AppalCART
Appalachian Campus Area Rapid Transit

Request for Proposal (RFP)
Double Decker Bus

RFP's must be received at AppalCART by 4:00p.m. Eastern Standard Time. Friday, March 3, 2023
Submittals must be in a sealed envelope, marked with the name and address of the offeror, the due date, and RFP# 2022DD, and addressed to:

AppalCART
305 NC Hwy 105 Bypass
Boone, NC 28607
Attention: Craig Hughes, Director

POLICY STATEMENT:

AppalCART, in accordance with Title VI of the Civil Rights Act of 1964, 78 Stat. 252, 42 U.S.C. 2000d to 2000d-4 and Title 49, Code of Federal Regulations, Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Nondiscrimination in Federally-Assisted Programs of the Department of Transportation issued pursuant to such Act, hereby notifies all bidders/proposers that it will affirmatively insure that in any contract entered into pursuant to this advertisement, minority business enterprises will be afforded full opportunity to submit bids in response to the invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award.

GENERAL CONDITIONS STATEMENT:

AppalCART reserves the right to reject all submissions, and to accept multiple submissions that are deemed beneficial to the participating transit agencies; with the requirements of each vendor submission meeting the rules and regulations of the Federal Transit Administration, and those identified within the RFP document.

It is anticipated that multiple vendors may be awarded under this solicitation based on those submissions that are identified as being in a competitive range, and are both responsive and responsible.

Disadvantaged Business Enterprise (DBE):

All Proposers are hereby notified that the DBE requirements of 49 CFR Part 26 do apply to this Solicitation. 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, as amended, to the Federal Transit Administration (FTA). The goal has either been approved or not disapproved by the FTA.

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SECTION 1: NOTICE OF REQUEST FOR PROPOSALS

NR 1. Description of the Work to be Done

AppalCART has developed a proposal and requests Proposals for the manufacture and delivery of a double decker style - Low Floor Heavy Duty buses 42' 5". All associated details and price submissions are included for the most responsive and responsible bidder for buses and associated components, spare parts and options in accordance with the terms and conditions set forth in RFP# 2022DD. The Contract shall be a firm-fixed-price Contract.

Specifically AppalCART is requesting the following type of bus: Double Decker style body 42' 5" Low Floor - Heavy Duty Bus. Propulsion systems should include Clean Diesel.

NR 2. Obtaining Proposal Documents

Proposal documents may be obtained from Craig Hughes, AppalCART Director, in person at 305 NC Hwy 105 Bypass, Boone, NC 28607 or electronically, at https://www.appalcart.com/post/double-deck-bus-rfp . Documents requested by mail will be packaged and sent postage paid.

NR 3. Proposal Due Date and Submittal Requirements

Proposals must be received by 4:00PM EST, Friday, March 3, 2023.

1. Sealed Proposals shall be submitted to the following addresses:
    a. For courier delivery, hand delivery, or U.S. mail: 305 NC Hwy 105 Bypass, Boone, NC 28607

2. Envelopes or boxes containing Proposals shall be sealed and clearly labeled with the Agency's Proposal number and the solicitation title: **RFP# 2022DD**, AppalCART Double Decker Low Floor Heavy Duty Bus Project.

3. Proposers are requested to submit to the Agency one hard copy marked "Original," two additional printed copies, and two CDs/flash drives, each containing an electronic PDF copy of the Proposal. In case of any discrepancies, the hard copy "Original" will be considered by the Agency in evaluating the Proposal, and the electronic version is provided for the Agency's administrative convenience only. A Proposal is deemed to be late if it is received by the Agency after the deadline stated above. Proposals received after the submission deadline may be rejected.

NR 4. Validity of Proposals

Proposals and subsequent offers shall be valid for a period of 90 days.

NR 5. Pre-Proposal Meeting Information (Optional)

A Pre-Proposal Meeting will be held on **January 13, 2022 at 2:00pm EST**. Prospective Proposers are strongly encouraged to attend in person. The meeting will convene at 2:00pm in AppalCART's board room, located at 305 NC Hwy 105 Bypass, Boone, NC 28607.

Prospective Proposers are requested to submit written questions to the Contract administrator, identified below, no later than 4:00pm EST January 6, 2023 - in advance of the Pre-Proposal Meeting. In addition, questions may be submitted up to the date specified in the "Proposed Schedule for the Procurement." Responses will be shared with all prospective Proposers. Prospective Proposers are reminded that any changes to the RFP will be by written

addenda only, and nothing stated at the Pre-Proposal Meeting shall change or qualify in any way the provisions in the RFP and shall not be binding on the Agency.

Contracting Officer's Contact Information:
Name: Craig Hughes
Title: Director
Address: 305 NC Hwy 105 Bypass, Boone, NC 28607
Phone number: 828-297-1300
E-mail: director@appalcart.com
Fax number: 828-297-4100
Additional contact: Judy Arwood, Finance Officer

Identification of Source of Funding
Financial support of this project is provided through financial assistance grants from the Federal Transit Administration (FTA), State of North Carolina and the local funding of the various agencies participating in this RFP.

This bus procurement RFP is being administered by the AppalCART, and it is clearly stated that actual PO's will be issued by the participating transit agency that are included in this RFP. Any subsequent purchases will be between the vehicle manufacturer and the local transit agency.

Signed and Dated for Posting

AppalCART Director December 30, 2022
Signature/Title Date

SECTION 2: INSTRUCTIONS TO PROPOSERS

IP 1. Quantities

The Work under these Contract documents consists of the manufacture and delivery of a projected base order of 1 Double Decker Low Floor Diesel Bus 42' 5", and the associated listing of alternate components of technical specs, optional components, special tools, spare parts, and optional training as detailed in the associated price pages.

IP 2. Proposed Schedule for the Procurement

The following is the solicitation schedule for Proposers:

Proposed Timeline	Date
Pre-proposal Meeting	Friday, January 13, 2023, 2:00pm EST
Deadline for Questions / Approved Equals Submission	Friday, January 27, 2023, 4:00pm EST
Response to Questions and Addendum(s) Distributed	Monday, February 17, 2023, 5:00pm EST
RFP Due Date	Friday, March 3, 2023, 4:00pm EST
Interviews for Competitive Range (tentative)	Friday, March 24, 2023 (times TBD)
Best and Final Offer (BAFO) - tentative	Friday, March 31, 2023, 4:00pm EST
Issue Notice of Intent to Award	Monday, April 10, 2023
Governing Body Action – Contract Awards	Monday, April 24, 2023

IP 3. Obtaining Proposal Documents

Proposal documents may be obtained from Craig Hughes, AppalCART Director in person at 305 NC Hwy 105 Bypass or electronically at https://www.appalcart.com/post/double-deck-bus- requested by mail will be packaged and sent postage paid. Documents requested by express courier will be packaged and sent only at the Proposers' expense.

IP 4. Pre-Proposal Meeting/Information for Proposers

A Pre-Proposal Meeting will be held on **Friday, January 13, 2023**. The meeting will convene at 2:00pm, EST in AppalCART's board room, located at 305 NC Hwy 105 Bypass, Boone, NC 28607. Prospective Proposers are urged to make every effort to attend this meeting.

Prospective Proposers are requested to submit written questions to the Contracting Officer, identified above, no later than 4:00pm EST, Friday, January 27, 2023 in advance of the Pre-Proposal Meeting. In addition, questions

may be submitted up to the date specified in "Proposed Schedule for the Procurement." Responses will be shared with all prospective Proposers. Prospective Proposers are reminded that any changes to the RFP will be by written addenda only, and nothing stated at the Pre-Proposal Meeting shall change or qualify in any way any of the provisions in the RFP and shall not be binding on AppalCART.

IP 5. Questions, Clarifications and Omissions

All correspondence, communication and contact in regard to any aspect of this solicitation or offers shall be only with the Contracting Officer identified above. Unless otherwise instructed by the Contracting Officer, Proposers and their representatives shall not make any contact with or communicate with any member of the AppalCART team, or its employees and consultants, or participating transit agencies planning to purchase off this contract; other than the designated Contracting Officer, in regard to any aspect of this solicitation or offers.

At any time during this procurement up to the time specified in "Proposed Schedule for the Procurement," Proposers may request, in writing, a clarification or interpretation of any aspect, a change to any requirement of the RFP, or any addenda to the RFP. Requests may include suggested substitutes for specified items and for any brand names, which whenever used in this solicitation shall mean the brand name or approved equal. Such written requests shall be made to the Contracting Officer. The Proposer making the request shall be responsible for its proper delivery to the Agency as identified on the form Request for Pre-Offer Change or Approved Equal. Any request for a change to any requirement of the Contract documents must be fully supported with technical data, test results or other pertinent information showing evidence that the exception will result in a condition equal to or better than that required by the RFP, without a substantial increase in cost or time requirements.

All responses to Request for Pre-Offer Change or Approved Equal shall be provided to all Proposers. Any response that is not confirmed by a written addendum shall not be official or binding on the AppalCART.

If it should appear to a prospective Proposer that the performance of the Work under the Contract, or any of the matters relating thereto, is not sufficiently described or explained in the RFP or Contract documents, or that any conflict or discrepancy exists between different parts of the Contract or with any federal, state, local law, ordinance, rule, regulation or other standard or requirement, then the Proposer shall submit a written request for clarification to AppalCART within the time period specified above.

IP 6. Addenda to RFP

AppalCART reserves the right to amend the RFP at any time in accordance with "Proposed Schedule for the Procurement." Any amendments to the RFP shall be described in written addenda. Notification of or the addenda also will be distributed to all such prospective Proposers officially known to have received the RFP. Failure of any prospective Proposer to receive the notification or addenda shall not relieve the Proposer from any obligation under the RFP therein. All addenda issued shall become part of the RFP. Prospective Proposers shall acknowledge the receipt of each individual addendum in their Proposals on the form Acknowledgement of Addenda. Failure to acknowledge in the Proposal receipt of addenda may at AppalCART's sole option disqualify the Proposal.

If AppalCART determines that the addenda may require significant changes in the preparation of Proposals, the deadline for submitting the Proposals may be postponed no fewer than ten (10) days from the date of issuance of addenda or by the number of days that AppalCART determines will allow Proposers sufficient time to revise their Proposals. Any new Due Date shall be included in the addenda.

All relevant information, data, forms associated with this procurement will be posted on AppalCART website at www.appalcart.com/post/double-deck-bus-rfp .

IP 7. DBE Requirements for Transit Vehicle Manufacturers

Pursuant to Title 49, Code of Federal Regulations, Part 26.49, a Proposer, as a condition of being authorized to respond to this solicitation, must certify by completing the form TVM Approval Certification that it has on file with the Federal Transportation Administration (FTA) an approved or not disapproved annual disadvantaged business enterprise (DBE) subcontracting participation goal.

IP 8. Buy America Certification

This Contract is subject to the "Buy America" requirements of 49 United States Code (USC) §5323(j) and 49 Code of Federal Regulations (CFR) Part 661, as may be amended from time to time, and applicable federal regulations. Prospective Proposers' attention is directed to 49 CFR §661.11, "Rolling Stock Procurements." Prospective Proposers have the responsibility to comply with the cited and any governing statutes and regulations, including official interpretations.

A Proposer shall submit to AppalCART the appropriate Buy America certification, included in this document, with all offers on FTA-funded contracts. Proposals that are not accompanied by a properly completed Buy America certification are subject to the provisions of 49 CFR 661.13 and will be rejected as nonresponsive.

The two signature blocks on the Buy America certificate are mutually exclusive. Proposers shall sign only one signature block on the certificate. Signing both signature blocks will make the Proposal nonresponsive. A false certification is a criminal act in violation of 18 USC §1001.

A Proposer who has submitted an incomplete Buy America certificate or an incorrect certificate of noncompliance through inadvertent or clerical error (but not including failure to sign the certificate, submission of certificates of both compliance and noncompliance, or failure to submit any certification), may submit to the FTA Chief Counsel within ten (10) days of Proposal opening a written explanation of the circumstances surrounding the submission of the incomplete or incorrect certification in accordance with 28 USC §1746, sworn under penalty of perjury, stating that the submission resulted from inadvertent or clerical error. The Proposer will also submit evidence of intent, such as information about the origin of the product, invoices, or other working documents. The Proposer will simultaneously send a copy of this information to AppalCART.

The FTA Chief Counsel may request additional information from the Proposer, if necessary. AppalCART may not make Contract award until the FTA Chief Counsel issues his or her determination, except as provided in 49 CFR Part 661.15(m).

Certification based on ignorance of proper application of the Buy America requirements is not an inadvertent or clerical error.

A waiver from the Buy America provisions will be sought by AppalCART from the FTA for the proposed awardee, if the grounds for a waiver exist. All Proposers seeking a waiver must submit to AppalCART a timely request in writing, which shall include the facts and justification to support the granting of the waiver. Such waiver from the Buy America provisions may be granted if the FTA determines the following:

1. Their application would be inconsistent with the public interest;
2. Materials are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or
3. Inclusion of domestic material will increase the cost of the overall Contract by more than 25 percent.

Any party may petition the FTA to investigate a successful Proposer's compliance with the Buy America certification. The procedures are set out in 49 CFR Part 661.15. If the FTA determines that the evidence indicates noncompliance, the FTA will require AppalCART to initiate an investigation. The successful Proposer has the

burden of proof to establish compliance with its certification. If the successful Proposer fails to so demonstrate compliance, then the successful Proposer will be required to substitute sufficient domestic materials without revision of the original Contract terms. Failure to do so will be a breach of the Contract and may lead to the initiation of debarment proceedings under 49 CFR Part 29.

IP 9. Conditions, Exceptions, Reservations or Understandings

Proposers are cautioned to limit exceptions, conditions and limitations to the provisions of this RFP, as they may be determined to be so fundamental as to cause rejection of the Proposal for not responding to the requirements of the RFP.

