.

M. Wiring and Terminals

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

N. Discrete Inputs/Outputs (I/O)

All wiring to I/O devices, either at the harness level or individual wires, shall be labeled, stamped, or color-coded in a fashion that allows unique identification at a spacing not exceeding 4 inches. 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.

O. Shielding

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

- (2) 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.

P. Communications

- (1) The data network cabling shall be selected and installed according to the selected protocol requirements. The physical layer of all network communication systems shall not be used for any purpose other than communication between the system components, unless provided for in the network specifications.
- (2) Communications networks that use power line carriers (e.g. data modulated on a 24V power line) shall meet the most stringent applicable wiring and terminal specifications.

Q. 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 attribute 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.

R. 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.

S. Multiplexing – General

- (1) The Dynex multiplexing system shall control the components necessary to operate the vehicle. This is accomplished by processing information from input devices and controlling output devices through the use of an internal logic program.
- (2) 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.
- (3) 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.
- (4) Ten percent (10%) of the total number of inputs and outputs, or at least one each for each voltage type utilized (0V, 12V, 24V) at each module location shall be designated as spares.

T. Data Communications – General

- (1) 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:
 - (i.) 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).
 - (ii.) Data definition requirements that ensure access to diagnostic information and performance characteristics.
 - (iii.) The capability and procedures for uploading new application or configuration data.
 - (iv.) Access to revision levels of data, application software and firmware.
 - (v.) The capability and procedures for uploading new firmware or application software.
 - (vi.) Evidence that applicable data shall be broadcast to the network in an efficient manner such that the overall network integrity is not compromised.
- (2) Any electronic vehicle components used on a network shall be conformance tested to the corresponding network standard.

U. Drivetrain Level

Drivetrain components, consisting of the engine, transmission, retarder, anti-lock 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.

V. Diagnostics, Fault Detection and Data Access

- (1) Drivetrain performance, maintenance and diagnostic data, and other electronic messages shall be formatted and transmitted on the communications networks.
- (2) 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.

W. Programmability (Software)

The drivetrain level components shall be programmable by the Agency with limitations as specified by the sub-system supplier.

2.108 Multiplex Level

A. 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.

B. Diagnostics and Fault Detection

- (1) 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.
- (2) 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. The diagnostic data can be incorporated into the information level network or the central data access system.

C. Programmability (Software)

- (1) 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:
 - (i.) Password protection
 - (ii.) Limited distribution of the configuration software
 - (iii.) Limited access to the programming tools required to change the software
 - (iv.) Hardware protection that prevents undesired changes to the software
- (2) 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:
 - (i.) Hardware component identification where labels are included on all multiplex hardware to identify components
 - (ii.) Hardware series identification where all multiplex hardware displays the current hardware serial number and firmware revision employed by the module
 - (iii.) Software revision identification where all copies of the software in service displays the most recent revision number
 - (iv.) A method of determining which version of the software is currently in use in the multiplex system

D. Electronic Noise Control

- (1) 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.
- (2) Electrical and electronic subsystems on the buses 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.

2.109 Operator Provisions, Controls and Instrumentation

A. Operator's Area

(1) General

- (i.) In general when designing the operator's area, it is recommended that SAE J833, "Human Physical Dimensions," be used.
- (ii.) Switches and controls shall be divided into basic groups and assigned to specific areas, in conformance with SAE Recommended Practice J680, Revised 1988, "Location and Operation of Instruments and Controls in Motor Truck Cabs," and be essentially within the hand reach envelope described in SAE Recommended Practice J287, "Driver Hand Control Reach."

(2) Glare

The operator'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 operator's area shall be avoided.

B. Operator's Controls

- (1) 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.
- (2) All panel-mounted switches and controls shall be marked with easily read identifiers. Graphic symbols shall conform to SAE Recommended Practice 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.
- (3) 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.

C. Normal Bus Operation Instrumentation and Controls

- (1) 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.
- (2) Systems or components monitored by the onboard diagnostic 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.
- (3) 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.

As an option, an I/O Controls Multi-Function Display will be made available and priced separately.

- (4) 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.
- (5) Consideration shall be provided for future additions of spare indicators as the capability of onboard diagnostic systems improves. Blank spaces shall contain LEDs.

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	
Engine start, front	Approved momentary switch	Side console	Activates engine starter motor	
Engine start, rear	Three-position toggle switch	Engine compartment	Permits running engine 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	Upper sawtooth	Permits selection of passenger ventilation: off, cool, heat, low fan, high fan or full auto with on/off only	
Operator's ventilation	Rotary, three-position detent	Side console or dash left wing	Permits supplemental ventilation: fan off, low or high	
Defroster fan	Rotary, three-position detent	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 rotary position 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, normal	
Fast idle	Two-position switch	Side console	Selects high idle speed of engine	
W/C ramp/kneel enable	Two-position switch	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	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	Right side of steering wheel	Permits kneeling activation and raise and normal at front door remote location	Amber or red dash indicator; exterior alarm and amber light
Silent alarm	Recessed push button, NO and NC contacts momentary	Side console	Activates emergency radio alarm at dispatch and permits convert microphone and/or enables destination sign emergency message	
Video system event switch	Momentary on/off switch with plastic guard	Side console	Triggers event equipment, triggers event light on dash	Amber light
Left remote mirror	Four-position toggle switch	Side console	Permits two-axis adjustment of left exterior mirror	
Right remote mirror	Four-position toggle switch	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 operator to override activation of rear door passenger tape switches	
Engine shutdown override	Momentary switch with operation protection	Side console	Permits operator to override auto engine 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 operator to override and manually discharge fire suppression system	Red light
Mobile data terminal	Mobile data terminal bus operator interface panel	Above right dash wing	Facilitates operator interaction with communication system and master log-on	LCD display with visual status and text messages
Farebox interface	Farebox bus operator interface panel	Near farebox	Facilitates operator interaction with farebox system	LCD display
Destination sign interface	Destination sign interface panel	In approved location	Facilitates operator 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 operator to manually activate public address microphone	
Low profile microphone	Low-profile discrete mounting	Steering column	Permits operator to make announcements with both hands on the wheel and focusing on road conditions	
High beam	Detented push button	In approved location	Permits operator to toggle between low and high beam	Blue light
Parking brake	Pneumatic PPV	Side console or dash left wing	Permits operator to apply and release parking brake	Red light
Park brake release	Pneumatic PPV	Vertical side of the side console or dash center	Permits operator to push and hold to release brakes	
Hill holder	Two-position momentary switch	Side console	Applied brakes to prevent bus from rolling	
Remote engine speed	Rotary rheostat	Engine compartment	Permits technician to raise and lower engine RPM from engine compartment	
Master door/interlock	Multi-pole toggle, detented	Out of operator's reach	Permits operator to override disable door and brake/throttle interlock	Red light
Warning interlocks deactivated	Red indicator light	Dash panel center	Illuminates to warn operator that interlocks have been deactivated	Red light
Retarder disable	Multi-pole switch detented	Within reach of operator or approved location	Permits operator override to disable brake retardation/regeneration	Red light
Alarm acknowledge	Push button momentary	Approved location	Permits operator to acknowledge alarm condition	

Rear door passenger sensor disable	Multi-pole toggle, detented	In sign compartment or operator's barrier compartment	Permits operator to override rear door passenger sensing system	
Indicator/ alarm test button	Momentary switch or programming ¹	Dash center panel	Permits operator to activate test of sentry, indicators and audible alarms	All visuals and audibles
Auxiliary power	110-volt 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	Bus 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	Sensing low primary and secondary air tank pressure	Dash center	Indication of low air system pressure	Buzzer and red light
Methane detection function	Detection of system integrity	Property specific or dash center	Detects system failure	No start condition, amber light
Methane detection	Indication of 20% LED emergency light (LEL)	Property specific or dash center	Detects levels of methane	Flashing red at 20% LEL
Methane detection	Indication of 50% LEL	Property specific or dash center	Detects levels of methane	Solid red at 50% LEL
Engine coolant indicator	Low coolant indicator may be supplied as audible alert and visual and/or text message	Within operator's sight	Detects low coolant condition	Amber light
Hot engine indicator	Coolant temperature indicator may be supplied as audible alert and visual and/or text message	Within operator's sight	Detects hot engine condition and initiates time delay shutdown	Red light
Low engine oil pressure indicator	Engine oil pressure indicator may be supplied as audible alert and visual and/or text message	Within operator's sight	Detects low engine oil pressure condition and initiates time-delayed 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

Charging system indicator (12/24V)	Detects 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	Indication of bike rack not being in fully stowed position	Amber or red light
Fuel tank level	Analog gauge, graduated based on fuel type	Dash center	Indication of fuel tank level/pressure	
DEF gauge	Level indicator	Center dash	Displays level of DEF tank and indicates with warning light when low	Red light
Active regeneration	Detects status	Dash center	Indication of electric regeneration	Amber or red light

D. Operator 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.

E. Pedal Angle

(1) 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 degrees at the point of initiation of contact and extend downward to an angle of 10 to 18 degrees at full throttle.