Any and all Deviations must be explicitly, fully and separately stated in the Proposal by completing the Form for Proposal Deviation, setting forth at a minimum the specific reasons for each Deviation so that it can be fully considered and, if appropriate, evaluated by AppalCART. All Deviations shall be evaluated in accordance with the appropriate evaluation criteria and procedures and may result in the Proposer receiving a less favorable evaluation than without the Deviation.

The Form for Proposal Deviations are included in the Technical package.

IP 10. Protest Procedures

All protests must be in writing, stating the name and address of protestor, a contact person, Contract number and title. Protests shall specify in detail the grounds of the protest and the facts supporting the protest.

IP 10.1 Address

All protests must be addressed as follows:

- AppalCART contact: Craig Hughes, AppalCART Director
- For special delivery or hand delivery: 305 NC Hwy 105 Bypass, Boone, NC 28607
- For U.S. mail: 305 NC Hwy 105 Bypass, Boone, NC 28607

Protests not properly addressed to the address shown above may not be considered by AppalCART

Copies of AppalCART's protest procedures and the protest provisions of FTA Circular 4220.1F or its successor may be obtained from Craig Hughes, Director, 305 NC Hwy 105 Bypass, Boone, NC 28607; 1-828-2967-1300, director@appalcart.com. Proposals will be opened and a Notice of Award will be issued by AppalCART in accordance with AppalCART's protest procedures and the protest provisions of FTA Circular 4220.1F, or its successor.

IP 10.2 Pre-Proposal Protests

Pre-Proposal protests are protests based upon the content of the solicitation documents. Three copies of Pre-Proposal protests must be received by AppalCART's office no later than fifteen (15) calendar days prior to the Due Date. Protests will be considered and either denied or sustained in part or in whole, in writing, in a manner that provides verification of receipt, prior to the Due Date for Proposals. A written decision specifying the grounds for sustaining all or part of or denying the protest will be transmitted to the protestor prior to the Due Date for Proposals in a manner that provides verification of receipt prior to the Due Date for Proposals. If the protest is sustained, then the Proposal Due Date may be postponed and an addendum issued to the solicitation documents or, at the sole discretion of AppalCART, the solicitation may be canceled. If the protest is denied, then Proposals will be received and opened on the scheduled date unless a protest is filed with FTA. See "FTA Review," below.

IP 10.3 Protests on the Recommended Award

All Proposers will be notified of the recommended award. This notice will be transmitted to each Proposer at the address contained in its Proposal form in a manner that provides verification of receipt. Any Proposer whose Proposal has not lapsed may protest the recommended award on any ground not specified in "Pre-Proposal Protests," above. Three (3) copies of a full and complete written statement specifying in detail the grounds of the protest and the facts supporting the protest must be received by AppalCART at the appropriate address in "Address," above, no later than fifteen (15) calendar days after the date such notification is received. Prior to the issuing of the Notice of Award, a written decision stating the grounds for allowing or denying the protest will be transmitted to the protestor and the Proposer recommended for award in a manner that provides verification of receipt.

IP 10.4 FTA Review

After such administrative remedies have been exhausted, an interested party may file a protest with the Federal Transit Administration of the U.S. Department of Transportation pursuant to the procedures provided in the FTA C 4220.1 For its successor. FTA review is limited to the alleged failure of AppalCART to have written protest procedures, the alleged failure of AppalCART to follow those procedures, the alleged failure of AppalCART to review a protest or the alleged violation of federal law or regulation.

IP 11. Preparation of Proposals

IP 11.1 Use of Proposal Forms

Proposers are advised that the forms contained in this RFP are required to be used for submission of a Proposal.

IP 11.2 Proposal Format Requirements

Proposals shall be submitted in four separately sealed packages identified below. Each package shall be marked as specified below and shall contain all the Proposal documents for which the package is required to be marked and shall include no other documents. Each package should be separated with section tabs. For example, Tab 1 – Letter of Transmittal, Tab 2 – Technical Proposal, etc. These same requirements shall apply to any Best and Final Offers (BAFOs) that may be requested.

Proposers shall submit one original (marked clearly as such), RFP 2022DD hard copies, and RFP 2022DD CDs/flash drive, each containing an electronic PDF copy of the Proposal to AppalCART. In case of any discrepancies, the original will be considered by AppalCART in evaluating the Proposal, and the electronic version is provided for the AppalCART's administrative convenience only.

The hard-copy Proposals shall be prepared double-sided on 8½ × 11 in. paper in at least 11-point font. The hard copies shall be contained in three-ring binders, the contents of which are identified on the outside. Use of 11 × 17 in. foldout sheets for large tables, charts or diagrams is permissible but should be limited. Elaborate formatting is not necessary. Do not provide promotional or advertising information, unless this information is requested and/or is necessary to support the technical submittal.

Package 1: Technical Proposal Requirements

1. Letter of Transmittal
2. Technical Proposal
3. Acknowledgement of Addenda
4. Contractor Service and Parts Support Data
5. Form for Proposal Deviation (without price data)
6. Vehicle Questionnaire

7. References and Non-Priced Information
8. Engineering organization chart, engineering change control procedure, field modification process
9. Manufacturing facilities plant(s) layout, other contracts, staffing
10. Production and delivery schedule and other Contract commitments for the duration of this Contract
11. Quality Assurance Management Plan that includes key personnel for this project that identifies individuals from sales, field service, order administrator, etc. Also, included in this management plan a complete listing of vehicles sold to North America public transit agencies over the past five years – listed out as total number of vehicles sold, per agency identified.

Package 2: Price Proposal Requirements

Each Price Proposal shall be on the prescribed Proposal form(s) contained within the Excel file associated with this RFP, and shall be for the entire Contract, including all Proposal items. The price pages are labeled accordingly on specific tabs of the Excel spreadsheet, and will include all items to be priced from manufacturer's – including bus, parts, equipment, etc.

1. Letter of Transmittal
2. Pricing Schedule, (including but not limited to such pricing elements as option buses, spare parts package, manuals, training, special tools and test equipment)

The Proposer is required to complete and execute AppalCART's Pricing Schedule, contained as part of the Proposal documents, and provide the same in the Price Proposal. The Contractor shall be liable for payment of all local taxes applicable to the complete bus as delivered and should add these amounts to the Proposal price.

The prices included in Proposers submission, or BAFO will be fixed for a period of one year from the time of contract award notification. Each subsequent year will have eligible increase per PPI, and this must be provided to the Agency from the awarded Proposer. Each Proposer has the option of providing a fixed price for each year of the 5 year term of this contract; with the recognition that Proposer submission may result positively, or negatively on the total amount of points earned.

Package 3: Qualification Package Requirements

1. Pre-Award Evaluation Data Form
2. A copy of the three (3) most recent financial statements audited by an independent third party or a statement from the Proposer regarding how financial information may be reviewed by AppalCART
3. Letter for insurance, indicating the Contractor's ability to obtain the insurance coverage in accordance with the RFP requirements
4. Letter from a surety for a Performance Guarantee, if required, indicating the Contractor's ability to obtain financial guarantees in accordance with the RFP requirements
5. Warranty coverage confirmation within required limits identified.
6. Altoona Testing confirmation documents.
7. All state/federal certifications: E-Verify, Buy America Certification, Debarment and Suspension Certification for Prospective Contractor, Debarment and Suspension Certification (Lower-Tier Covered Transaction), Non-Collusion Affidavit, Lobbying Certification, Certificate of Compliance with Bus Testing Requirement, DBE Approval Certification, and Federal Motor Vehicle Safety Standards
8. Proposal Form

Package 4: Proprietary/Confidential Information Package Requirements

The Proposer is directed to collect and submit any information it deems to be proprietary or confidential in nature in a separate marked and sealed package. If there is no confidential information, then the Proposer should include a statement to that effect. Subject package shall be submitted in accordance with the terms and conditions governing the submittal of Proposer's Proposal to this RFP. Blanket-type identification by designating whole pages or

sections as containing proprietary information, trade secrets or confidential commercial and financial information will not ensure confidentiality. The specific proprietary information, trade secrets or confidential commercial and financial information must be clearly identified as such.

The Proposer is advised that AppalCART is public and as such may be subject to certain state and/or local Public Records Act provisions regarding the release of information concerning this RFP. If a request is received by AppalCART for the release of Proposer's proprietary/confidential information, then subject request will be referred to the Proposer for review and consideration. If Proposer chooses to declare the information proprietary/confidential and withhold it from release, then it shall defend and hold harmless AppalCART from any legal action arising from such a declaration.

IP 11.3 Agency Treatment of Proprietary/Confidential Information

Access to government records is governed by the North Carolina Open Records law. Except as otherwise required to be disclosed by applicable NC laws, AppalCART will exempt from disclosure proprietary information identified in Package 4.

Upon a request for records from a third party regarding this Proposal, AppalCART will notify the Proposer in writing. The Proposer must respond within five (5) business days with the identification of any and all "proprietary, trade secret or confidential commercial or financial" information. Failure to respond within the allowed period shall be deemed an approval to release. The Proposer shall indemnify AppalCART's defense costs associated with its refusal to produce such identified information; otherwise, the requested information may be released.

AppalCART shall employ sound business practices no less diligent than those used for AppalCART's own confidential information to protect the confidence of all licensed technology, software, documentation, drawings, schematics, manuals, data and other information and material provided by Proposers and the Contractor pursuant to the Contract that contain confidential commercial or financial information, trade secrets or proprietary information as defined in or pursuant to the State of North Carolina Open Records law against disclosure of such information and material to third parties, except as permitted by the Contract. The Contractor shall be responsible for ensuring that confidential commercial or financial information, trade secrets or proprietary information—with such determinations to be made by AppalCART at its sole discretion—bears appropriate notices relating to its confidential character.

IP 11.4 Signing of Proposal Forms

Proposals shall include firm name (and, in the event that the Proposer is a joint venture, the names of the individual firms comprising the joint venture); business address; and the name, title, business address, telephone number, facsimile (fax) number and email address of the responsible individual(s) who may be contacted during the Proposal evaluation period for scheduling oral presentations and for receiving notices from AppalCART. The Proposer shall submit with its Proposal a copy of the joint venture agreement.

Proposals shall be signed by those individual(s) authorized to bind the Proposer. The Proposer shall submit evidence of the official's authority to act for and bind the Proposer in all matters relating to the Proposal.(In the event that the Proposer is a joint venture or consortium, a representative of each of the members of the joint venture or consortium shall execute the Proposal. Each joint venture or consortium member is jointly and severally liable for the joint venture or consortium.)

IP 11.5 Modification or Withdrawal of Proposals

A modification of a Proposal already received will be accepted by AppalCART only if the modification is received prior to the Proposal Due Date, is specifically requested by AppalCART, or is made with a requested BAFO. All

modifications shall be made in writing and executed and submitted in the same form and manner as the original Proposal.

A Proposer may withdraw a Proposal already received prior to the Proposal Due Date by submitting to AppalCART, in the same manner as the original Proposal, a written request for withdrawal executed by the Proposer's authorized representative. After the Proposal Due Date, a Proposal may be withdrawn only AppalCART fails to award the Contract within the Proposal validity period prescribed in "Duration of the Validity of Proposals," or any agreed-upon extension thereof. The withdrawal of a Proposal does not prejudice the right of a Proposer to submit another Proposal within the time set for receipt of Proposals.

IP 11.6 Ownership and Cost of Proposal Development

All proposals will become the property of AppalCART.

This RFP does not commit AppalCART to enter into a Contract, to pay any costs incurred in the preparation or presentation of a Proposal, nor to procure or contract for the equipment.

IP 12. Proposal Evaluation, Negotiation and Selection

Proposals will be evaluated, negotiated, selected and any award made in accordance with the criteria and procedures described below. The approach and procedures are those applicable to a competitive negotiated procurement whereby Proposals are evaluated to determine which Proposals are within a Competitive Range. Discussions and negotiations may then be carried out with Proposers within the Competitive Range, after which BAFOs may be requested.

However, AppalCART may select a Proposal for award without any discussions or negotiations or request for any BAFOs. Subject to AppalCART's right to reject any or all Proposals, the Proposer whose Proposal is found to be most advantageous to AppalCART will be selected, based upon consideration of the criteria of "Proposal Selection Process," below.

IP 12.1 Confidentiality of Proposals

Proposals will not be publicly opened. All Proposals and evaluations will be kept strictly confidential throughout the evaluation, negotiation and selection process, except as otherwise required by applicable law. Only the members of the Evaluation Team and other AppalCART officials, employees and agents having a legitimate interest will be provided access to the Proposals and evaluation results during this period.

IP 12.2 Duration of the Validity of Proposals

Proposals and subsequent offers shall be valid for the period stated in "Section 1: Notice of Request for Proposals." AppalCART may request Proposers to extend the period of time specified herein by written agreement between AppalCART and the Proposer(s) concerned.

IP 12.3 Evaluation Committee

An Evaluation Committee, which will include officers, employees and agents of AppalCART. The Evaluation Committee will carry out the detailed evaluations, including establishing the Competitive Range, carrying out negotiations and recommending the selection of the Proposer, if any, that may be awarded the Contract.

The Evaluation Committee may report its recommendations and findings to the AppalCART Board for awarding the Contract.

IP 12.4 Review of Proposals for Responsiveness and Proposers for Responsibility

Each Proposal will be reviewed to determine if the Proposal is responsive to the submission requirements outlined in this RFP and if the Proposer is responsible.

A responsive Proposal is one that follows the requirements of this RFP, includes all documentation, is submitted in the format outlined in this RFP, is of timely submission, and has the appropriate signatures as required on each document. Failure to comply with these requirements may result in the Proposal being deemed nonresponsive.

A responsible Proposer is one that demonstrates the capability to satisfy the commercial and technical requirements set forth in the Solicitation. A Proposer's failure to demonstrate that it is responsible may result in the proposal being rejected.

Any Proposal found to be nonresponsive or Proposer found to be non-responsible will not be considered further for award. Proposals that do not comply with the RFP instructions and requirements or do not include the required information may be rejected as insufficient and may not be further considered. AppalCART reserves the right to request a Proposer to provide additional information and/or to clarify information. AppalCART's determination regarding the responsiveness of a Proposal and the responsibility of a Proposer shall be final.

IP 12.5 Proposal Selection Process

The following describes the process by which Proposals will be evaluated and a selection made for a potential award. Any such selection of a Proposal shall be made by consideration of only the criteria set forth below.

"Qualification Requirements" specifies the requirements for determining responsible Proposers, all of which must be met by a Proposer to be found qualified. Final determination of a Proposer's qualification will be made based upon all information received during the evaluation process and as a condition for award.

"Proposal Evaluation Criteria" contains all the evaluation criteria, and their relative order of importance, by which a Proposal from a qualified Proposer will be considered for selection. An award, if made, will be to a responsible Proposer for a Proposal that is found to be in AppalCART's best interests, based on price and other evaluation criteria considered. The procedures to be followed for these evaluations are provided in "Evaluation Procedures," below.

Qualification Requirements

The following are the requirements for qualifying responsible Proposers. All of these requirements should be met; therefore, they are not listed in any particular order of importance. Any Proposal that the Evaluation Committee finds does not meet these requirements, and cannot be made to meet these requirements, may be determined by the Evaluation Committee not to be responsible and the Proposal rejected. The requirements are as follows:

1. Sufficient financial strength, resources and capability to finance the Work to be performed and to complete the Contract in a satisfactory manner, as measured by the following:

Proposer's financial statements prepared in accordance with generally accepted accounting principles of the jurisdiction in which the Proposer is located, and audited by an independent certified public accountant; oral statement from the Proposer regarding how financial information may be reviewed by AppalCART. The Proposer should show sufficient financial strength to pay its bills on time, fund the cash flow, and meet obligations to Subcontractors. The evaluation of your financial strength will take into account the Proposer's other contractual commitments, and your deliverable should clearly show your financial stability to meet these expectations.

Proposer's ability to obtain required insurance with coverage values that meet minimum requirements, evidenced by a letter from an underwriter confirming that the Proposer can be insured for the required amount.

2. Evidence that the human and physical resources are sufficient to perform the Contract as specified and to ensure delivery of all equipment within the time specified in the Contract, to include the following:

Engineering, management and service organizations with sufficient personnel and requisite disciplines, licenses, skills, experience and equipment to complete the Contract as required and to satisfy any engineering or service problems that may arise during the warranty period.

Adequate manufacturing facilities sufficient to produce and factory-test equipment on schedule.

A spare parts procurement and distribution system sufficient to support equipment maintenance without delays and a service organization with skills, experience and equipment sufficient to perform all warranty and on-site Work.

3. Evidence that Proposer is qualified in accordance with the provisions of "Section 8: Quality Assurance."

4. Evidence of satisfactory performance and integrity on contracts in making deliveries on time, meeting specifications and warranty provisions, parts availability and steps Proposer took to resolve any judgments, liens, Fleet Defects history or warranty claims. Evidence shall be by client references.

Proposal Evaluation Criteria

The following are the complete criteria, listed in their relative order of importance, by which Proposals from responsible Proposers will be evaluated and ranked for the purposes of determining any Competitive Range and to make any selection of a Proposal for a potential award. Any exceptions, conditions, reservations or understandings explicitly, fully and separately stated on the Form for Proposal Deviation, which do not cause AppalCART to consider a Proposal to be outside the Competitive Range, will be evaluated according to the respective evaluation criteria and sub-criteria that they affect.

The criteria are listed numerically by their relative order of importance. However, certain criteria may have sub-criteria identified that are listed by their relative order of importance within the criterion they comprise. Also, certain sub-criteria may have sub-criteria that are listed by their relative degree of importance within the specific sub-criterion they comprise.

A. Evaluation Committee

An Evaluation Committee (Committee), which may include Agency staff, consortium members, and possibly one or more outside experts, will review and screen the Proposals submitted according to the pre-established criteria as set forth below.

B. Pre-Proposal Meeting (maximum of 5 points)

Attendance at the Pre-Proposal Meeting on January 13, 2023, 2020, 2:00pm EST.

C. Technical Evaluation Criteria (maximum of 75 points)

Proposals will be evaluated using the following principal selection criteria:

1. **Product design and performance (0–40 points):**The information provided by the Proposer in its **technical** submittal relating to the buses to be provided will be utilized to evaluate the Proposal in relation to this factor. Vehicle construction and system design, as well as documented reliability, may be used in this evaluation, as well as other design and performance elements of the components that comprise those systems. At a minimum, test results, safety and maintenance factors, and cost of normal operation for the bus design and system components proposed, may be considered in determining a final value for this factor. ***Proposers are encouraged to provide full and open details with their technical submittal to earn the maximum points allowed.***

2. **Proposer's reputation and performance (0–20 points):**The Committee will consider the capability and reputation of the Proposer as presented in the Proposal or as is determined by review of information available from references or other resources in its **technical** submittal. The evaluation may look at the Proposer's overall organizational and financial capabilities and consider key components such as organizational reporting structure, quality control, quality assurance, research and development, technical, training and parts support, response time, product capabilities, ability to furnish multiple bus configurations, bonding capacity, and financial history, as well as other considerations, in reaching a final point determination. The committee may also look at judgments, liens, Fleet Defect history, warranty claims and the steps that the manufacturer took to resolve these concerns in assessing the overall reputation of the manufacturer. ***Proposers are encouraged to provide full and open details with their technical submittal to earn the maximum points allowed.***

3. **Delivery schedule (0–15 points):**The Committee will review the proposed delivery schedule for the Agency's purchase of buses for each PO issued by the Agency and participating transit providers. Delivery schedules that fulfill the delivery requirements, with evidence that the schedule can be accomplished, may receive higher points for this category. Delivery schedules more aggressive than the weeks identified in this RFP will receive the highest points. ***Proposers are encouraged to provide full and open details with their technical submittal to earn the maximum points allowed.***

D. Cost Proposal Evaluation (maximum of 25 points)

As described below, the proposed cost as submitted by the Proposer on the Agency's Excel Spreadsheet tabs will be assigned a maximum of 25 points. The Contractor is *required* to use the Agency's Excel spreadsheet, without alteration, for submittal of its cost Proposal. *Please DO NOT use your own forms.*

The cost will be evaluated in the following manner:

1. **Cost Proposal Criteria (0–25 points)**

   a. The Cost Proposal criteria will be based on the "Total of the Low-Floor," "Sum of Total Base Offer per Bus." Each length and propulsion system being grouped accordingly.
   b. The lowest average Cost Proposal will receive 25 points. Every other Proposal previously found to be in the Competitive Range will be given points proportionately in relation to the lowest price. This point total will be calculated by dividing the lowest price by the total price of the Proposal being evaluated and the result multiplied by the maximum weight for price (25 points) to arrive at a Cost Proposal score.

      Example: Lowest Proposed Price / Proposer's Proposed Price × 25 = Proposal Score

      The application of the above formula will result in a uniform assignment of points relative to the criterion of price. Review and consideration of associated alternatives, options, tools and training will be reviewed and considered in pricing evaluations.

A. Evaluation Methodology

The maximum number of points achievable in each of the aforementioned areas is as follows:

- **Attendance at Pre-Proposal Meeting:** 5 points
- **Product design and performance:**0–40 points
- **Manufacturer's reputation and performance:**0–20 points

- **Delivery schedule:**0–15 points
- **Cost proposal:**0–25 points

TOTAL POSSIBLE POINTS: 105

IP 12.6 Evaluation Procedures

Proposals will be analyzed for conformance with the instructions and requirements of the RFP and Contract documents. Proposals that do not comply with these instructions and do not include the required information may be rejected as insufficient or not be considered for the Competitive Range. AppalCART reserves the right to request that a Proposer provide any missing information and make corrections. Proposers are advised that the detailed evaluation forms and procedures will follow the same Proposal format and organization specified in "Preparation of Proposals." Therefore, Proposers should pay close attention to and strictly follow all instructions. Submittal of a Proposal will signify that the Proposer has accepted the whole of the Contract documents, except such conditions, exceptions, reservations or understandings explicitly, fully and separately stated on the forms and according to the instructions of the Form for Proposal Deviation. Any such conditions, exceptions, reservations or understandings that do not result in the rejection of the Proposal are subject to evaluation under the criteria set forth in "Proposal Selection Process."

Evaluations will be made in strict accordance with all the evaluation criteria specified in "Proposal Selection Process," above. AppalCART will choose the Proposal that it finds to be most advantageous to AppalCART, based upon the evaluation criteria.

IP 12.7 Evaluations of Competitive Proposals

1. **Qualification of responsible Proposers.** Proposals will be evaluated to determine the responsibility of Proposers. A final determination of a Proposer's responsibility will be made upon the basis of initial information submitted in the Proposal, any information submitted upon request by AppalCART, information submitted in a BAFO, and information resulting from AppalCART inquiry of Proposer's references and its own knowledge of the Proposer.

2. **Detailed evaluation of Proposals and determination of Competitive Range.** AppalCART will carry out and document its evaluations in accordance with the criteria and procedures set forth in "Proposal Selection Process." Any Proposal deficiencies that may render a Proposal unacceptable will be documented. AppalCART will make specific note of questions, issues, concerns and areas requiring clarification by Proposers and to be discussed in any meetings with Proposers that AppalCART finds to be within the Competitive Range.

   Rankings of the Proposals against the evaluation will then be made for determining which Proposals are within the Competitive Range, or may reasonably be made to be within the Competitive Range.

3. **Proposals not within the Competitive Range.** Proposers of any Proposals that have been determined by AppalCART as not in the Competitive Range, and that cannot be reasonably made to be within the Competitive Range, will be notified by AppalCART for further activities or actions related to this RFP.

4. **Discussions with Proposers in the Competitive Range.** The Proposers whose Proposals are found by AppalCART to be within the Competitive Range, or that may be reasonably made to be within the Competitive Range, will be notified and any questions or requests for clarifications provided to them in writing. Each such Proposer may be invited for an interview and discussions with AppalCART to

discuss answers to written or oral questions, clarifications and any facet of its Proposal, and provide a demo bus for review from participating agencies.

In the event that a Proposal that has been included in the Competitive Range contains conditions, exceptions, reservations or understandings to any Contract requirements as provided in the Form for Proposal Deviation, said conditions, exceptions, reservations or understandings may be negotiated during these meetings. However, AppalCART shall have the right to reject any and all such conditions and exceptions, and instruct the Proposer to amend its Proposal and remove said conditions and exceptions; and any Proposer failing to do so may cause AppalCART to find such Proposal to be outside the Competitive Range.

No information, financial or otherwise, will be provided to any Proposer about any of the Proposals from other Proposers, to the extent permitted by applicable law. Proposers will not be given a specific price or specific financial requirements they must meet to gain further consideration, except that proposed prices may be considered to be too high with respect to the marketplace or unacceptable. Proposers will not be told of their rankings among the other Proposers prior to Contract award.

5. **Factory and site visits.** The Agency issuing a PO under this RFP and associated contract reserves the right to conduct factory visits of the Proposer's facilities and/or the facilities of major sub-suppliers included in the Proposal.

6. **Best And Final Offers.** After all interviews have been completed, the Proposers in the Competitive Range may be afforded the opportunity to amend their Proposals and make their BAFOs. The Request for BAFOs shall include the following:

   Any modification to the initial Proposal made by a Proposer in its BAFO shall be identified in its BAFO. BAFOs will be evaluated by the Agency according to the same requirements and criteria as the initial Proposals ("Proposal Selection Process"). The Agency will make appropriate adjustments to the initial scores for any sub-criteria and criteria that have been affected by any Proposal modifications made by the BAFOs. These final scores and rankings within each criterion will again be arrayed by the Agency and considered according to the relative degrees of importance of the criteria defined in "Proposal Selection Process."

   The Agency will then choose the Proposal that it finds to be most advantageous to the Agency, based upon the evaluation criteria. The results of the evaluations and the selection of a Proposal for any award will be documented.

   The Agency reserves the right to make an award to a Proposer whose Proposal it judges to be most advantageous to the Agency based upon the evaluation criteria, without conducting any written or oral discussions with any Proposers or solicitation of any BAFOs.

7. **Debriefing.** Subsequent to the award, the unsuccessful Proposers will be notified and may request a debriefing. Proposers will be debriefed in accordance with Agency policies, including information regarding the shortcomings of their Proposal.

IP 13. Response to Proposals

IP 13.1 Single Proposal Response

If only one Proposal is received in response to this RFP and it is found by the Agency to be acceptable, then a price or cost analysis, or both, possibly including an audit, may be performed by or for the Agency. The Proposer has agreed to such analysis by submitting a Proposal in response to this RFP.

IP 13.2 Availability of Funds

Subsequent purchasing is subject to the availability of funding. The Agency relies heavily on Federal and State grant funds for Capital Investments. Fund sources such as Federal Section 5339 competitive grants, Congestion Mitigation Air Quality (CMAQ), Section 5311, and various other Federal, State and Local Funds are continuously sought after to enhance the Capital Fleets. The need for having a vehicle contract in place is to permit the Agency to move quickly with purchasing.

IP 13.3 Agency Contract Approval Process

The Agency will make recommendations on awarded Proposers. The AppalCART Board will be asked to approve the recommendations of the selection committee, and award the contract with chosen Proposer. Once adopted as an awarded Manufacturer, the Agency will work directly with the manufacturer, and develop any subsequent PO. This activity will be undertaken by the Agency and the vehicle Manufacturer.

IP 13.4 Agency Rights

The Agency reserves the right to cancel the procurement in whole or in part, at its sole discretion, at any time before the Contract is fully executed and approved on behalf of the Agency.