(2) The location of the accelerator and brake pedals shall be determined by the manufacturer, based on space needs, visibility, lower edge of windshield, and vertical H-point.

F. Pedal Dimensions and Position

The floor-mounted accelerator pedal shall be 10 to 12 inches long and 3 to 4 inches wide. Clearance around the pedal must allow for no interference precluding operation.

As an option, adjustable accelerator/brake pedals will be made available and priced separately.

2.110 Visors/Sun Shades

A. Front and Side Sun Shade/Visor

(1) An AutoMotionShade Manual Flexi-Visor shall be provided over the operator's windshield and/or the operator's side window. The sunscreen shall be capable of being lowered to the midpoint of the operator's window. When deployed, the screen shall be secure, stable and shall not rattle, sway or intrude into the operator's field of view due to the motion of the bus 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 operator. Sunscreen shall be shaped to minimize light leakage between the visor and windshield pillars to the extent possible.

(2) 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.

2.111 Operator's Foot Switches

A. 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 degrees and a maximum of 37 degrees. It shall be located no closer to the seat front than the heel point of the accelerator pedal.

B. Turn Signal Controls

Turn signal controls shall be floor-mounted, foot-controlled, water-resistant, heavy-duty, momentary contact switches.

C. Foot Switch Control

(1) 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 operator'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 an approved location.

- (2) The foot switches shall be UL-listed, heavy-duty type, of a rugged, corrosion-resistant metal construction. The foot switches for the directionals 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.

D. Other Floor-Mounted Controls

The following may be floor mounted, momentary or latching, as identified by the Agency at the pre-production meeting.

- (1) Hazard
- (2) Silent alarm
- (3) PA system

2.112 Operator's Amenities

A. Coat Hook

A hook and tie-back loop shall be provided to secure the operator's coat. It shall be mounted above and to the left rear of the operator's head level behind the operator's seat.

B. Cup Holder

As an option, a dash mounted cup holder will be made available and priced separately.

C. Dash Fans

As an option, two (2) MCC 24V fans with dash mounted switch will be made available and priced separately.

D. Pleasure Radio

As an option, pre-wiring for an REI AM/FM/CD/MP3-USB/SD Player will be made available and priced separately.

2.113 Windshield Wipers and Washers

A. 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. Electric wipers will be used.

B. 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 (5) and twenty five (25) cycles per minute.

C. Non-Synchronized Wipers

For non-synchronized wipers, separate controls for each side shall be supplied.

D. Windshield Washers

- (1) The windshield washer system, when used with the wipers, shall deposit washing fluid evenly and completely wet the entire wiped area.
- (2) The windshield washer system shall have a minimum 3-gallon reservoir, located for easy refilling from outside of the bus. Reservoir pumps, lines and fittings shall be corrosion-resistant and must include a means to determine fluid level.

2.114 Operator's Seat

A. Dimensions

- (1) The Operator'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.
- (2) The seat will be a USSC G2A with a two point seat belt.

As an option, the Recaro Ergo Metro, USSC 9100 ALX, USSC 9100 ALX3 will be made available and priced separately.

As an option, and to the extent practicable, 3-point seat belts for the seats listed above will be made available and priced separately.

As an option, a silicone cushion for the operator's seat will be made available and priced separately.

- B. 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 inches at its minimum length and no more than 20.5 inches at its maximum length.
- C. Seat Pan Cushion Height
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 inches with a minimum 6 inches vertical range of adjustment.
- D. 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 degrees). The seat pan shall adjust in its slope from no less than plus 12 degrees (rearward "bucket seat" incline), to no less than minus 5 degrees (forward slope).
- E. 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 inches). On all low floor buses, the seat base shall travel horizontally a minimum of 9 inches. It shall adjust no closer to the heel point than 6 inches.
- F. Seat Pan Cushion Width
Measurement is the horizontal distance across the seat cushion. The seat pan cushion shall be 17 to 21 inches across at the front edge of the seat cushion and 20 to 23 inches across at the side bolsters.
- G. Seat Suspension
 - (1) The operator's seat shall be appropriately dampened to support a minimum weight of 380 pounds. The suspension shall be capable of dampening adjustment in both directions.
 - (2) Rubber snubbers shall be provided to prevent metal-to-metal contact.
- H. 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 inches. Seat back will include dual recliner gears on both sides of the seat.
- I. 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 inches.
- J. Seat Back Angle Adjustment
 - (1) The seat back angle shall be measured relative to a level seat pan, where 90 degrees is the upright position and 90 degrees-plus represents the amount of recline.
 - (2) The seat back shall adjust in angle from a minimum of no more than 90 degrees (upright) to at least 105 degrees (reclined), with infinite adjustment in between.
- K. Seat Belt
 - (1) The belt assembly should be an auto-locking retractor (ALR) lap seat belt only. All seat belts should be stored in automatic retractors. The belts shall be mounted to the seat frame so that the operator may adjust the seat without resetting the seat belt.
 - (2) The seat and seat belt assemblies as installed in the bus shall withstand static horizontal forces as required in FMVSS 207 and 210. Seatbelt webbing shall be black in color.
- L. Seat Control Locations
While seated, the operator 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.

M. Seat Structure and Materials

(1) Cushions

Cushions shall be fully padded with at least 3 inches of materials in the seating areas at the bottom and back.

(2) Cushion Materials

All materials used on the seat assembly, passenger and operator's seat shall meet the flammability requirements of FMVSS 302. Proof of compliance must be submitted with proposals.

N. Pedestal

Exposed portions of seat frame and hardware shall be stainless steel or chrome plated.

2.115 Mirrors

A. Exterior Mirrors

Exterior mirrors shall be Safe Fleet 9" x 13" 2-piece flat and convex. Mirrors shall be heated and remote controlled with black powder coated stainless steel arms that return to original position when moved. Left mirror shall be mounted near the front or upper edge of the operator's window. Right mirror shall be viewed through the upper right corner of windshield and mounted so as to provide maximum practical clearance to the ground. Mirrors must fold out of way of automatic washer. Metal mirror parts to be chrome plated or stainless steel. Exterior mirrors must utilize a "quick disconnect" for electrical wiring. **As an option, Safe Fleet Mirrors will be made available and priced separately.**

As an option, Lucerix (Metagal) 8" x 15" 2-piece flat and convex, heated and remote w/ powder coated stainless steel arms will be made available and priced separately.

B. Interior Mirrors

(1) Mirrors shall be provided for the operator to observe passengers throughout the bus without leaving the seat and without shoulder movement. The operator shall be able to observe passengers in the front/entrance and rear/exit areas, anywhere in the aisle, and in the rear seats.

(2) A 8-1/4" x 16" rear view mirror shall be provided on the front sign header.

(3) A 6" diameter adjustable convex mirror over and forward of the front door shall be provided. An adjustable convex mirror shall be provided over/above and to the rear of the rear exit door. The convex mirrors described above are to be used in conjunction with each other. The glass in this mirror shall be replaceable.

2.116 Windows

A. Windshield

(1) The windshield shall permit an operator's field of view as referenced in SAE Recommended Practice J1050. The vertically upward view shall be a minimum of 14 degrees, measured above the horizontal and excluding any shaded band. The vertically downward view shall permit detection of an object 3-1/2 feet high no more than 2 feet in front of the bus. The horizontal view shall be a minimum of 90 degrees above the line of sight. Any binocular obscuration due to a center divider may be ignored when determining the 90 degree requirement, provided that the divider does not exceed a 3 degree angle in the operator's field of view. Windshield pillars shall not exceed 10 degrees of binocular obscuration. The windshield shall be designed and installed to minimize external glare as well as reflections from inside the bus.

(2) 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.

B. Glazing

The windshield glazing material shall have a 1/4 inch nominal thickness laminated safety glass conforming to the requirements of ANSI Z26.1 Test Grouping 1A and the Recommended Practices defined in SAE J673.

C. Operator's Side Window

(1) The operator's side window shall be the sliding type, requiring only the rear half of sash to latch upon closing, and shall open sufficiently to permit the seated operator to easily adjust the street side outside rear view 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.

(2) The operator's view, perpendicular through operator's side window glazing, should extend a minimum of 33 inches (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 inches (560 mm) above the operator's floor to ensure visibility of an under-mounted convex mirror.

(3) Operator's window construction shall maximize ability for full opening of the window.

- (4) The operator's side window glazing material shall have a 1/4 inch nominal thickness laminated safety glass conforming to the requirements of ANSI Z26.1-1996 Test Grouping 2 and the Recommended Practices defined in SAE J673.
- (5) The design shall prevent sections from freezing closed in the winter. Light transmittance shall be 75 percent on the glass area below 53 inches from the operator platform floor. On the top fixed over bottom slider configuration, the top fixed area above 53 inches may have a maximum 5 percent light transmittance.

D. Passenger Side Windows

- (1) Frameless bonded, lower fixed, upper transom passenger side windows shall be provided. With the exception of the upper portion of first right-hand and/or left hand window where the side destination sign shall be located, all other tinted 7/32" 28% gray tinted safety glass and frame windows will have black (dark) polyester powder coat aluminum frames inside and out. Windows shall be flat panel, transit application with approved laminated safety glass (ANSI 25.1). Glazing in the sash shall be easily replaced without removing the sash from the bus. Side window sliders shall be equipped with metal latches. All window glass shall be mounted in removable rubber retaining strips/seals.

As an option, fixed frame, framed transom, frameless bonded fixed, and frameless bonded transom mounted windows will be made available and priced separately.

- (2) A positive lock type emergency latch meeting FMVSS 217 shall be furnished on each window frame. Each window shall have a permanent decal describing emergency window operation procedures.
- (3) Side windows shall be designed to prevent the entrance of air and water when windows are closed. The window seal rubber must be installed so that passengers cannot remove it and rubber shall be of such quality to resist adhering to other sash sill.

2.117 Heating, Ventilating and Air Conditioning

A. Capacity and Performance

- (1) The Heating, Ventilation and Air Condition (HVAC) climate control system shall be rear-mounted Thermo King T-14 (616) Screw Compressor, Brushless Evaporator & Condenser Motors with R134a refrigerant capable of maintaining the interior of the bus at the temperature and humidity levels defined in the following paragraphs. Accessibility and serviceability of components preferably shall be provided without requiring maintenance personnel to climb up on the roof of the bus.
- (2) The following climatic factors shall be used as design guidelines and shall be considered as operational requirements.

Temperature and Solar Load

Ambient air temperature, external equipment:

Minimum	-20°F
Maximum.....	120°F

Humidity:

Minimum	5%
Maximum.....	100%

Precipitation

Maximum rainfall rate	6 inches per hour
Maximum snowfall rate	5 inches per hour
Maximum snow accumulation.....	18 inches

- (3) 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 maintain an average passenger compartment temperature within a range between 65° and 80°F, while controlling 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. Reheat system water control valve to be pulsing type to provide even heat distribution.
- (4) 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 one degree for each degree of exterior temperature in excess of 95°F. When bus is operated in outside ambient temperatures in the range of -10°F to +10°F, the interior temperature of the bus shall not fall below 55°F while bus is running on the design operating profile.

- (5) System capacity testing, including pull down/warm-up, stabilization and profile, shall be conducted in accordance with the APTA "Recommended Instrumentation and Performance Testing for Transit Bus Air Conditioning System." Temperature measurements shall be made in accordance with this document with the following modifications:
- (i.) The temperatures measured from a height of 6 inches below the ceiling shall be within plus or minus 3°F of the average temperature at the top surface of the seat cushions.
 - (ii.) Temperatures measured more than 3 inches above the floor shall be within plus or minus 5°F of the average temperature at the top surface of the seat cushions. The interior temperatures, from front to rear of the bus, shall not vary more than plus or minus 3°F from the average.
 - (iii.) The recommended locations of temperature probes are only guidelines and may require slight modifications to address actual bus design. Care must be taken to avoid placement of sensing devices in immediate path of air duct outlet. In general, the locations are intended to accurately represent the temperatures of the interior passenger area.
- (6) 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 engine startup. Engine temperature shall be within the normal operating range at the time of startup of the cool-down test and the engine speed shall be limited to fast idle that may be activated by an operator-controlled device. During the cool-down period the refrigerant pressure shall not exceed safe high-side pressures and the condenser discharge air temperature, measured 6 inches 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 4:00 p.m. on August 21, shall be used. There shall be no passengers on board, and the doors and windows shall be closed. The air conditioning system shall meet these performance requirements using HFC R134a. The climate control blower motors and fan shall be designed such that their operation complies with the interior noise level requirements. There shall be manual shutoff valves to isolate the drier, receiver, and compressor.

As an option, the Thermo King X426 Compressor will be made available and priced separately.

As an option, the Thermo King S391 Compressor will be made available and priced separately.

As an option, the Thermo King X430 Compressor will be made available and priced separately.

As an option, GE Wound Field motors will be made available and priced separately.

As an option, the Thermo King all electric HVAC will be made available and priced separately.

As an option, the MCC FleeTracker System will be made available and priced separately.

As an option, the MCC Reciprocating Compressor with unloading will be made available and priced separately.

As an option, the MCC Micro-channel Coils will be made available and priced separately.

As an option, the MCC Patented Compressor Mount will be made available and priced separately.

B. Controls and Temperature Uniformity

- (1) The HVAC system excluding the operator'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.
- (2) Hot engine coolant water shall be delivered to the HVAC system operator's defroster/ heater and other heater cores by means of an auxiliary coolant pump, sized for the required flow, which is brushless and sealless having a minimum maintenance free service life for both the brushless motor and the pump of at least 40,000 hours at full power.

C. 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 plus or minus 2°F of specified temperature control set-point.

D. Manually Adjustable Temperature Control Set Point

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

- (2) The operator shall have full control over the defroster and operator's heater. The operator shall be able to adjust the temperature in the operator'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.
- (3) 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 inches 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 plus or minus 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 plus or minus 5°F will be allowed for limited, localized areas provided the majority of the measured temperatures fall within the specified requirement.

2.118 Air Flow

A. Passenger Area

- (1) The cooling mode at 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 feet per minute on any passenger. The ventilating mode shall provide air at a minimum flow rate of 20 cfm per passenger.
- (2) 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.
- (3) The climate control blower motors and fan shall be designed such that their operation complies with the interior noise level requirements.

B. Operator's Area

The bus interior climate control system shall deliver at least 100 cfm of air to the operator'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 Recommended Practice J382, "Windshield Defrosting Systems Performance Requirements," and shall have the capability of diverting heated air to the operator's feet and legs. The defroster or interior climate control system shall maintain visibility through the operator's side window.

C. Controls for the Climate Control System (CCS)

The controls for the operator's compartment for heating, ventilation and cooling systems shall be integrated and shall meet the following requirements:

- (1) 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.
- (2) A manually operated control valve shall control the coolant flow through the heater core.
- (3) If a cable-operated manual control valve is used, 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.

D. Operator's Compartment Requirements

- (1) The heating, ventilation and defroster system for the operator's area shall be controlled by the operator. The system shall meet the following requirements:
 - (i.) The heater and defroster system shall provide heating for the operator and heated air to completely defrost and defog the windshield, operator'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 the exterior through a control device and pass it through the heater core to the defroster system and over the operator's feet. A minimum capacity of 100 cfm shall be provided. The operator shall have complete control of the heat and fresh airflow for the operator's area.
 - (ii.) 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 operator's position to allow direction of air onto the side windows.