The Agency reserves the right to reject any or all Proposals, to undertake discussions with one or more Proposers, and to accept that Proposal or modified Proposal which, in its judgment, will be most advantageous to the Agency, considering price and other evaluation criteria. The Agency reserves the right to determine any specific Proposal that is conditional or not prepared in accordance with the instructions and requirements of this RFP to be nonresponsive. The Agency reserves the right to waive any Defects, or minor informalities or irregularities in any Proposal that do not materially affect the Proposal or prejudice other Proposers.

If there is any evidence indicating that two or more Proposers are in collusion to restrict competition or are otherwise engaged in anti-competitive practices, the Proposals of all such Proposers shall be rejected, and such evidence may be a cause for disqualification of the participants in any future solicitations undertaken by the Agency.

The Agency may reject a Proposal that includes unacceptable Deviations as provided in the Form for Proposal Deviation.

IP 13.5 Execution of Contract

The acceptance of a Proposal for award, if made, shall be evidenced in writing by a notice of award of Contract delivered to the Proposer whose Proposal is accepted. Upon notice of award of the Contract to a Proposer, the Proposer shall commence performance under the Contract by furnishing any required bonds, and by furnishing copies of the certificates of insurance required to be procured by the Contractor pursuant to the Contract documents within 30 calendar days after the date of receipt of the notice of award. Failure to fulfill these requirements within the specified time is cause for termination of the Contract under “Termination for Default” in Section 3.

IP 14. Conflicts of Interests and Gratuities

Proposers are prohibited from engaging in any practice that may be considered a conflict of interest under existing Agency policies and/or state law, and to refrain from participating in any gifts, favors or other forms of compensation that may be viewed as a gratuity in accordance with existing policies and laws.

SECTION 3: GENERAL CONDITIONS

GC 1. Definitions

The following are definitions of special terms used in this document:

Agency: AppalCART

AppalCART: Appalachian Campus Area Rapid Transit, created under NCGS 160A-575, Article 25. The purpose of the authority shall be to provide for a safe, adequate and convenient public transportation system for the municipality creating the authority and for its immediate environs, through the granting of franchises, ownership and leasing of terminals, buses and other transportation facilities and equipment, and otherwise through the exercise of the powers and duties conferred upon it.

Authorized Signer: The person who is executing this Contract on behalf of the Contractor and who is authorized to bind the Contractor.

Best and Final Offer (BAFO): The last Proposal made by a Proposer. If a BAFO is not specifically requested by the Agency, or if the Proposer does not promptly respond to a request for a BAFO, then the most recent, current Proposal is the BAFO.

Class 1 Failure (physical safety):A failure that could lead directly to passenger or operator injury and represents a severe crash situation.

Class 2 Failure (road call):A failure resulting in an en route interruption of revenue service. Service is discontinued until the bus is replaced or repaired at the point of failure.

Competitive Range: The range of proposals that are identified as the most highly rated, unless the range is further reduced for purposes of efficiency.

Contract: The Proposal and its acceptance by the Agency as manifested by the Contract documents specified in "Section 10: Contract."

Contracting Officer: The person who is executing this Contract on behalf of the Agency and who has complete and final authority except as limited herein.

Contractor: The successful Proposer who is awarded a Contract for providing all buses and equipment described in the Contract documents.

Days: Unless otherwise stated, "days" shall mean calendar days.

Defect: Patent or latent malfunction or failure in manufacture, installation or design of any component or subsystem.

Deviation: Variance from a requirement or specification that does not alter the basis of a contractor adversely affects its performance.

Due Date: The date and time by which Proposals must be received by the Agency as specified in "Section 1: Notice of Request for Proposals."

Extended Warranty: A warranty available for purchase above the standard warranty.

Fatigue Failure (Corrosion Fatigue): The mechanical degradation of a material under the joint action of corrosion and cyclic loading.

Pass-Through Warranty: A warranty provided by the Contractor but administered directly with the component Supplier.

Proposal: A promise, if accepted, to deliver equipment and services according to the underlying solicitation of the Agency documented using the prescribed form in the solicitation, including any Proposal or BAFO.

Proposer: A legal entity that makes a Proposal.

Related Defect: Damage inflicted on any component or subsystem as a direct result of a separate Defect.

Solicitation: An Agency's request for proposals.

Superior Warranty: A warranty still in effect after all contractually required warranties have expired. The remaining warranty is administered directly between the sub-Supplier and the Agency.

Supplier: Any manufacturer, company or Agency providing units, components or subassemblies for inclusion in the bus that are installed by the Contractor. Supplier items shall require qualification by type and acceptance tests in accordance with requirements defined in "Section 8: Quality Assurance."

Subcontractor: Any manufacturer, company or Agency providing units, components or subassemblies for inclusion in the bus that are installed by a Subcontractor. Subcontractor items shall require qualification by type and acceptance tests in accordance with requirements defined in "Section 8: Quality Assurance."

Work: Any and all labor, supervision, services, materials, machinery, equipment, tools, supplies and facilities called for by the Contract and necessary to the completion thereof.

GC 2. Materials and Workmanship

The Contractor shall be responsible for all materials and workmanship in the construction of the bus and all accessories used, whether the same are manufactured by the Contractor or purchased from a Supplier. This provision excludes any equipment leased or supplied by the Agency, except insofar as such equipment is damaged by the failure of a part or component for which the Contractor is responsible, or except insofar as the damage to such equipment is caused by the Contractor during the manufacture of the buses.

GC 3. Conformance with Specifications and Drawings

Materials furnished and Work performed by the Contractor shall conform to the requirements of the Technical Specifications and other Contract documents. Notwithstanding the provision of drawings, technical specifications or other data by the Agency, the Contractor shall have the responsibility of supplying all parts and details required to make the bus complete and ready for service even though such details may not be specifically mentioned in the drawings and specifications. Items that are installed by the Agency shall not be the responsibility of the Contractor unless they are included in this Contract.

Omissions from the Contract specifications, or the inaccurate description of details of Work that are manifestly necessary to carry out the intent of the Contract specifications, or that are customarily performed, shall not relieve the Contractor from performing such omitted Work or inaccurately described details of the Work, and they shall be performed as if fully and correctly set forth and described.

GC 4. Inspection, Testing and Acceptance

GC 4.1 General

The Agency's Representative shall at all times have access to the Work, the Contractor and, through the Contractor, its Suppliers. The Contractor and its Suppliers shall furnish every reasonable facility for ascertaining that the materials and the workmanship are in accordance with the requirements of the Contract Documents. All Work done may be subject to the Agency Representative's inspection and approval in accordance with the approved Work products developed as a result of the Contract Documents. Inspections may be full responsibility of the manufacturer, in such that all requirements are met as detailed within this RFP, and the best practices of the vehicle manufacturer. For any single from the Agency that requires a resident inspector per the guidelines of the FTA; the Agency will provide a resident inspector.

The pre-delivery tests and inspections shall be performed at the Contractor's plant; they shall be performed in accordance with the procedures defined in "Section 8: Quality Assurance"; and they may be witnessed by the resident inspector. When a bus passes these tests and inspections, the resident inspector shall authorize release of the bus.

Within fifteen (15) calendar days after arrival at the designated point of delivery, the bus shall undergo the Agency tests defined in "Post-Delivery Tests." If the bus passes these tests or if the Agency does not notify the Contractor of non-acceptance within 15 calendar days after delivery, then acceptance of the bus by the Agency occurs on the 15th day after delivery. If the bus fails these tests, it shall not be accepted until the repair procedures defined in "Repairs after Non-Acceptance" have been carried out and the bus retested until it passes. Acceptance occurs earlier if the Agency notifies the Contractor of early acceptance or places the bus in revenue service.

GC 4.2 Risk of Loss

The Agency shall assume risk of loss of the bus on delivery, as defined in "Bus Delivery." Prior to this delivery, the Contractor shall have risk of loss of the bus, including any damages sustained for both interior and exterior of the bus during the delivery regardless of the status of title or any payments related to the bus. Drivers shall keep a maintenance log en route, and it shall be delivered to the Agency with the bus. Smoking is prohibited on the interior of the bus. If the bus is released back to the Contractor for any reason, then the Contractor has the risk of loss upon such release.

GC 5. Title and Warranty of Title

Adequate documents for registering the bus in North Carolina shall be provided to the Agency not less than 10 business days before delivery to the Agency. Upon acceptance of each bus, the Contractor warrants that the title shall pass to the Agency free and clear of all encumbrances.

GC 6. Intellectual Property Warranty

The Agency shall advise the Contractor of any impending patent suit related to this Contract against the Agency and provide all information available. The Contractor shall defend any suit or proceeding brought against the Agency based on a claim that any equipment, or any part thereof, furnished under this Contract constitutes an infringement of any patent, and the Contractor shall pay all damages and costs awarded therein, excluding incidental and consequential damages against the Agency. In case said equipment, or any part thereof, is in such suit held to constitute infringement and use of said equipment or parts is enjoined, the Contractor shall, at its own expense and at its option, either procure for the Agency the right to continue using said equipment or part, or replace same with non-infringing equipment, or modify it so it becomes non-infringing.

The Contractor's obligations under this section are discharged and the Agency shall hold the Contractor harmless with respect to the equipment or part if it was specified by the Agency and all requests for substitutes were rejected,

and the Contractor advised the Agency under "Questions, Clarifications and Omissions" of a potential infringement, in which case the Contractor shall be held harmless.

GC 7. Data Rights

GC 7.1 Proprietary Rights/Rights in Data

The term "subject data" used in this clause means recorded information, whether or not copyrighted, that is delivered or specified to be delivered under the Contract. It includes the proprietary rights of the following:

- Shop drawings and working drawings
- Technical data including manuals or instruction materials, computer or microprocessor software
- Patented materials, equipment, devices or processes
- License requirements

The Agency shall protect proprietary information provided by the Contractor to the fullest extent of the law. The Contractor shall grant a non-exclusive license to allow the Agency to utilize such information in order to maintain the vehicles. In the event that the Contractor no longer provides the information, the Agency has the right to reverse engineer patented parts and software.

The Agency reserves a royalty-free, non-exclusive and irrevocable license to reproduce, publish or otherwise use, and to authorize others to use, the following subject data for its purposes: (1) any subject data required to be developed and first produced in the performance of the Contract and specifically paid for as such under the Contract, whether or not a copyright has been obtained; and (2) any rights of copyright to which the Contractor, Subcontractor or Supplier purchases ownership for the purpose of performance of the Contract and specifically paid for as such under the Contract. The Contractor agrees to include the requirements of this clause, modified as necessary to identify the affected parties, in each subcontract and supply order placed under the Contract.

GC 7.2 Access to Onboard Operational Data

The Agency grants to the Contractor the right to inspect, examine, download, and otherwise obtain any information or data available from components provided by the Contractor, including, but not limited to, any electronic control modules or other data-collection devices, to the extent necessary to enable the Contractor to perform reliability maintenance analysis, corrective action and/or other engineering type Work for the bus. This right expressly excludes access to information or data collected on any equipment not provided and installed by the Contractor.

GC 8. Changes

GC 8.1 Contractor Changes

Any proposed change in this Contract shall be submitted to the Agency for its prior approval. Oral change orders are not permitted. No change in this Contract shall be made without the prior written approval of the Contracting Officer. The Contractor shall be liable for all costs resulting from, and/or for satisfactorily correcting, any specification change not properly ordered by written modification to the Contract and signed by the Contracting Officer.

GC 8.2 Agency Changes

The Agency may obtain changes to the Contract by notifying the Contractor in writing. As soon as reasonably possible but no later than thirty (30) calendar days after receipt of the written change order to modify the Contract, the Contractor shall submit to the Contracting Officer a detailed price and schedule Proposal for the Work to be performed. This Proposal shall be accepted or modified by negotiations between the Contractor and the Contracting Officer. At that time, a detailed modification shall be executed in writing by both parties. Disagreements that

cannot be resolved within negotiations shall be resolved in accordance with “Disputes,” below. Regardless of any disputes, the Contractor shall proceed with the Work ordered.

GC 9. Legal Clauses

GC 9.1 Indemnification

GC 9.1.1 The Contractor shall, to the extent permitted by law:(1) protect, indemnify and save the Agency and its officers, employees and agents, including consultants, harmless from and against any and all liabilities, damages, claims, demands, liens, encumbrances, judgments, awards, losses, costs, expenses and suits or actions or proceedings, including reasonable expenses, costs and attorneys’ fees incurred by the Agency and its officers, employees and agents, including consultants, in the defense, settlement or satisfaction thereof, for any injury, death, loss or damage to persons or property of any kind whatsoever, arising out of or resulting from the intentional misconduct or negligent acts, errors or omissions of the Contractor in the performance of the Contract, including intentional misconduct, negligent acts, errors or omissions of its officers, employees, servants, agents, Subcontractors and Suppliers; and (2) upon receipt of notice and if given authority, shall settle at its own expense or undertake at its own expense the defense of any such suit, action or proceeding, including appeals, against the Agency and its officers, employees and agents, including consultants, relating to such injury, death, loss or damage. Each party shall promptly notify the other in writing of the notice or assertion of such claim, demand, lien, encumbrance, judgment, award, suit, action or other proceeding hereunder. The Contractor shall have sole charge and direction of the defense of such suit, action or proceeding. The Agency shall not make any admission that might be materially prejudicial to the Contractor unless the Contractor has failed to take over the conduct of any negotiations or defense within a reasonable time after receipt of the notice and authority above provided. The Agency shall at the request of the Contractor furnish to the Contractor all reasonable assistance that may be necessary for the purpose of defending such suit, action or proceeding, and shall be repaid all reasonable costs incurred in doing so. The Agency shall have the right to be represented therein by advisory council of its own selection at its own expense.