- (2) The bus interior climate control system shall deliver at least 100 cubic feet per minute of air to the operator's area when operating in the ventilation, heating, and cooling modes without use of the operator's booster fan. The climate control system blower motors will operate at the set speed during all operating modes. All return air ducts will be protected by guards constructed of a sturdy mesh which will resist damage.
- (3) Adjustable nozzles shall permit variable distribution or shutdown of all air flow. The defroster and/or interior climate control system shall maintain visibility through the operator's side window. A booster fan with operator control shall be provided in the ductwork at the operator's area, forward of the operator's position, for increased air flow to the operator. The windshield defroster unit shall meet or exceed all requirements of SAE Recommended Practice J382, Windshield Defrosting Systems Performance Requirements, and shall have the capability of diverting heated air to the operator's feet and legs.

E. Air Filtration

Air shall be filtered before discharge 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.

F. Filters

Hogs hair filters shall be provided.

G. Roof Ventilators

- (1) One roof ventilator shall be provided in the roof of the bus, approximately or just forward of the front axle of the bus.
- (2) The 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 square inches and shall be capable of being positioned as a scoop with either the leading or trailing edge open no less than 4 inches, or with all four edges raised simultaneously to a height of no less than 3-1/2 inches. An escape hatch shall be incorporated into the roof ventilator. The roof ventilator shall be sealed to prevent entry of water when closed.

2.119 Exterior Panels, Finishes and Exterior Lighting

A. Design

- (1) The bus shall have a clean, smooth, simple transit bus 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 bus 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.
- (2) 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 or 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.

As an option, alternative exterior styling designs will be made available and priced separately.

B. 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.

C. Roof-Mounted Equipment

A non-skid, walkway shall be incorporated on the roof to provide access to equipment without climbing on or over any equipment.

D. Pedestrian Safety

- (1) Exterior protrusions along the side and front of the bus greater than 1/2 inch and within 80 inches 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 7/8 inch 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.

- E. Easily Replaceable Lower Side Body Panels
The lower section of the side body panels (low floor buses) shall be easily and quickly replaceable.
- F. Rain Gutters
Rain gutters shall be provided to prevent water flowing from the roof onto the passenger doors and operator's side window. When the bus is decelerated, the gutters shall not drain onto the windshield, operator's side window or door boarding area. Cross-sections of the gutters shall be adequate for proper operation.
- G. License Plate Provisions
Provisions shall be made to mount standard-size U.S. license plates per SAE J686 on the 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 provisions shall be illuminated per SAE J587.
- H. Fender Skirts
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.
- I. Standard Splash Aprons
Splash aprons, composed of 1/4 inch minimum composition or rubberized fabric, shall be installed behind and/or in front of wheels as needed to reduce road splash and protect under floor components. The splash aprons shall extend downward to within 6 inches 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 aprons 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. An approved method of grounding static electricity shall be provided on each bus such as a conductive nylon grounding strap.

2.120 Service Compartments and Access Doors

- A. Access Doors
 - (1) Conventional or pantograph hinged doors shall be used for the engine compartment and for all auxiliary equipment compartments including doors for checking the quantity and adding to the engine coolant, engine lubricant and transmission fluid. Access openings shall be sized for easy performance of tasks within the compartment, including tool operating space.
 - (2) 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 over-center 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.
 - (3) If precluded by design, the manufacturer shall provide door design information specifying how the requirements are met.
 - (4) The engine compartment, including the exhaust duct plenum, shall be completely sealed to prevent smoke or fumes from entering the bus interior. The engine bulkhead and exhaust duct plenum shall be insulated adequately to prevent discomfort to passengers due to heat, to minimize hazards in case of fire in the engine compartment, and to aid in controlling noise to meet required levels.
 - (5) An engine air intake designed to minimize noise shall be provided. Insulation shall be provided as needed in the engine compartment area for sound suppression.
 - (6) An adequate number of fire detectors shall be furnished in the engine compartment, as determined by the bus manufacturer. The detectors shall activate an alarm (visual as well as audible) at the operator's station.
 - (7) Access panels to the left and right side of the engine compartment shall be provided with expanded metal inserts to provide heat dissipation in the engine compartment. Panels shall also be constructed so that maintenance personnel can easily reach all under the floor and engine compartment equipment requiring

access from outside the bus body. Access panels will be hinged to swing up and out of the way, and be secured with a 5/16 inch square latch.

- (8) Gas operated shocks with safety locks shall secure access doors in the open position during inspection and servicing. The engine compartment doors will be equipped with handles. Louvers shall be provided in the rear engine compartment door to optimize airflow. Access doors are not required in the engine door.
- (9) Forward edge hinges with positive-action hold-open-springs shall be provided on the fuel connector and lay flat against the adjacent panel when fully opened. The battery access door shall have top edge hinges with gas operated shocks with safety devices when the battery is being serviced. A small access door shall be provided to the battery disconnect switch. The battery disconnect switch access door and the fuel and air tank drain valve doors will be equipped with a well type securing latch.

2.121 Bumpers

A. Location

Bumpers shall provide impact protection for the front and rear of the bus with the top of the bumper being 27 inches, plus or minus 2 inches, 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.

B. Front Bumper

- (1) 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 pounds 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 degree angle to the longitudinal centerline of the bus.
- (2) 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 inches. Mounting provisions will be made for integrating bike rack if necessary.

As an option, a 2-position Byk-Rak stainless steel bike rack will be made available and priced separately.

As an option, a Sportworks VeloPorter 2 bike rack will be made available and priced separately.

As an option, a dash mounted bike deployed indicator lamp will be made available and priced separately.

As an option, a mounting bracket for the Sportworks VeloPorter 2 bike rack only shall be made available and priced separately.

C. Rear Bumper

- (1) 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 feet 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 inch high, and at accelerations up to 2 mph/sec. 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 pounds, at 4 mph parallel to or up to a 30 degree angle to the longitudinal centerline of the bus.
- (2) The rear bumper shall be shaped to preclude unauthorized riders from standing on the bumper. The bumper shall not require service or maintenance or in normal operation during the service life of the bus. The bumper may increase overall bus length specified by no more than 7 inches.

D. Bumper Material

Bumper material shall be corrosion-resistant and withstand repeated impacts of the specified loads without sustaining damage. Visible surfaces shall be black. These bumper qualities shall be sustained throughout the service life of the bus.

2.122 Finish and Color

A. Appearance

- (1) 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 assure a proper bond between the basic surface and successive coats of original paint for the service life of the bus. Drilled holes and cutouts in exterior surfaces shall be made prior to cleaning, priming and painting, where possible, to prevent corrosion. Body filler materials may be used for surface dressing, but not for repair of damaged or improperly fitted panels.
- (2) Paint shall be applied smoothly and evenly with the finished surface free of visible dirt and the following other imperfections:
 - i. Blisters or bubbles appearing in the topcoat film
 - ii. Chips, scratches, or gouges of the surface finish
 - iii. Cracks in the paint film
 - iv. Craters where paint failed to cover due to surface contamination
 - v. Overspray
 - vi. Peeling
 - vii. Runs or sags from excessive flow and failure to adhere uniformly to the surface
 - viii. Chemical stains and water spots
 - ix. Dry patch due to incorrect mixing of paint activators
 - x. Buffing swirls
- (3) 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.
- (4) 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 of 300 foot-pounds. 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.
- (5) Bus exteriors shall be painted and numbered to include numbers on the roof to the general design to be provided with each order. Minor variations to this color scheme may be required in order to accommodate the specific styling of the Contractor's buses.
- (6) Proposers shall provide a basic "white" paint for the body exterior in order to adequately price the bus at time of proposal submittal. Please note that all required interior and exterior decals will be included in the base vehicle pricing. Once an award is made and individual procuring agencies' express interest in purchasing buses, the contractor can enter into discussion regarding specific paint schemes and graphics.
- (7) The bus exterior shall be primed as recommended by the manufacturer of the final finish, and shall be finished with the color scheme specified in the order. Proposers should provide listings of available colors. Current color schemes used by the Procuring Agencies are publicly available.
- (8) There shall be no bare or exposed metal surfaces showing on the exterior of the bus, exclusive of ornamentation and accessories. The display of manufacturer's name or insignia on the exterior of the bus will be as specified in the individual order.

B. Decals, Numbering and Signing

- (1) 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 38.27.
- (2) Buses shall have fleet numbers applied both on the interior and exterior of the bus in sequence with factory serial numbers. Each individual order will include the correct starting number and the location, font, size and color of numbers.