GC 9.1.2 The obligations of the Contractor under the above paragraph shall not extend to circumstances where the injury, death or damages are caused solely by the negligent acts, errors or omissions of the Agency, its officers, employees, agents or consultants, including, without limitation, negligence in:(1) the preparation of the Contract documents, or (2) the giving of directions or instructions with respect to the requirements of the Contract by written order. The obligations of the Contractor shall not extend to circumstances where the injury, death or damages are caused, in whole or in part, by the negligence of any third-party operator, not including an assignee or Subcontractor of the Contractor, subject to the right of contribution. In case of joint or concurrent negligence of the parties giving rise to a claim or loss against either one or both, each shall have full rights of contribution from the other.

GC 9.2 Suspension of Work

GC 9.2.1 The Agency may at any time and for any reason within its sole discretion issue a written order to the Contractor suspending, delaying or interrupting all or any part of the Work for a specified period of time.

GC 9.2.2 The Contractor shall comply immediately with any such written order and take all reasonable steps to minimize costs allocable to the Work covered by the suspension during the period of work stoppage. Contractor shall continue the Work that is not included in the suspension and shall continue such ancillary activities as are not suspended. The Contractor shall resume performance of the suspended Work upon expiration of the notice of suspension, or upon direction from the Agency.

GC 9.2.3 The Contractor shall be allowed an equitable adjustment in the Contract price (excluding profit) and/or an extension of the Contract time, to the extent that cost or delays are shown by the Contractor to be directly attributable to any suspension. However, no adjustment shall be made under this section for any suspension, delay

or interruption due to the fault or negligence of the Contractor, or for which an equitable adjustment is provided for, or excluded under any other term or condition of the Contract. As soon as reasonably possible but no later than forty-five (45) calendar days, or any other period of time agreed to by the parties, after receipt of the written suspension of work notice, the Contractor shall submit to the Contracting Officer a detailed price and schedule Proposal for the suspension, delay or interruption.

GC 9.3 Excusable Delays/Force Majeure

GC 9.3.1 If the Contractor is delayed at any time during the progress of the Work by the neglect or failure of the Agency or by a cause as described below, then the time for completion and/or affected delivery date(s) shall be extended by the Agency subject to the following cumulative conditions:

a. The cause of the delay arises after the Notice of Award and neither was nor could have been anticipated by the Contractor by reasonable investigation before such award. Such cause may also include force majeure events such as any event or circumstance beyond the reasonable control of the Contractor, including but not limited to acts of God; earthquake, flood and any other natural disaster; civil disturbance, strikes and labor disputes; fires and explosions; war and other hostilities; embargo; or failure of third parties, including Suppliers or Subcontractors, to perform their obligations to the Contractor;
b. The Contractor demonstrates that the completion of the Work and/or any affected deliveries will be actually and necessarily delayed;
c. The Contractor has taken measures to avoid and/or mitigate the delay by the exercise of all reasonable precautions, efforts and measures, whether before or after the occurrence of the cause of delay; and
d. The Contractor makes written request and provides other information to the Agency as described in paragraph GC 9.3.4 below.

A delay in meeting all of the conditions of this section shall be deemed an excusable delay. Any concurrent delay that does not constitute an excusable delay shall not be the sole basis for denying a request hereunder.

GC 9.3.2 None of the above shall relieve the Contractor of any liability for the payment of any liquidated damages owing from a failure to complete the Work by the time for completion that the Contractor is required to pay pursuant to "Liquidated Damages for Late Delivery of the Bus" for delays occurring prior to, or subsequent to the occurrence of an excusable delay.

GC 9.3.3 The Agency reserves the right to rescind or shorten any extension previously granted, if subsequently the Agency determines that any information provided by the Contractor in support of a request for an extension of time was erroneous; provided, however, that such information or facts, if known, would have resulted in a denial of the request for an excusable delay. Notwithstanding the above, the Agency will not rescind or shorten any extension previously granted if the Contractor acted in reliance upon the granting of such extension and such extension was based on information that, although later found to have been erroneous, was submitted in good faith by the Contractor.

GC 9.3.4 No extension or adjustment of time shall be granted unless: (1) written notice of the delay is filed with the Agency within fourteen (14) calendar days after the commencement of the delay and (2) a written application therefore, stating in reasonable detail the causes, the effect to date and the probable future effect on the performance of the Contractor under the Contract, and the portion or portions of the Work affected, is filed by the Contractor with the Agency within thirty (30) calendar days after the commencement of the delay. No such

extension or adjustment shall be deemed a waiver of the rights of either party under this Contract. The Agency shall make its determination within thirty (30) calendar days after receipt of the application.

GC 9.4 Termination

GC 9.4.1. Termination for Convenience

The performance of Work under this Contract may be terminated by the Agency in accordance with this clause in whole, or from time to time in part, whenever the Contracting Officer shall determine that such termination is in the best interest of the Agency. Any such termination shall be effected by delivery to the Contractor of a notice of termination specifying the extent to which performance of Work under the Contract is terminated, and the date upon which such termination becomes effective.

After receipt of a notice of termination, and except as otherwise directed by the Contracting Officer, the Contractor shall do the following:

- Stop Work under the Contract on the date and to the extent specified in the notice of termination.
- Place no further orders or subcontracts for materials, services or facilities, except as may be necessary for completion of such portion of the Work under the Contract as is not terminated.
- Terminate all orders and subcontracts to the extent that they relate to the performance of work terminated by the notice of termination; assign to the Agency in the manner, at the times, and to the extent directed by the Contracting Officer, all of the right, title and interest of the Contractor under the orders and subcontracts so terminated, in which case the Agency shall have the right, in its discretion, to settle or pay any or all claims arising out of the termination of such orders and subcontracts.
- Settle all outstanding liabilities and all claims arising out of such termination of orders and subcontracts, with the approval or ratification of the Contracting Officer, to the extent he or she may require, which approval or ratification shall be final for all the purposes of this clause.
- Transfer title to the Agency and deliver in the manner, at the times and to the extent, if any, directed by the Contracting Officer the fabricated or unfabricated parts, Work in process, completed Work, supplies and other material produced as part of, or acquired in connection with the performance of, the Work terminated, and the completed or partially completed plans, drawings, information and other property which, if the Contract had been completed, would have been required to be furnished to the Agency.
- Use its best efforts to sell, in the manner, at the times, to the extent, and at the price(s) directed or authorized by the Contracting Officer, any property of the types referred to above, provided, however, that the Contractor shall not be required to extend credit to any purchaser, and may acquire any such property under the conditions prescribed by and at prices approved by the Contracting Officer, and provided further that the proceeds of any such transfer or disposition shall be applied in reduction of any payments to be made by the Agency to the Contractor under this Contract or shall otherwise be credited to the price or cost of the Work covered by this Contract or paid in such other manner as the Contracting Officer may direct.
- Complete performance of such part of the Work as shall not have been terminated by the notice of termination.
- Take such action as may be necessary, or as the Contracting Officer may direct, for the protection or preservation of the property related to this Contract that is in the possession of the Contractor and in which the Agency has or may acquire an interest.

The Contractor shall be paid its costs, including Contract close-out costs, and profit on Work performed up to the time of termination. The Contractor shall promptly submit its termination claim to the Agency to be paid the Contractor. Settlement of claims by the Contractor under this termination for convenience clause shall be in accordance with the provisions set forth in Part 49 of the Federal Acquisition Regulations (48 CFR 49) except that wherever the word “Government” appears, it shall be deleted and the word “Agency” shall be substituted in lieu thereof.

GC 9.4.2. Termination for Default

The Agency may, by written notice of default to the Contractor, terminate the whole or any part of this Contract if the Contractor fails to make delivery of the supplies or to perform the services within the time specified herein or any extension thereof; or if the Contractor fails to perform any of the other material provisions of the Contract, or so fails to make progress as to endanger performance of this Contract in accordance with its terms, and in either of these two circumstances does not cure such failure within a period of ten (10) business days, or such longer period as the Contracting Officer may authorize in writing, after receipt of notice from the Contracting Officer specifying such failure.

If the Contract is terminated in whole or in part for default, the Agency may procure, upon such terms and in such manner as the Contracting Officer may deem appropriate, supplies or services similar to those so terminated. The Contractor shall be liable to the Agency for any excess costs for such similar supplies or services and shall continue the performance of this Contract to the extent not terminated under the provisions of this clause.

Except with respect to defaults of Subcontractors, the Contractor shall not be liable for any excess costs if the failure to perform the Contract arises out of a cause beyond the control and without the fault or negligence of the Contractor. If the failure to perform is caused by the default of a Subcontractor, and if such default arises out of causes beyond the control of both the Contractor and Subcontractor, and without the fault or negligence of either of them, the Contractor shall not be liable for any excess costs for failure to perform, unless the supplies or services to be furnished by the Subcontractor were obtainable from other sources and in sufficient time to permit the Contractor to meet the required delivery schedule.

Payment for completed supplies delivered to and accepted by the Agency shall be at the Contract price. The Agency may withhold from amounts otherwise due the Contractor for such completed supplies such sum as the Contracting Officer determines to be necessary to protect the Agency against loss because of outstanding liens or claims of former lien holders.

If, after notice of termination of this Contract under the provisions of this clause, it is determined for any reason that the Contractor was not in default under the provisions of this clause, or that the default was excusable under the provisions of this clause, then the rights and obligations of the parties shall be the same as if the notice of termination had been issued pursuant to termination for convenience of the Agency.

GC 9.5 Compliance with Laws and Regulations

The Contractor shall at all times comply with all applicable laws, regulations, policies, procedures and directives (together, the "Law"), including without limitation, FTA regulations, policies, procedures and directives, including those listed directly or by reference in the agreement between the Agency and FTA that funds any part of this Contract, as they may be amended or promulgated from time to time during the term of this Contract. Contractor's failure to so comply shall constitute a material breach of this Contract.

GC 9.6 Changes of Law

Changes of Law that become effective after the Proposal due date may result in price changes. If a price adjustment is indicated, either upward or downward, it shall be negotiated between the Agency and the Contractor, and the final Contract price will be adjusted upward or downward to reflect such changes in Law. Such price adjustment may be audited, where required.

GC 9.7 Governing Law and Choice of Forum

This Contract shall be governed by the laws of North Carolina without regard to conflict of law rules. The Contractor consents to the jurisdiction of the identified state, County of Watauga.

GC 9.8 Disputes

Except as otherwise provided in this Contract, any dispute concerning a question of fact arising under or related to this Contract that is not disposed of by agreement shall be decided in accordance with the following steps. However, by mutual agreement the matter may be taken immediately to any higher step in the dispute resolution process, or a mutually agreed-to alternative dispute resolution process (which may include structured negotiations, mediation or arbitration) or litigation. Pending final resolution of a dispute hereunder, the Contractor shall proceed diligently with the performance of the Contract and in accordance with the Contracting Officer's or Chief Executive Officer's decision, as the case may be.

1. **Notice of dispute.** All disputes shall be initiated through a written dispute notice submitted by either party to the other party within 10 (ten) calendar days of the determination of the dispute.

2. **Negotiation between Contracting Officers.** The parties shall attempt in good faith to resolve any dispute arising out of or relating to this Contract promptly by negotiation between executives who have authority to settle the controversy and who are at a higher level of management than the people with direct responsibility for administration of this Contract. Any party may give the other party written notice of any dispute not resolved in the normal course of business as provided in paragraph 1 above. Within 14 (fourteen) calendar days after delivery of the dispute notice, the receiving party shall submit to the other party a written response. The dispute notice and written response shall include: (a) a statement of the party's position and a summary of the arguments supporting that position, (b) any evidence supporting the party's position and (c) the name of the executive who will represent that party and of any others who will accompany the executive in negotiations. Within 28 (twenty-eight) calendar days after delivery of the dispute notice, the Contracting Officer of both parties shall meet at a mutually acceptable time and place, and thereafter as they reasonably deem necessary to attempt to resolve the dispute. All reasonable requests for information by one party to the other shall be honored.

   If the matter has not been resolved by these people within 42 (forty-two) calendar days of the dispute notice, the dispute may be referred to more senior executives of both parties who have authority to settle the dispute and who shall likewise meet to attempt to resolve the dispute.

3. **Chief Executive Officer's decision.** Should the dispute not be resolved by negotiation between Contracting Officers, as provided in paragraph 2 above, the Agency's Contracting Officer from paragraph 2 above shall submit a written request for decision to the Agency's Chief Executive Officer (CEO) along with all documentation and minutes from the negotiations. The Chief Executive Officer shall issue a written decision within 14 (fourteen) days of receipt of a request.

   B. For disputes involving $50,000 or less, the decision of the CEO shall be administratively final and conclusive. For disputes involving $50,000 or less, it is the intent of the parties that such administratively final and conclusive decision pursuant to either this paragraph or paragraph 4 shall be overturned only if determined by a court of competent jurisdiction to be fraudulent, arbitrary, capricious, unsupported by the evidence or so grossly erroneous as to imply bad faith. For disputes greater than $50,000, the decision of the CEO shall be administratively final and conclusive unless, within thirty (30) days from the date of delivery of the written decision, the Contractor appeals the decision in writing to the Agency's Chief Executive Officer or designee, who shall render a written decision within fourteen (14) days of delivery of such written appeal. Such decision by the Chief Executive Officer or his or her designee shall be administratively final and conclusive.

   C. Within thirty (30) days of the issuance of any administratively final and conclusive decision under this paragraph, the Contractor shall notify the Agency in writing of the Contractor's agreement with the

final decision. Failure to provide such written notice of agreement shall indicate an intent by the Contractor to litigate the claim.

D. Any dispute that is not resolved by the parties through the operation of the provisions of this paragraph, or any mutually agreed-upon alternative disputes resolution process pursuant to paragraph 4, may be submitted to any court in North Carolina.

E. Pending final resolution of a dispute hereunder, the Contractor shall proceed diligently with the performance of its obligations under the Contract in accordance with the written directions of the Agency.

4. **Alternatives disputes resolution.** If agreed to by both parties, disputes may be resolved by a mutually agreed-to alternative dispute resolution process that may include structured negotiations different from paragraph 2 above, mediation or arbitration.

5. **Arbitration.** Disputes appealed to arbitration involving more than $50,000 but less than $250,000 shall be decided by a qualified and disinterested arbitrator, selected through the American Arbitration Association and mutually agreed to by both parties. The arbitrator shall conduct all proceedings in accordance with the rules of the American Arbitration Association and shall consider the Contract, equity, the prevailing law and established commercial practices in rendering a decision.

   Disputes appealed to arbitration involving $250,000 or more shall be decided by three (3) qualified and disinterested arbitrators selected through the American Arbitration Association. One arbitrator shall be selected by each of the parties, and the two selected arbitrators shall select a third arbitrator within ten (10) calendar days of their selection. The arbitrators shall conduct all proceedings in accordance with the rules of the American Arbitration Association and shall consider the Contract, equity, the prevailing law and established commercial practice in rendering a decision.

The decision by the arbitrators shall be final and enforceable in any court having jurisdiction over the parties.

GC 9.9 Maintenance of Records; Access by Agency; Right to Audit Records

In accordance with 49 CFR § 18.36(i), 49 CFR § 19.48(d) and 49 USC § 5325(a), provided that the Agency is the FTA recipient or a sub-grantee of the FTA recipient, the Contractor agrees to provide the Agency, FTA, the Comptroller General of the United States, the Secretary of the U.S. Department of Transportation, North Carolina, or any of their duly authorized representatives access to any books, documents, papers and records of the Contractor that are directly pertinent to or relate to this Contract (1) for the purpose of making audits, examinations, excerpts and transcriptions and (2) when conducting an audit and inspection.

1. In the event of a sole-source Contract, single Proposal, single responsive Proposal, or competitive negotiated procurement, the Contractor shall maintain and the Contracting Officer, the U.S. Department of Transportation (if applicable) or the representatives thereof shall have the right to examine all books, records, documents and other cost and pricing data related to the Contract price, unless such pricing is based on adequate price competition, established catalog or market prices of commercial items sold in substantial quantities to the public, or prices set by law or regulation, or combinations thereof. Data related to the negotiation or performance of the Contract shall be made available for the purpose of evaluating the accuracy, completeness and currency of the cost or pricing data. The right of examination shall extend to all documents necessary for adequate evaluation of the cost or pricing data, along with the computations

and projections used therein, including review of accounting principles and practices that properly reflect all direct and indirect costs anticipated for the performance of the Contract.

2. For Contract modifications or change orders, the Contracting Officer, the U.S. Department of Transportation, if applicable, or their representatives shall have the right to examine all books, records, documents and other cost and pricing data related to a Contract modification, unless such pricing is based on adequate price competition, established catalog or market prices of commercial items sold in substantial quantities to the public, or prices set by law or regulation, or combinations thereof. Data related to the negotiation or performance of the Contract modification or change order shall be made available for the purpose of evaluating the accuracy, completeness and currency of the cost or pricing data. The right of examination shall extend to all documents necessary for adequate evaluation of the cost or pricing data, along with the computations and projections used therein, either before or after execution of the Contract modification or change order for the purpose of conducting a cost analysis. If an examination made after execution of the Contract modification or change order reveals inaccurate, incomplete or out-of-date data, the Contracting Officer may renegotiate the Contract modification or change order price adjustment, and the Agency shall be entitled to any reductions in the price that would result from the application of accurate, complete or up-to-date data.

   The requirements of this section are in addition to other audit, inspection and record-keeping provisions specified elsewhere in the Contract documents.

GC 9.10 Confidential Information

Access to government records is governed by the State of North Carolina. Except as otherwise required by the State of North Carolina, and Local Municipal Governments as a condition of this solicitation. The Agency will exempt from disclosure proprietary information, trade secrets and confidential commercial and financial information submitted or disclosed during the Contract period. Any such proprietary information, trade secrets or confidential commercial and financial information that a Contractor believes should be exempted from disclosure shall be specifically identified and marked as such. Blanket-type identification by designating whole pages or sections as containing proprietary information, trade secrets or confidential commercial and financial information will not ensure confidentiality. The specific proprietary information, trade secrets or confidential commercial and financial information must be clearly identified as such.

Upon a request for records from a third party regarding the Contract, the Agency will notify the Contractor in writing. The Contractor must respond within twenty (20) days with the identification of any and all “proprietary, trade secret or confidential commercial or financial” information, and the Contractor shall indemnify the Agency’s defense costs associated with its refusal to produce such identified information; otherwise, the requested information may be released.

The Agency shall employ sound business practices no less diligent than those used for the Agency’s own confidential information to protect the confidence of all licensed technology, software, documentation, drawings, schematics, manuals, data and other information and material provided by the Contractor pursuant to the Contract that contain confidential commercial or financial information, trade secrets or proprietary information as defined in or pursuant to the State of North Carolina against disclosure of such information and material to third parties except as permitted by the Contract. The Contractor shall be responsible for ensuring that confidential commercial or financial information, trade secrets or proprietary information, with such determinations to be made by the Agency at its sole discretion, bears appropriate notices relating to its confidential character.

During the performance of the Work under the Contract, it may be necessary for either party (the “Discloser”) to make confidential information available to the other party (the “Recipient”). The Recipient agrees to use all such information solely for the performance of the Work under the Contract and to hold all such information in

confidence and not to disclose same to any third party without the prior written consent of the Discloser. Likewise, the Recipient agrees that all information developed in connection with the Work under the Contract shall be used solely for the performance of the Work under the Contract, and shall be held in confidence and not disclosed to any third party without the prior written consent of the Discloser.

This Confidentiality section shall survive the termination or expiration of the Contract.

GC 9.11 Conflicts of Interest, Gratuities

No member, officer, or employee of the Agency or of a local public body during his or her tenure, or one year thereafter, shall have any interest, direct or indirect, in this Contract or the proceeds thereof.

GC 9.12 General Nondiscrimination Clause

In connection with the performance of Work provided for under this Contract, the Contractor agrees that it will not, on the grounds of race, religious creed, color, national origin, ancestry, physical disability, medical condition, marital status, sex, sexual orientation or age, discriminate or permit discrimination against any person or group of people in any manner prohibited by federal, state or local laws.

GC 9.13 Amendment and Waiver

GC 9.13.1. Amendment

Any modification or amendment of any provisions of any of the Contract documents shall be effective only if in writing, signed by authorized representatives of both the Agency and Contractor, and specifically referencing this Contract.

GC 9.13.2. Waiver

In the event that either party elects to waive its remedies for any breach by the other party of any covenant, term or condition of this Contract, such waiver shall not limit the waiving party's remedies for any succeeding breach of that or of any other term, covenant or condition of this Contract.

GC 9.14 Remedies Not Exclusive

The rights and remedies of the Agency provided herein shall not be exclusive and are in addition to any other rights and remedies provided by law or under the Contract.

GC 9.15 Counterparts

This Contract may be executed in any number of counterparts. All such counterparts shall be deemed to constitute one and the same instrument, and each of said counterparts shall be deemed an original thereof.

GC 9.16 Severability

Whenever possible, each provision of the Contract shall be interpreted in a manner as to be effective and valid under applicable law. However, if any provision, or part of any provision, should be prohibited or invalid under applicable law, then such provision, or part of such provision, shall be ineffective to the extent of such prohibition or invalidity without invalidating the remainder of such provision or the remaining provisions of the Contract.

GC 9.17 Third-Party Beneficiaries

No provisions of the Contract shall in any way inure to the benefit of any third party, including the public at large, so as to constitute such person a third-party beneficiary of the Contract or of any one or more of the terms and conditions of the Contract or otherwise give rise to any cause of action in any person not a party to the Contract, except as expressly provided elsewhere in the Contract.

GC 9.18 Assignment of Contract

Neither party will assign or subcontract its rights or obligations under the Contract without prior written permission of the other party, and no such assignment or subcontract will be effective until approved in writing by the other party.

GC 9.19 Independent Parties

The Contractor is an independent contractor with respect to the performance of all Work hereunder, retaining control over the detail of its own operations, and the Contractor shall not be considered the agent, employee, partner, fiduciary or trustee of the Agency.

GC 9.20 Survival

The following sections shall survive the nominal expiration or discharge of other Contract obligations, and the Agency may obtain any remedy under law, Contract or equity to enforce the obligations of the Contractor that survive the manufacturing, warranty and final payment periods:

- "Intellectual Property Warranty"
- "Data Rights"
- "Indemnification"
- "Governing Law and Choice of Forum"
- "Disputes"
- "Confidential Information"
- "Parts Availability Guarantee"
- "Access to Records"
- "Training"

SECTION 4: SPECIAL PROVISIONS

SP 1. Inspection, Tests and Repairs

SP 1.1 Repair Performance

SP 1.1.1 Repairs by Contractor

After non-acceptance of the bus, the Contractor must begin Work within five (5) working days after receiving notification from the Agency of failure of acceptance tests. The Agency shall make the bus available to complete repairs timely with the Contractor repair schedule.

The Contractor shall provide, at its own expense, all spare parts, tools and space required to complete the repairs. At the Agency's option, the Contractor may be required to remove the bus from the Agency's property while repairs are being made. If the bus is removed from the Agency's property, then repair procedures must be diligently pursued by the Contractor's representatives, and the Contractor shall assume risk of loss while the bus is under its control.

SP 1.1.2 Repairs by the Agency

The Agency will not take responsibility to correct Defects, except to replace defective parts as instructed by the Contractor.

1. **Parts used.** If the Agency performs the repairs after non-acceptance of the bus, it shall correct or repair the Defect and any Related Defects using Contractor-specified parts available from its own stock or those supplied by the Contractor specifically for this repair. reports of all repairs covered by this procedure shall be submitted by the Agency to the Contractor for reimbursement or replacement of parts monthly, or at a period to be mutually agreed upon. The Contractor shall provide forms for these reports.
2. **Contractor-supplied parts.** If the Contractor supplies parts for repairs being performed by the Agency after non-acceptance of the bus, then these parts shall be shipped prepaid to the Agency.
3. **Return of defective components.** The Contractor may request that parts covered by this provision be returned to the manufacturing plant. The total costs for this action shall be paid by the Contractor.
4. **Reimbursement for labor.** The Agency shall be reimbursed by the Contractor for labor. The amount shall be determined by the Agency for a qualified mechanic at a straight time wage rate of $45 per hour, which includes fringe benefits and overhead adjusted for the Agency's most recently published rate in effect at the time the Work is performed, plus the cost of towing in the bus, if such action was necessary. These wage and fringe benefits rates shall not exceed the rates in effect in the Agency's service garage at the time the Defect correction is made.
5. **Reimbursement for parts.** The Agency shall be reimbursed by the Contractor for defective parts that must be replaced to correct the Defect. The reimbursement shall include taxes where applicable and fifteen (15) percent handling costs.

SP 1.2 Configuration and Performance Approval

In order to assess the Contractor's compliance with the Technical Specifications, the Agency and the Contractor shall, at the Pre-Production Meeting, jointly develop a configuration and performance review document for review of the pilot vehicle. This document shall include appropriate performance standards for each test that is being required, and the document shall become part of the official record of the Pre-Production Meeting.

SP 1.3 First Article Inspection – Production

The purpose of a first article inspection is to confirm that any components, systems, subsystems, major assemblies, subassemblies, products, parts, apparatuses, articles and other materials comply with the Technical Specifications and other Contract documents.

Where required by the Contract documents or requested by the Agency, the Contractor shall cause first article inspections to be conducted. A first article inspection may include both a physical configuration inspection and a functional demonstration. First article inspections shall be conducted at the Contractor or Subcontractor's facility. The Contractor shall furnish to the Agency prior to each first article inspection a written inspection and demonstration plan for each item for review. The Agency's inspectors will attend each first article inspection unless the Agency provides a written waiver of its right to attend any such inspection. The results of each first article inspection shall be documented by the Contractor in a format deemed acceptable by the Agency, and all documents relating to the inspection shall be forwarded to the Agency.

SP 1.4 Post-Delivery Tests

The Agency will conduct acceptance tests on each delivered bus. These tests shall be completed within fifteen (15) days after bus delivery and shall be conducted in accordance with written test plans. The purpose of these tests is to identify Defects that have become apparent between the time of bus release and delivery to the Agency. The post-delivery tests shall include visual inspection and bus operations. No post-delivery test shall apply criteria that are different from the criteria applied in an analogous pre-delivery test (if any).

Buses that fail to pass the post-delivery tests are subject to non-acceptance. The Agency shall record details of all Defects on the appropriate test forms and shall notify the Contractor of acceptance or non-acceptance of each bus according to "Inspection, Testing and Acceptance" after completion of the tests. The Defects detected during these tests shall be repaired according to the procedures defined in "Repairs after Non-Acceptance."

SP 1.5 Repairs after Non-Acceptance

The Contractor, or its designated representative, shall perform the repairs after non-acceptance. If the Contractor fails or refuses to begin the repairs within five (5) days, then the Work may be done by the Agency's personnel with reimbursement by the Contractor.

SP 2. Deliveries

SP 2.1 Bus Delivery

Delivery of buses shall be determined by signed receipt of the Agency's designated agent(s). The agents name and address should be detailed on the issuing PO for each order.

SP 2.2 Delivery Schedule

The buses shall be delivered at a rate not to exceed six (6) buses per week. Delivery shall be completed in less than fifty four (54) weeks after delivery of the executed Contract Purchase Order document from participating Agency. Hours of delivery shall be 8:00am – 5:00pm on the following days of the week: Monday – Friday.