C. Passenger Information

- (1) ADA priority seating signs as required and defined by 49 CFR Part 38.27 shall be provided to identify the seats designated for passengers with disabilities.
- (2) Requirements for a public information system in accordance with 49 CFR Part 38.35 shall be provided.
- (3) Interior decals including but not limited to "No Smoking," "Exit door," "Emergency Exit," "Watch Your Step," "Wheelchair instructions and "Reserved for Wheelchairs," etc. shall be provided. All decals shall be in English

and Spanish. Decals containing identification of windows, hatches, etc. shall also be provided. All decals shall conform to Arkansas state law.

2.123 Exterior Lighting

A. General Requirements

- (1) Exterior lighting and reflectors shall comply, as applicable, with Part 393, Subpart B of the FMCSA and FMVSS 108.
- (2) All exterior lights shall be designed to prevent entry and accumulation of moisture or dust. Commercially available LED-type lamps shall be utilized at all exterior lamp locations. 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. 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.
- (3) Exterior lighting shall comply with all applicable federal and state regulations. Replacement lamps shall be readily available from commercial sources; they shall not be unique to the manufacturer. Those applications which will not accommodate and LED lamp shall have a replaceable bulb with access to the bulb by removing the lens from outside the bus.
- (4) LED headlights are required with high and low beams controlled from a sealed, moisture-protected foot switch located on the floor in the operator's station. The sealed beam units shall be of the latest heavy duty type and be ruggedly mounted to maintain adjustment under transit operating conditions. Headlights shall be wired to operate on reduced voltage in the run position.
- (5) All other lights shall be LED as allowed by applicable state laws. The stop lights and tail lights shall be 4" diameter. Rear turn indicator lights shall be separate from the stop/tail lights.

As an option, 7" LED stop/tail/turn lamps will be made available and priced separately.

- (6) The LED marker lights at the front and rear upper corners of the bus shall be of flush mounted type to preclude breakage by tree limbs, bus washers, etc.
- (7) Each doorway shall have an outside light (or lights) which, when the door is open, provides at least one foot candle of illumination of the street surface for a distance of three feet perpendicular to the bottom step tread outer edge. Light(s) shall be located below window level and shielded to protect the eyes of entering and exiting passengers.

B. Backup Light/Alarm

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

C. Doorway Lighting

Lamps at the front and rear passenger doorways 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 foot-candle for a distance of 3 feet outward from the outboard edge of the door threshold. The lights may be positioned above or below the lower daylight opening of the windows and shall be shielded to protect passengers' eyes from glare.

D. 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 are not 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.

2.124 Interior Panels and Finishes

A. General Requirements

- (1) Materials shall be selected on the basis of maintenance, durability, appearance, safety, 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 operating conditions.

- (2) Interior surfaces more than 10 inches 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 bus is parked on a level surface.
- (3) 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.

B. Operator Area Barrier

A barrier or bulkhead between the operator 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 operator by standing behind the operator's seat. The lower area between the seat and panel must be accessible to the operator. The partition must be strong enough in conjunction with entire partition assembly for mounting of such equipment as flare kits, fire extinguishers (1.2k), microcomputer, public address amplifier, etc. Dark or black panels are preferred behind the operator's head. The panel should be isolated for noise control and attached with rubber grommets.

C. Modesty Panels

- (1) 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.
- (2) Design and installation of modesty panels located in front of forward-facing seats shall include a handhold or grab handle along its 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 1-1/2 inches above the floor. Panels forward of longitudinal seats shall extend below the level of the seat cushion. Dividers positioned at the doorways shall provide no less than 2-1/2 inches 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.
- (3) The modesty panel and its mounting shall withstand a static force of 250 pounds applied to a 4 x 4 inch area in the center of the panel without permanent visible deformation.

D. Front End

The entire front end of the bus shall be sealed to prevent debris accumulation behind the dash and to prevent the operator's feet from kicking or fouling wiring and other equipment. The front end 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 operator'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 operator's barrier shall be finished with a surface that reduces glare. Any mounted equipment must have provisions to support the weight of equipment.

E. Rear Bulkhead

- (1) 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.
- (2) The rear bulkhead paneling shall be contoured to fit the ceiling, side walls 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 litter being thrown or drawn through the grille. If it is necessary to remove the panel to service components located on the rear bulkhead, the panel 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.

F. 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.

G. Fastening

Interior panels shall be attached so that there are no exposed unfinished or 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.

H. Insulation

- (1) 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.
- (2) 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 operator or passengers cannot feel drafts during normal operations with the passenger doors closed. Insulation shall meet the requirements of FMVSS 302.

I. Floor Covering

- (1) The floor covering shall be Altro flooring material. 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 standee line shall be approximately 2 inches wide and shall extend across the bus aisle. This line and the edge of the steps shall be yellow. The color and pattern shall be consistent throughout the floor covering.

As an option, RCA rubber floor material will be made available and priced separately.

- (2) 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.
- (3) 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.
- (4) 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.

2.125 Interior Lighting

A. Passenger Lighting

- (1) The passenger interior lighting system shall be an I/O Controls LED lighting system. The interior lighting system shall provide a minimum 15 foot candle illumination on a 1 square foot plane at an angle of 45 degrees from horizontal, centered 33 inches above the floor and 24 inches in front of the seat back at each seat position. Allowable average light level for the rear bench seats shall be 7 foot candles. Floor surface in the aisles shall be a minimum of 10 foot candles, vestibule area a minimum of 4 foot candles with the front doors open and minimum of 2 foot candles with the front doors closed. The front entrance area and curb lights shall illuminate when the front door is open and master run switch is in the "lights" positions. Rear exit area and curb lights shall illuminate when rear door is unlocked.
- (2) Step lighting for the intermediate platform between the lower and upper floor levels shall be provided and shall illuminate in all engine 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.
- (3) 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 bus shall be equipped with interior advertising card tracks on each side of the interior passenger compartment, running the length of the bus, to hold 11 inch-high ad cards. Photo sensor detects and adjusts light level automatically relative to ambient light for passenger comfort.
- (4) Lens material shall be clear polycarbonate. Lens shall be designed to effectively "mask" all individual LEDs to make them invisible and there shall be no "hot spot" or "dark spot". Lens shall be sealed to inhibit incursion of dust and insects yet easily removable for service. If threaded fasteners are used they must be held captive in the lens. Access panels shall be provided to allow servicing of components located behind light panels.

- (5) An individual operator module shall be provided for each light fixture. The operator module shall have built-in self-protection of thermal shut-down and restart, PWM (Pulse Width Modulation) output to regulate light level, reverse polarity protect and rebuild able.
- (6) When the master switch is in the Run or Night Run mode, the first light module on each side of the bus shall slowly fade to darkness when the front door is in the closed position and light output shall gradually illuminate to reach maximum light level when the door is opened. Solid state LED lighting shall have unlimited on-off cycles.
- (7) The light system may be designed to form part of the entire air distribution duct.
- (8) Emergency backup system shall keep the light fixtures over the front and rear doors illuminated at minimum light output under separate battery power for 10 to 15 minutes allowing passengers visibility and timely evacuation from the vehicle during emergency conditions.

B. Operator Area

The operator's area shall have a light to provide general illumination, and it shall illuminate the half of the steering wheel nearest the operator to a level of 5 to 10 foot candles. This light shall be controlled by a toggle switch that is convenient to the operator. 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.

As an option, a light that illuminates the farebox will be made available and priced separately.

C. Vestibules/Doors

Floor surface in the aisles shall be a minimum of 10 foot candles, and the vestibule area a minimum of 4 foot candles with the front doors open and a minimum of 2 foot candles with the front doors closed. The front entrance area and curb lights shall illuminate when the front door is open and master run switch is in the "lights" positions. Rear exit area and curb lights shall illuminate when the rear door is unlocked.

D. Step Lighting

Step lighting for the intermediate steps between lower and upper floor levels shall be a minimum of 4 foot candles and shall illuminate in all engine 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.

E. Ramp Lighting

Exterior and interior ramp lighting shall comply with 49 CFR Parts 19.29 and 19.31.

F. Fare Collection

If selected, a farebox shall be installed in a space as far forward as practicable, and/or structural provisions shall be made for installation of a farebox (if not installed by manufacturer). Location of this fare collection device shall not restrict traffic in the vestibule and shall allow the operator to easily reach the device. The farebox shall not restrict access to the operator's area and shall not restrict operation of operator controls. Farebox location shall permit accessibility to the vault for easy manual removal. Meters and counters on the farebox shall be readable on a daily basis. A 20 amp, 12VDC, protected lead will be made available to power the farebox.

As an option, a Genfare Odyssey farebox will be made available and priced separately.

As an option, a Genfare Fast Fare farebox will be made available and priced separately.

G. Interior Access Panels and Doors

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 or mechanical props or over-center 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. Access doors shall be secured with hand screws or latches. All fasteners that retain access panels shall be captive in the cover.

H. Floor Panels

(1) 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.

(2) The number of special fastener tools required for panel and access door fasteners shall be minimized.

2.126 Passenger Accommodations

A. Passenger Seating

- (1) American Seating InSight Prime+ passenger seats shall be arranged in the bus so that seating capacity is maximized and shall accommodate as many forward facing seats as possible. Hip-to-knee room shall be a minimum of 26.50". Passenger seating shall be molded shell seats with vandal resistant fabric inserts. Installation shall be with cantilever mount and no closeout where possible.

As an option, USSC Aries seats with plastic inserts will be made available and priced separately.

As an option, USSC Gemini seats with plastic inserts will be made available and priced separately.

As an option, American Seating InSight Prime seats shall be made available and priced separately.

As an option, American Seating InSight Classic seats shall be made available and price separately.

- (2) Proposers shall provide a proposed seating layout for each size bus.
- (3) Any exposed metal of the frame will be powder coated, color coordinated to match the seat inserts, brushed aluminum, or brushed stainless steel.
- (4) The handholds shall be stainless steel.
- (5) The top area of the seat back shell will wrap around the upper portion of the seat back (below the grab rail) in a "bubble" to form a crash pad on the rear of each seat. The crash pad will be of continuous construction with the back.
- (6) Rear seat platform shall be hinged to gain access to engine compartment.
- (7) Proposers shall submit a certified test report as evidence of compliance with all testing activities, test diagrams, test equipment as well as test data related to loads, deflections and permanent deformation of the seat assembly as defined in the APTA Standard Bus Procurement Guidelines manual.

B. 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 vertical surface immediately in front, shall be a minimum of 26 inches. At all seating positions in paired transverse seats immediately behind other seating positions, hip-to-knee room shall be no less than 27 inches.

C. 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 inches. Seats immediately behind the wheel housings and modesty panels may have foot room reduced.

D. Aisles

The aisle between the seats shall be no less than 20 inches wide at seated passenger hip height. Seat backs shall be shaped to increase this dimension to no less than 24 inches at 32 inches above the floor (standing passenger hip height).

E. Structure and Design

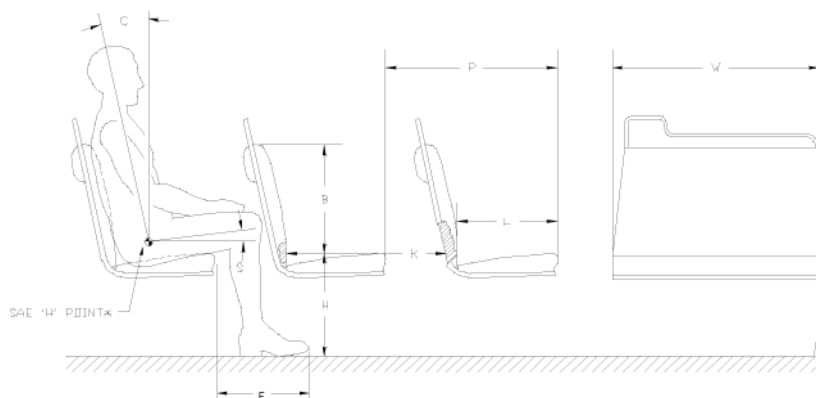
- (1) The passenger seat frame and its supporting structure shall be constructed and mounted so that space under the seat is maximized and is completely free of obstructions to facilitate cleaning.
- (2) Seats, structures and restraints around the securement area should not infringe into the mobility device envelope or maneuverability.
- (3) 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 inches of the aisle shall be at least 10 inches above the floor.

As an option, pedestal-type mounting shall be made available and priced separately.

- (4) In locations at which cantilevered installation is precluded by design and/or structure, other seat mounting may be allowed.
- (5) 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 pounds 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 inches, measured at the aisle side of the seat frame at height H. The seat back should not deflect more than 14 inches, measured at the top of the seat back, in a controlled manner to minimize passenger injury. Structural failure of any part of the seat or sidewall shall not introduce a laceration hazard.

- (6) The seat assembly shall withstand static vertical forces of 500 pounds applied to the top of the seat cushion in each seating position with less than 1/4 inch permanent deformation in the seat or its mountings. The seat assembly shall withstand static horizontal forces of 500 pounds evenly distributed along the top of the seat back with less than 1/4 inch permanent deformation in the seat or its mountings. The seat backs at the aisle position and at the window position shall withstand repeated impacts of two 40-pound 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 inch pendulum and shall strike the seat back 10,000 times each from distances of 6, 8, 10 and 12 inches. Seats at both seating positions shall withstand 4,000 vertical drops of a 40-pound sandbag without visible deterioration. The sandbag shall be dropped 1000 times each from heights of 6, 8, 10 and 12 inches. Seat cushions shall withstand 100,000 randomly positioned 3-1/2 inch drops of a squirming, 150 pound, smooth surfaced, buttocks shaped striker with only minimal wear on the seat covering and no failures to seat structure or cushion suspension components.
- (7) The back of each transverse seat shall incorporate a handhold no less than 7/8 inch 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 inches 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 Standard J211a) shall not exceed 400 for passengers ranging in size from a 5th percentile female through a 95th percentile male.
- (8) 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.
- (9) 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 operator'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 3-1/2 inches of the end of the seat cushion. Armrests shall be located from 7 to 9 inches 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 inch and shall be free from sharp protrusions that form a safety hazard.
- (10) Seat back handhold and armrests shall withstand static horizontal and vertical forces of 250 pounds applied anywhere along their length with less than 1/4 inch permanent deformation. Seat back handholds and armrests shall withstand 25,000 impacts in each direction of a horizontal force of 125 pounds with less than 1/4 inch permanent deformation and without visible deformation.

Seating Dimensions and Standard Configuration



F. Construction and Materials

- (1) 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.
- (2) 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 1/4 inch. 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, allow the passenger to deform the seating materials in the impact areas. Complete seat assemblies shall be interchangeable to the extent practicable. Agency to select seat fabric.

G. Passenger Assists

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 95th percentile male and the 5th percentile female. 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 seat back assist or as a separate item so that a 5th percentile female passenger may easily move from one assist to another using one hand and the other without losing support. All stanchions shall be stainless steel finish.

As an option, yellow powder coated stanchions will be made available and priced separately.

H. Assists

- (1) Excluding those mounted on the seats and doors, the assists shall have a cross-sectional diameter between 1-1/4 and 1-1/2 inches or shall provide an equivalent gripping surface with no corner radii less than 1-1/2 inches 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.
- (2) 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 material. Assists shall withstand a force of 300 pounds applied over a 12 inch lineal dimension in any direction normal to the assist without permanent visible deformation. All passenger assist components, including brackets, clamps, screw heads and other fasteners used on the passenger assists shall be designed to eliminate pinching, snagging and cutting hazards and shall be free from burrs or rough edges.
- (3) Front Doorway Assists
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 inches 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 and the vertical assist and the assists on the wheel housing or on the front modesty panel.
- (4) Vestibule Assists
 - (i.) The aisle side of the operator'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 inches of the floor. These assists shall have sufficient clearance from the barrier to prevent inadvertent wedging of a passenger's arm.
 - (ii.) 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 inches 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 operator's barrier, wheel housings or front modesty panel.
- (5) Rear Doorway Assists
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 1-1/4 and 1-1/2 inches or providing an equivalent gripping surface with no corner radii less than 1/4 inch, and shall provide at least 1-1/2 inches 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.

(6) Overhead Assists

(i.) 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 inches above the floor.

(ii.) There shall be 14 vinyl coated grab straps positioned throughout the bus interior mounted to the horizontal stanchions. A deduct will be made available for any agency not desiring grab straps.