SP 2.3 Contract Deliverables

Contract deliverables associated with this Contract are set forth in the table below, along with other pertinent information. Contract deliverables shall be submitted in accordance with "Section 6: Technical Specifications." Due dates shown note the last acceptable date for receipt of Contract deliverables. The Agency will consider early receipt of Contract deliverables on a case-by-case basis. The reference section designates the appropriate specification section(s) where the requirement is referenced.

Deliverable		Agency Action	Due Date	Format	Quantity Due
1.	Bus Testing— Altoona Test Report	Review	Included in RFP Submittal	Hardcopy	1
2.	List of serialized units installed on each bus	Review	With each delivered bus	Electronic media	1 per bus
3.	Copy of Manufacturers' formal Quality Assurance Program	Review	Pre-award site visit	Hardcopy	1
4.	QA manufacturing certificate	Review	With each delivered bus	Hardcopy	1 per bus
5.	QA purchasing certifications acknowledging receipt of applicable specification	Review	30 days following first Pre-Production Meeting	Hardcopy	1 per major Supplier
6.	Pre-Delivery Bus Documentation Package	Review	With each delivered bus	Hardcopy	1 per bus
7.	Motor Vehicle Pollution Requirements Certificate	Review	With each bus	Hardcopy	1
8.	Engine Emissions Certificate— NOx levels	Review	Prior to completion of pilot bus	Hardcopy	1
9.	Pre-Production Meeting minutes	Approval	30 days after each meeting	Hardcopy	2 originals
10.	Driver's log and incident report	Review	With each bus delivery if drive-away service is used	Hardcopy	1 per bus
11.	Title documentation	Review	10 days prior to bus delivery	Hardcopy	1 per bus
12.	Performance bond (if applicable)	Review	30 days following execution of Contract	Hardcopy	1
13.	Insurance certificates	Approval	Before Work commences	Hardcopy	1
14.	Engineering support	Review	During Pre-Production Meeting	Contracts	1
15.	Training instructor information	Approval	30 days prior to delivery of pilot bus		
16.	Training curriculum	Approval	30 days prior to delivery of pilot bus	Electronic media	
17.	Teaching materials	Review	During classroom instruction	Hardcopy	1
18.	Professionally prepared mechanics' "Bus Orientation" training video	Review	30 days prior to first production bus	Electronic Media	5 each
19.	Final preventative maintenance manuals	Review	90 days after Agency written approval	Hardcopy Electronic media	3
20.	Final diagnostic procedures manuals	Review	90 days after Agency written approval	Hardcopy Electronic media	3

Deliverable		Agency Action	Due Date	Format	Quantity Due
21.	Final parts manuals	Approval	90 days after Agency written approval	Hardcopy Electronic media	3
22.	Component repair manuals (Agency approval/review period of 90 days from date of receipt)	Approval	90 days after Agency written approval of OEM component repair list	Hardcopy Electronic media	2 2
23.	Draft preventative maintenance manuals (Agency approval/review period of 90 days from date of receipt)	Approval	With pilot bus	Hardcopy	3
24.	Draft diagnostic procedures manuals (Agency approval/review period of 90 days from date of receipt)	Approval	With pilot bus	Hardcopy	3
25.	Draft parts manuals (Agency approval/review period of 90 days from date of receipt)	Approval	With pilot bus	Hardcopy	5
26.	List of OEM component repair manuals	Approval	With pilot bus	Hardcopy	5
27.	Draft operators' manuals (Agency approval/review period of 90 days from date of receipt)	Approval	With pilot bus or maximum of 30 days prior to start of production	Hardcopy	5
28.	Final operators' manuals	Review	30 days following Agency approval of draft manual	Hardcopy	1 per bus
29.	Recommended spare parts list, including bill of materials	Review	60 days prior to shipment of first bus	Hardcopy	1
30.	Part number index	Approval	60 days prior to shipment of first bus	Hardcopy Spreadsheet	1 1
31.	Current price list	Review	90 days after Agency written approval of draft parts manual	Hardcopy	3
32.	In-process drawings	Review	30 days prior to production	Scale drawings	1
33.	Electrical and air schematics	Review	30 days prior to production	Hardcopy	1
34.	As-built drawings	Review	Within 60 days after final bus delivery	Electronic media	1
35.	Material samples	Review	By conclusion of Pre-Production Meetings		1
36.	Undercoating system program	Approval	First Pre-Production Meeting	Hardcopy	1
37.	Flooring certificate	Review	First Pre-Production Meeting	Certificate/ copy of purchase order	1
38.	Interior features – fire-resistance certificates	Review	Prior to pilot bus completion	Certificates	1
39.	Crashworthiness	Review	Pre-award audit	Certificate	1

Deliverable		Agency Action	Due Date	Format	Quantity Due
40.	Technical review of electronic functionality	Approval	Prior to production	Hardcopy	1
41.	Interior security camera layout	Approval	Prior to pilot bus completion	Copies of interior views	1 each
42.	Technical review of power plant		Prior to production		
43.	Power plant certifications	Review	Prior to pilot bus completion	Hardcopy	1 each
44.	Striping layout	Approval	Prior to production	Hardcopy	1
45.	Resolution of issues “subject to Agency approval”	Approval	Prior to production	Hardcopy	1

SP 3. Pricing Scale for Vehicles, Options and Option Pricing

The Contractor recognizes the initial submission of prices are locked for the initial 12 month period from the date of Contract Award. The Contractor may set fixed prices for the term of the contract period, or utilize the latest PPI for annual updates.

The Contractor hereby grants the Agency options (“Options”) to purchase up to ten (10) additional vehicles (“Option Vehicles”) per vehicle length and type. The Options shall be valid for a period of the same length of time from the effective date of the Contract to a maximum 5 years. There shall be no minimum order quantity for any permissible assignee. Subject to the Agency’s right to order modifications, the Option Vehicles shall have the same specifications as the vehicles purchased under this Contract. AppalCART must approve the exercise the Options by written notice to the Contractor (“Notice of Exercise of Option”) at any time on or before the end date of this 5 year contract; following the effective date of the Contract (“Option Date”).

The price of the Option Vehicles shall be the unit price of the base order vehicles for year one of the contract, (“Base Order Price”) adjusted by multiplying the base order price by the following fraction:

> *Latest Published Preliminary Index Number Prior to Notice of Exercise of Option / Index Number on Effective Date of the Contract*

The Index shall be the Producer Price Index for Truck and Bus Bodies, Series No. 1413, published by the United States Department of Labor, Bureau of Labor Statistics, or if such Index is no longer in use, then such replacement that is most comparable to the Index as may be designated by the Bureau of Labor Statistics, or as agreed by the parties.

Within thirty (30) days after delivery of the Notice of Exercise of Option to the Contractor, the Contractor shall submit a proposed delivery schedule. Along with the proposed delivery schedule, the Contractor will provide the Agency with access to its production schedule for the purpose of the parties verifying available production capacity. The production schedule shall include a reasonable time for mobilization and for coordinating with other vehicle orders, and it shall be based upon a production rate at least equal to the production rate actually realized with respect to the base order vehicles. If the parties are unable to agree on a production schedule, then the maximum term for the production of the Option Vehicles shall not exceed a total of fourteen months (14) months after the date of Notice to Proceed with Option Vehicle production. The Agency or any permissible assignee may issue a Notice to Proceed at any time after the Contractor submits its proposed delivery schedule. The Contractor shall not commence production of the Option Vehicles prior to issuance of the Notice to Proceed by the Agency or any permissible assignee of the Agency for the Option Vehicles incorporating the agreed production delivery schedule or the fourteen (14) -month maximum term.

Except as otherwise specially provided in this Contract, all other terms of the Contract shall apply to the Option Vehicles.

SP 4. Payment

The Agency shall pay and the Contractor shall accept the amounts set forth in the price schedule as full compensation for all costs and expenses of completing the Work in accordance with the Contract, including but not limited to all labor, equipment and material required; overhead; expenses; storage and shipping; risks and obligations; taxes (as applicable); fees and profit; and any unforeseen costs.

SP 4.1 Payment Terms

Payment upon Delivery

All payments shall be made as provided herein, less any additional amount withheld as provided below and less any amounts for liquidated damages in accordance with "Liquidated Damages for Late Delivery of the Bus."

The Agency shall make payments for buses at the unit prices itemized in the price schedule within 30 calendar days after the delivery and acceptance of each bus and receipt of a proper invoice.

The Agency shall make payments for spare parts and/or equipment at the unit prices itemized in the price schedule within 30 calendar days after the delivery and acceptance of said spare parts and/or equipment and receipt of a proper invoice.

The Agency shall make a final payment for all withholding within 15 calendar days of receipt of a final proper invoice and the following:

1. Delivery and acceptance of all Contract deliverables, including manuals and other documentation required by the Contract, excluding training.
2. Contractor provision of any certifications as required by law and/or regulations.
3. Completion of post-delivery audits required under the Contract.

The Contractor may charge interest for late payment if payment is delayed more than ten (10) days after the payment Due Date set forth above. Interest will be charged at a rate not to exceed the prime rate of interest published by The Wall Street Journal on the 10th day.

SP 4.2 Payment of Taxes

Unless otherwise provided in this Contract, the Contractor shall pay all federal, state and local taxes, and duties applicable to and assessable against any Work, goods, services, processes and operations incidental to or involved in the Contract, including but not limited to retail sales and use, transportation, export, import, business and special taxes. The Contractor is responsible for ascertaining and paying the taxes when due. The total Contract price shall include compensation for all taxes the Contractor is required to pay by laws in effect on the Proposal Due Date. The Contractor will maintain auditable records, subject to the Agency reviews, confirming that tax payments are current at all times.

SP 5. Liquidated Damages for Late Delivery of the Bus

It is mutually understood and agreed by and between the parties to the Contract that time is of the essence with respect to the completion of the Work and that in case of any failure on the part of the Contractor to deliver the buses within the time specified in "Delivery Schedule," except for any excusable delays as provided in "Excusable Delays/Force Majeure" or any extension thereof, the Agency will be damaged thereby. The amount of said

damages, being difficult if not impossible of definite ascertainment and proof, it is hereby agreed that the amount of such damages due to the Agency shall be fixed at Two Hundred Fifty ($250) dollars per business day per bus not delivered in substantially good condition as inspected by the Agency at the time released for shipment. The maximum amount of liquidated damages will not exceed 10% of the total cost per the PO amount of the issuing Agencies vehicle order.

The Contractor hereby agrees to pay the aforementioned amounts as fixed, agreed and liquidated damages, and not by way of penalty, to the Agency and further authorizes the Agency to deduct the amount of the damages from money due the Contractor under the Contract, computed as aforesaid. If the money due the Contractor is insufficient or no money is due the Contractor, then the Contractor shall pay the Agency the difference or the entire amount, whichever may be the case, within thirty (30) days after receipt of a written demand by the Contracting Officer.

The payment of aforesaid fixed, agreed and liquidated damages shall be in lieu of any damages for any loss of profit, loss of revenue, loss of use, or for any other direct, indirect, special or consequential losses or damages of any kind whatsoever that may be suffered by the Agency arising at any time from the failure of the Contractor to fulfill the obligations referenced in this clause in a timely manner.

SP 6. Service and Parts

SP 6.1 Contractor Service and Parts Support

The Contractor shall state on the form Contractor Service and Parts Support Data the representatives responsible for assisting the Agency, as well as the location of the nearest distribution center, which shall furnish a complete supply of parts and components for the repair and maintenance of the buses to be supplied. The Contractor also shall state below, or by separate attachment, its policy on transportation charges for parts other than those covered by warranty.

SP 6.2 Documentation

The Contractor shall provide an electronic copy and two (2) printed current maintenance manual(s) to include preventative maintenance procedures, diagnostic procedures or troubleshooting guides and major component service manuals, an electronic copy and two (2) printed current parts manual(s), and an electronic copy and two (2) printed standard operator’s manual(s) as part of this Contract. The Contractor also shall exert its best efforts to keep maintenance manuals, operator’s manuals and parts books up to date for a period of fifteen (15) years. The supplied manuals shall incorporate all equipment ordered on the buses covered by this procurement. In instances where copyright restrictions or other considerations prevent the Contractor from incorporating major components information into the bus parts and service manuals, separate manual sets as published by the subcomponent Supplier will be provided.

SP 6.3 Parts Availability Guarantee

The Contractor hereby guarantees to provide, within reasonable periods of time, the spare parts, software and all equipment necessary to maintain and repair the buses supplied under this Contract for a period of at least twelve (12) years after the date of acceptance. Parts shall be interchangeable with the original equipment and shall be manufactured in accordance with the quality assurance provisions of this Contract. Prices shall not exceed the Contractor’s then-current published catalog prices.

Where the parts ordered by the Agency are not received within two (2) working days of the agreed-upon time and date and a bus procured under this Contract is out of service due to the lack of said ordered parts, then the Contractor shall provide the Agency, within eight (8) hours of the Agency’s verbal or written request, the original

Suppliers' and/or manufacturers' parts numbers, company names, addresses, telephone numbers and contact persons' names for all of the specific parts not received by the Agency.

Where the Contractor fails to honor this parts guarantee or parts ordered by the Agency are not received within thirty (30) days of the agreed-upon delivery date, then the Contractor shall provide to the Agency, within seven (7) days of the Agency's verbal or written request, the design and manufacturing documentation for those parts manufactured by the Contractor and the original Suppliers' and/or manufacturers' parts numbers, company names, addresses, telephone numbers and contact persons' names for all of the specific parts not received by the Agency. The Contractor's design and manufacturing documentation provided to the Agency shall be for its sole use in regard to the buses procured under this Contract and for no other purpose.

SP 6.4 Agency-Furnished Property

In the event that equipment or other goods or materials are specified in the Technical Specifications to be furnished by the Agency to the Contractor for incorporation in the Work, the following provisions shall apply:

The Agency shall furnish the equipment, goods or materials in a timely manner so as not to delay Contract delivery or performance dates. If Agency-furnished property is received in a condition not suitable for the intended use, then the Contractor shall promptly notify the Agency, detailing the facts, and at the Agency's expense repair, modify, return or take such other action as directed by the Agency. The parties may conduct a joint inspection of the property before the Contractor takes possession to document its condition.