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

(7) Longitudinal Seat Assists

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 inches apart or functionally continuous for a 5th percentile female passenger.

(8) Wheel Housing Barriers/Assists

Passenger assists shall be mounted around the exposed sides of the wheel housings which shall also be designed to prevent passengers from sitting on the wheel housings. Such passenger assists shall also effectively retain items, such as bags and luggage, placed on top of wheel housing.

I. Passenger Doors

(1) The front door shall be a "slide glide" type inward opening, operator controlled, of corrosion-resistant construction. Minimum clear opening shall be 31.75 inches. The front door shall have a minimum height of 78 inches. The overhead clearance between the top of the door opening and the highest point of the ramp shall be a minimum of 68 inches. The step height shall not exceed 16.5 inches at either doorway without kneeling and shall not exceed 15.5 inches at the step. A maximum of two steps is allowed to accommodate a raised aisle floor in the rear of the bus.

(2) Operation of, and power to, the front door shall be controlled by the operator. Door shall be opened completely in 1 to 3.5 seconds from the time of control actuation, and shall be subject to adjustment requirements of this specification. A control 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.

(3) The rear or exit door shall be a two panel swing out type designed to provide a minimum clear opening of 30 inches panel to panel and a minimum height of 78 inches. Rear doors shall be operator opened and spring closed. The closing of the door shall begin after the control has been moved to the closed position, and after the door has been fully opened. Door opening and closing speeds shall be adjustable. The rear door shall be equipped with a sensitive edge which will open the door automatically if an object is trapped between the doors. **As an option, 42" Rear Door will be made available and priced separately.**

(4) The doors shall have handrails (1.25 inches or equivalent surface area with a 1.50 inch knuckle clearance) mounted on the door panels and/or a modesty panel in the door well/step well. The clear opening dimension shall apply inside these handrails. Handrails whether on the door panel or in the body, shall be part of the systematic set of passenger assists.

(5) To preclude movement of the bus, an accelerator interlock shall lock the accelerator in the close position and a brake interlock shall engage the rear axle service brake system when the front and rear door control is activated and the vehicle is moving below 3 mph. When the vehicle is moving above 3 mph, the rear door shall remain locked. The braking effort shall be to the maximum capability of the rear axle brakes.

As an option, the Vapor V-Touch control system will be made available and priced separately.

As an option, the Vapor CLASS control system will be made available and priced separately.

(6) Locked doors shall require a force of more than 300 pounds 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.

J. Rear Door Interlocks

See "Hardware Mounting" for door system interlock requirements.

K. 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 pounds 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.

L. Door Control

The door control shall be located in the operator's area within the hand reach envelope described in SAE Recommended Practice J287, "Operator Hand Control Reach." The operator's door control shall provide tactile feedback to indicate commanded door position and resist inadvertent door actuation.

2.127 Door Controller

A. Five-Position Operator's Door Controller

- (1) 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 operator. 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.
- (2) Position of the door control handle shall result in the following operation of the front and rear doors:
 - (i.) Center position: front door closed, rear door closed or set to lock.
 - (ii.) First position forward: front door open, rear door closed or set to lock.
 - (iii.) Second position forward: front door open, rear door open or set to open.
 - (iv.) First position back: front door closed, rear door open or set to open.
 - (v.) Second position back: front door open, rear door open or set to open.

B. Loading Systems

- (1) The bus shall be equipped with a front door Lift-U LU 18 ramp system that conforms to all requirements of the Americans with Disabilities Act (ADA). It is to be an all electrically operated system which will assume the normal entrance configuration when stowed. When stowed, the ramp should not exceed any of the normal bus undercarriage clearances. All ramp components and mechanisms shall be constructed of corrosion resistant materials and incorporate a design which affords maximum protection from the elements during normal bus operations. Ease of maintenance and servicing shall be a prime consideration in system design and construction.

As an option, the Ricon 6:1 ramp will be made available and priced separately.

- (2) The wheelchair ramp shall have a manual release, deploy, and stow mechanism. The components involved with manual operation shall be completely accessible. If ramp provides for a nylon strap, it must be located on the forward side of the ramp to preclude a trip hazard.
- (3) The ramp shall be controlled by toggle switches, master on-off, up-down and stow-deploy. The control switches shall be of the spring-loaded-to-safe-position-type so that constant manual pressure is required by the operator during ramp operation. All controls shall be clearly identified by function and present a reasonably foolproof and natural sequence of operation.
- (4) Visual and audible warning devices shall be located immediately to the rear of the front door. The audible warning device shall be activated only when the ramp is functioning. Interlocking and fast idle provisions shall be incorporated so the ramp cannot be extended unless the entrance door is in the full open position, the transmission is in neutral, and the parking brake is engaged. The entrance door cannot be closed unless the ramp is in the fully stowed position. The bus service brakes shall be automatically applied when the ramp is in any position other than the stowed and locked position. All ramp components mounted under the bus shall be protected from dirt, debris, and road splash through the use of appropriate enclosures, mud flaps, or sealed compartments, subject to approval by each Procuring Agency.
- (5) Weatherproof access panels/doors shall be provided to allow for servicing and troubleshooting both ramp and under-floor bus components. Lubing the ramp shall be accomplished without removing the belly pan. The electrical interfacing connections between the bus and the ramp shall be of the quick disconnect type to facilitate ramp removal and installation.

C. Two Forward-Facing Wheelchair Securement Locations

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

D. Wheelchair Securing System

The wheelchair securement system shall be the American Seating Company telescoping ARM with Q'Straint belts in the front and Q'Straint belts and retractors in the rear. At a minimum, all restraint systems must meet CFR 49, FMVSS, FTA and ADA standards. **As an option, the Q-Straint Q-Pods System will be made available and priced separately.**

2.128 Signage and Communication

A. Destination Signs

A Hanover destination sign system shall be furnished and installed in each bus by the manufacturer. The destination sign system shall consist of:

- (1) One (1) front sign with 16 rows x 160 columns, display height minimum 7.9 inches, display width 63 inches, or a 24 rows x 200 columns sign.

As an option, a rear destination sign will be made available and priced separately.

- (2) One (1) side sign, on the curb side, 14 rows x 108 columns; display height minimum of 4.2 inches, display width 42 inches.

As an option, a Twin Vision destination sign system will be made available and priced separately.

As an option, a Luminator destination sign system will be made available and priced separately.

- (3) Operators Control Unit (OCU)

As an option, white (silver) LED light sign system will be made available and priced separately.

As an option, color LED light sign system will be made available and priced separately.

- (4) The front destination sign shall be mounted on the front of the bus, near the top edge of the body, behind windshield protection, and in an enclosed but accessible compartment. The side destination sign shall be located on the right side (curb side) of the bus near the front door, mounted near the top of an existing window.
- (5) The entire display area of all signs shall be readable in direct sunlight, at night, and in all lighting conditions between those two lighting extremes, with evenly distributed illumination appearance to the unaided eye.
- (6) The system shall be microprocessor-based; utilizing approved bi-directional serial communications, such as SAE J1708 or IBIS, EIA RS-485, between system components, and shall utilize error detection techniques within the communication protocol.
- (7) The system shall be capable of communicating with additional information devices, such as interior information signs, voice annunciation devices, farebox, etc. The system shall provide for destination and/or public relations message entry.
- (8) Flash memory integrated circuits shall be capable of storing and displaying up to 10,000 message lines. Message memory shall be changeable by the use of PCMCIA card of not less than 1 Mb memory capacity but sized according to the message listing noted herein.
- (9) The system shall have the ability to sequentially display multi-line destination messages, with the route number portion remaining in a constant "on" mode at all times, if so programmed. It shall also be capable of accepting manual entry of alphanumeric route information on all signs.
- (10) The various signs shall be programmable to display independent messages or the same messages; up to two destination messages and one public relations message shall be pre-selectable. The operator shall be able to quickly change between the pre-selected messages without re-entering a message code. Public relations messages shall be capable of being displayed alternately with the regular text and route messages or displayed separately.
- (11) An emergency message shall be activated by a push button or toggle switch. The emergency message shall be displayed on signs facing outside the vehicle while signs inside the vehicle, including the OCU display, remain unchanged. The emergency message shall be canceled by entering a new destination code, or power cycling (after removal of the emergency signal).
- (12) The programming software shall provide means of adjusting the length of time messages are displayed in 0.1 second increments up to twenty five (25) seconds.
- (13) Power to the sign system shall be controlled by the bus's Master Run Switch. The signs shall operate in all positions of this switch except "Off." The signs shall be internally protected against transient voltage and radio frequency interference to ensure proper operation in the local environment.
- (14) Display and Illumination

- (i.) All sign displays shall consist of pixels utilizing high intensity amber LEDs, with a light wavelength of 590 NM, for superior outdoor environmental performance. LEDs should be made of AlInGaP II, superior UV resistant Epoxy lens and superior resistance to the effects of moisture. Each pixel shall have a dedicated LED for illumination of that pixel in all lighting conditions. The sign system shall have multi-level intensity changes, which adjust automatically as a function of ambient lighting conditions. There shall be no requirement for any fan or any specialized cooling or air circulation.
 - (ii.) LEDs shall be mounted so that they are visible directly to the observer positioned in the viewing cone, allowing for full readability 65 degrees either side of the destination sign centerline. The LEDs shall be the only means of illumination of the sign system. The LED illumination source shall have an operating life of not less than 100,000 hours mean time between failures. Each LED shall not consume more than 0.02 watts.
 - (iii.) The characters formed by the system shall meet the requirements of the Americans with Disabilities Act (ADA) and 49 CFR Part 38.39.
- (15) Sign Enclosures
All signs shall be enclosed in a manner that inhibits the entry of dirt, dust, water and other contaminants during normal operation or cleaning. Access shall be provided to clean the inside of the bus window(s) associated with the sign and to remove or replace the sign components. Access panels and display boards shall be mounted for ease of maintenance/replacement. The vehicle manufacturer shall comply with the sign manufacturer's recommended mounting, mounting configuration, and installation procedures to assure optimum visibility and service accessibility of the sign system and system components.
- (16) Electronic System Requirements
All electronic circuit boards used in the sign system shall be coated to meet the requirements of military specification MIL-I-46058C. All sign system components shall be certified to have been subjected to a "burn-in" test of a minimum of 12 hours operation in a temperature of 150°F prior to final inspection.
- (17) Operator Control Unit (OCU)
- (i.) The OCU shall be used to view and update display messages. It shall be recess mounted on the front sign compartment access cover or door. The OCU shall utilize a multi-key conductive rubber pad keyboard and shall be designed for transit operating conditions. Other mounting locations for the OCU shall be made available, with selection made at the pre-production meeting.
 - (ii.) Only one switch is required to activate the 3 systems (radio, surveillance, and destination signs).
 - (iii.) The OCU shall contain a display of at least two-lines of 20-character capability. The OCU shall contain an audio annunciation that beeps indicating that a key is depressed. The OCU shall continuously display the message associated with the selected destination readings (except the emergency message feature as noted above).
 - (iv.) If the IBIS interface is required in the destination sign system, an auxiliary RS232 (DB9) port shall be made optionally available on the OCU under frame for inputs from any wireless technology that might be envisioned in the future. The auxiliary RS232 port shall operate at 9600 baud and accept commands from a wireless source (such as spread spectrum receivers) and will set destination sign addresses as if manually operated by the OCU operator.
 - (v.) If the J1708 interface is selected for the destination sign system, an auxiliary J1708 port shall be made available on the OCU so that auxiliary J1708 commands may be provided to the destination sign system from a wireless source that conforms to the J1708 command structure.
- (18) Interconnecting Cabling
- (i.) Data Communication – single twisted pair (two conductors) cable
 - (ii.) Power Cabling – three conductor cable connecting to the switched and unswitched (battery) power and a return (battery)
 - (iii.) OCU – single twisted pair cable between the OCU and front

2.129 Passenger Information and Advertising

A. Interior Displays

Advertising media 11 inches high and 0.09 inches thick shall be retained near the juncture of the bus ceiling and sidewall. The retainers may be concave and shall support the media with adhesives. The media shall be illuminated by the interior light system.

B. Exterior Displays

As an option, 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.

C. Passenger Stop Request/Exit Signal

- (1) The ambulatory passenger signal shall include pull cords that can be conveniently reached by both standing and seated passengers. The pull cords shall be accessible from the exit door area. There shall be a lighted display sign which indicates "STOP REQUESTED" when the signal is activated. The signal chime shall operate once, and the sign shall light and remain lit with the chime disabled until the next stop when the front doors or rear doors have been opened, resetting the system.
- (2) There shall be a second passenger signal of a different tone that meets ADA requirements mounted to the bottom of the flip seat for the mobility aid users to alert the operator when a mobility aid user wishes to disembark. One such system that meets these minimum requirements is the Tape Switch Corporation's 3.5" x 7" yellow push pad. There shall be two lights on the operator's front dash that indicate when an ambulatory or non-ambulatory passenger wishes to disembark.

As an option, the touch tape system will be made available and priced separately.

D. Video Surveillance System

Pre-wiring for a Seon video surveillance system shall be furnished and installed in each bus by the manufacturer. The system will require 6 internal and 2 external camera locations. The DVR shall have GPS, a 1 terabyte hard drive, an impact sensor and shall be mounted in a secured electrical cabinet. The GPS antenna shall be roof mounted. An event/status indicator switch shall be located on the left side of the operator's dash. **As an option, the AngelTrax H/D Mobile Video Surveillance System with 12 camera heads, will be made available and priced separately.**

As an option, pre-wiring for an AngelTrax video surveillance system shall be provided and priced separately. The system will require 5 internal and 2 external camera locations, with one channel available for GPS.

As an option, a backup camera system shall be made available and priced separately. The system shall include a 7" color LCD monitor mounted to the operator's dash.

E. Mobile Radio System

A separate electrical circuit protected with the circuit breaker shall be provided to the radio transceiver location. The radio circuit shall be connected and placed to minimize electrical noise and transient voltages. The power supply should be proposed with available variations to accommodate the differing systems in use by the Procuring Agencies.

As an option, the Motorola XLT 1500 and XLT 2500 and XLT 5000 with silent alarm switch will be made available and priced separately.

F. Electronics/Equipment Compartment

- (1) Each bus shall be equipped with a fully sealed compartment located on the left front wheelhouse to provide a mounting location for radio equipment, video recording equipment, APC equipment or other electronic equipment. The compartment shall be lockable, completely water resistant and of steel construction. It shall be accessible from inside the bus and shall have 3 slide trays that automatically lock into place for easy maintenance of the equipment. The compartment shall be water resistant when the service door is secured. The compartment shall be supplied with power and ground circuit requirements.
- (2) A location convenient to the operator shall be provided for the radio control head, speaker and handset. The antenna mounting and lead termination shall be accessible from the bus interior. Conduit shall lead to the radio compartment and shall have a minimum bend radius adequate for easy pulling of coaxial cable. An access plate shall be provided in the ceiling. The compartment door shall have a lock. A sealing provision (gasket) shall be incorporated into the door of this compartment. The radio compartment finish shall be powder coated black or agency-designated color.

G. Radio Mounting

A suitable area shall be provided for the mounting of the communication radio. This mounting could range from a simple plate to a box to contain the radio, depending on available space. Cabling connecting the radio and control head switch must be routed to an area immediately accessible to the operator.

H. Radio Transmitter

A radio control head and speaker mounting plate shall be installed in a location to provide easy access for operation. The handset shall be equipped with a cradle harness. The radio handset will be telephone-style with a magnetic hang up cup. All switches and controls shall be permanently and clearly labeled.

I. Antenna

A single antenna will be mounted on the roof of each bus that will accommodate RF, GPS, and Cellular. This antenna shall be located as close to midpoint between the two sides as practical, but not on a seam, and as close to the area of the radio, as to preclude a long run of coaxial cable that connects the radio and antenna, so as to provide access below, should the antenna ever need to be changed.

J. Intelligent Transportation System

Buses shall be pre-wired to accommodate Syncromatics mobile data terminals (MDTs), automatic passenger counters (APCs), and vehicle network gateways. Proposers will be required to contact Syncromatics for detailed requirements of Procuring Agencies' architecture and pricing.

As an option, a deduction will be made available for any agency not desiring the Syncromatics pre-wire.

As an option, the Passio Technologies AVL/APC/AVA Integration into MDT from Passio Technologies will be made available and priced separately.