The Agency retains title to all Agency-furnished property. Upon receipt of the Agency-furnished property, the Contractor assumes the charge and care of the property and bears the risk of loss or damage due to action of the elements or from any other cause. The Contractor shall provide appropriate protection for all such property during the progress of the Work. Should any Agency-furnished equipment or materials be damaged, such property shall be repaired or replaced at the Contractor's expense to the satisfaction of the Agency. No extension of time will be allowed for repair or replacement of such damaged items. Should the Contractor not repair or replace such damaged items, the Agency shall have the right to take corrective measures itself and deduct the cost from any sums owed to the Contractor.

Warranty administration and enforcement for Agency-furnished equipment are the responsibility of the Agency, unless the parties agree to transfer warranty responsibility to the Contractor.

SP 7. Federal Motor Vehicle Safety Standards (FMVSS)

The Contractor shall submit one (1) manufacturer's FMVSS self-certification, Federal Motor Vehicles Safety Standards, that the vehicle complies with relevant FMVSS or two manufacturer's certified statement that the contracted buses will not be subject to FMVSS regulations.

SP 8. Insurance

The Contractor shall maintain in effect during the term of this Contract, including any warranty period, at its own expense, at least the following coverage and limits of insurance:

- Statutory Workers Compensation and Employers Liability insurance and/or qualified self-insurance program covering Supplier's employees while on Agency property.
- Commercial General Liability Insurance:
    - Bodily Injury and Property Damage, including Contractual Liability covering the indemnification contained herein, $10,000,000 combined single limits per occurrence, $10,000,000 aggregate, where applicable.

    - Product liability: $5,000,000 per occurrence, for a period of five (5) years after acceptance of the last bus delivered under this Contract (Products Liability coverage may be effected through one or more excess liability policies).
- Automobile Liability Insurance: Bodily Injury and Property Damage, $1,000,000 combined single limits per occurrence.

Contractor shall deliver to the Agency, within ten (10) days after receiving Notice of Award of this Contract, evidence of the above. Prior to the expiration of any insurance during the time required, the Supplier shall furnish evidence of renewal to the Agency's Contract Administrator.

SP 9. Software Escrow Account

All the Contractor's policies shall contain an endorsement naming the Agency as an additional insured and providing that written notice shall be given to the Agency's location at least thirty (30) days prior to termination, cancellation or material reduction of coverage in the policy; provided, however, that such notice may be given on ten (10) days' notice if the termination is due to nonpayment of premium.

Upon execution of the Contract, the Contractor shall provide the Agency a list of all OEM software comprising proprietary works ("Proprietary Software") for all major vehicle subsystems. From time to time and only upon request, information contained within the listed software may be made available to the Agency through the OEM of the vehicle subsystem. The Contractor and OEM are not obligated to provide copies of source code, as this is proprietary intellectual property; however, the Contractor is obligated to assist the Agency with any technical assistance for the duration of the life of the vehicle. It is the Agency's prerogative to evaluate the long-term viability of the Contractor and its Subcontractors and Suppliers based upon the criteria set forth in "Qualification Requirements."

SP 10. Sustainability

The Agency recognizes that being sustainable (environmentally, economically and socially responsible) involves everyone, both internal and external to the Agency. The Agency expects its Contractors to have their own sustainability policies and programs in place and to provide services in line with the principles established therein. Implementation of sustainable practices may include maximizing the use of environmentally and socially responsible materials and services, utilizing energy-efficient and non-polluting vehicles, equipment and processes, and ensuring employee awareness of sustainability initiatives.

The Contractor will provide the Agency with a statement indicating that responsible parties have read and understand the Agency's sustainability policies and that it agrees to use reasonable efforts to conduct its work and operations in a manner that is consistent with them. In addition the Contractor will provide the Agency with a copy of its corporate sustainability policy.

SECTION 5: FEDERAL REQUIREMENTS

FR 1. Access to Records

The Contractor agrees to maintain all books, records, accounts and reports required under this Contract for a period of not less than three years after the date of termination or expiration of this Contract, except in the event of litigation or settlement of claims arising from the performance of this Contract, in which case Contractor agrees to maintain same until the Agency, the FTA Administrator, the Comptroller General or any of their duly authorized representatives have disposed of all such litigation, appeals, claims or exceptions related thereto. Reference 49 CFR 18.39(i)(11).

The following access to records requirements apply to this Contract:

FR 1.1 Local Governments

In accordance with 49 CFR 18.36(i), the Contractor agrees to provide the Agency, the FTA Administrator, the Comptroller General of the United States or any of their authorized representatives access to any books, documents, papers and records of the Contractor that are directly pertinent to this Contract for the purposes of making audits, examinations, excerpts and transcriptions. Contractor also agrees, pursuant to 49 CFR 633.17 to provide the FTA Administrator or his authorized representatives including any PMO Contractor access to Contractor's records and construction sites pertaining to a major capital project, defined at 49 USC 5302(a)1, which is receiving federal financial assistance through the programs described at 49 USC 5307, 5309 or 5311.

FR 1.2 State Governments

In accordance with 49 CFR 633.17, the Contractor agrees to provide the Agency, the FTA Administrator or his authorized representatives, including any PMO Contractor, access to the Contractor's records and construction sites pertaining to a major capital project, defined at 49 USC 5302(a)1, which is receiving federal financial assistance through the programs described at 49 USC 5307, 5309 or 5311. By definition, a major capital project excludes contracts of less than the simplified acquisition threshold currently set at $100,000.

The Contractor agrees to permit any of the foregoing parties to reproduce by any means whatsoever or to copy excerpts and transcriptions as reasonably needed.

FR 2. Federal Funding, Incorporation of FTA Terms and Federal Changes

The preceding provisions include, in part, certain standard terms and conditions required by the Department of Transportation, whether or not expressly set forth in the preceding Contract provisions. All contractual provisions required by DOT, as set forth in FTA Circular 4220.1F or its successors are hereby incorporated by reference. Anything to the contrary herein notwithstanding, all FTA mandated terms shall be deemed to control in the event of a conflict with other provisions contained in this agreement. The Contractor shall not perform any act, fail to perform any act or refuse to comply with any AppalCART requests that would cause AppalCART to be in violation of the FTA terms and conditions.

The Contractor shall at all times comply with all applicable FTA regulations, policies, procedures and directives, including without limitation those listed directly or by reference in the Master Agreement between Agency and FTA, as they may be amended or promulgated from time to time during the term of this Contract. Contractor's failure to so comply shall constitute a material breach of this Contract.

FR 3. Federal Energy Conservation Requirements

The Contractor agrees to comply with mandatory standards and policies relating to energy efficiency that are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act.

FR 4. Civil Rights Requirements

The following requirements apply to the underlying Contract:

1. **Nondiscrimination:** In accordance with Title VI of the Civil Rights Act, as amended, 42 USC§ 2000d, section 303 of the Age Discrimination Act of 1975, as amended, 42 USC § 6102, section 202 of the Americans with Disabilities Act of 1990, 42 USC § 12132, and federal transit law at 49 USC § 5332, the Contractor agrees that it will not discriminate against any employee or applicant for employment because of race, color, creed, national origin, sex, age, or disability. In addition, the Contractor agrees to comply with applicable federal implementing regulations and other implementing requirements FTA may issue.
2. **Equal Employment Opportunity:** The following equal employment opportunity requirements apply to the underlying Contract:
    (a) **Race, Color, Creed, National Origin, Sex:** In accordance with Title VII of the Civil Rights Act, as amended, 42 USC § 2000e, and federal transit laws at 49 USC § 5332, the Contractor agrees to comply with all applicable equal employment opportunity requirements of U.S. Department of Labor (U.S. DOL) regulations, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor," 41 CFR Parts 60 *et seq.*, (which implement Executive Order No. 11246, "Equal Employment Opportunity," as amended by Executive Order No. 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," 42 USC § 2000e note), and with any applicable federal statutes, executive orders, regulations, and federal policies that may in the future affect construction activities undertaken in the course of the Project. The Contractor agrees to take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, creed, national origin, sex, or age. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.
    (b) **Age:** In accordance with section 4 of the Age Discrimination in Employment Act of 1967, as amended, 29 USC §§ 623 and federal transit law at 49 USC § 5332, the Contractor agrees to refrain from discrimination against present and prospective employees for reason of age. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.
    (c) **Disabilities:** In accordance with section 102 of the Americans with Disabilities Act, as amended, 42 USC § 12112, the Contractor agrees that it will comply with the requirements of U.S. Equal Employment Opportunity Commission, "Regulations to Implement the Equal Employment Provisions of the Americans with Disabilities Act," 29 CFR Part 1630, pertaining to employment of persons with disabilities. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.
3. The Contractor also agrees to include these requirements in each subcontract financed in whole or in part with federal assistance provided by FTA, modified only if necessary to identify the affected parties.

FR 5. No Government Obligation to Third Parties

1. The Agency and Contractor acknowledge and agree that, notwithstanding any concurrence by the federal government in or approval of the Solicitation or award of the underlying Contract, absent the express written consent by the federal government, the federal government is not a party to this Contract and shall not be subject to any obligations or liabilities to the Agency, Contractor, or any other party (whether or not a party to that Contract) pertaining to any matter resulting from the underlying Contract.
2. The Contractor agrees to include the above clause in each subcontract financed in whole or in part with federal assistance provided by FTA. It is further agreed that the clause shall not be modified, except to identify the Subcontractor who will be subject to its provisions.

FR 6. Program Fraud and False or Fraudulent Statements or Related Acts

1. The Contractor acknowledges that the provisions of the Program Fraud Civil Remedies Act of 1986, as amended, 31 USC §§ 3801 *et seq*. and U.S. DOT regulations, "Program Fraud Civil Remedies," 49 CFR Part 31, apply to its actions pertaining to this Project. Upon execution of the underlying Contract, the Contractor certifies or affirms the truthfulness and accuracy of any statement it has made, it makes, it may make, or it causes to be made, pertaining to the underlying Contract or the FTA-assisted project for which this Contract Work is being performed. In addition to other penalties that may be applicable, the Contractor further acknowledges that if it makes, or causes to be made, a false, fictitious or fraudulent claim, statement, submission or certification, the federal government reserves the right to impose the penalties of the Program Fraud Civil Remedies Act of 1986 on the Contractor to the extent the federal government deems appropriate.
2. The Contractor also acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification to the federal government under a Contract connected with a project that is financed in whole or in part with Federal assistance originally awarded by FTA under the authority of 49 USC § 5307, the government reserves the right to impose the penalties of 18 USC § 1001 and 49 USC § 5307(n)(1) on the Contractor, to the extent the federal government deems appropriate.
3. The Contractor agrees to include the above two clauses in each subcontract financed in whole or in part with federal assistance provided by FTA. It is further agreed that the clauses shall not be modified, except to identify the Subcontractor who will be subject to the provisions.

FR 7. Suspension and Debarment

This Contract is a covered transaction for purposes of 49 CFR Part 29. As such, the Contractor is required to verify that none of the Contractor, its principals, as defined at 49 CFR 29.995, or affiliates, as defined at 49 CFR 29.905, are excluded or disqualified as defined at 49 CFR 29.940 and 29.945.

The Contractor is required to comply with 49 CFR 29, Subpart C, and must include the requirement to comply with 49 CFR 29, Subpart C, in any lower-tier covered transaction it enters into.

By signing and submitting its bid or Proposal, the Bidder or Proposer certifies as follows:

The certification in this clause is a material representation of fact relied upon by AppalCART. If it is later determined that the Bidder or Proposer knowingly rendered an erroneous certification, in addition to remedies available to AppalCART, the federal government may pursue available remedies, including but not limited to suspension and/or debarment. The Bidder or Proposer agrees to comply with the requirements of 49 CFR 29, Subpart C, while this Proposal is valid and throughout the period of any Contract that may arise from this Proposal. The Bidder or Proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

FR 8. Disadvantaged Business Enterprise (DBE)

This Contract is subject to the requirements of Title 49, Code of Federal Regulations, Part 26, Participation by Disadvantaged Business Enterprises in Department of Transportation Financial Assistance Programs.

The Contractor shall maintain compliance with "TVM Approval Certification" throughout the period of Contract performance.

The Contractor shall not discriminate on the basis of race, color, national origin or sex in the performance of this Contract. The Contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of this DOT-assisted Contract. Failure by the Contractor to carry out these requirements is a material breach of this Contract, which may result in the termination of this Contract or such other remedy as AppalCART deems

appropriate. Each subcontract the Contractor signs with a Subcontractor must include the assurance in this paragraph (see 49 CFR 26.13(b)).

FR 9. Clean Water Requirements

1. The Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 USC 1251 *et seq.* The Contractor agrees to report each violation to the Agency and understands and agrees that the Agency will, in turn, report each violation as required to ensure notification to FTA and the appropriate EPA Regional Office.
2. The Contractor also agrees to include these requirements in each subcontract exceeding $100,000 financed in whole or in part with federal assistance provided by FTA.

FR 10. Clean Air Requirements

1. The Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 USC §§ 7401 *et seq*. The Contractor agrees to report each violation to the Agency and understands and agrees that the Agency will, in turn, report each violation as required to ensure notification to FTA and the appropriate EPA Regional Office.
2. The Contractor also agrees to include these requirements in each subcontract exceeding $100,000 financed in whole or in part with federal assistance provided by FTA.

FR 11. Compliance with Federal Lobbying Policy

Contractors who apply or bid for an award of $100,000 or more shall file the certification required by 49 CFR Part 20, "New Restrictions on Lobbying." Each tier certifies to the tier above that it will not and has not used federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any Agency, a member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any federal Contract, grant or any other award covered by 31 USC 1352. Each tier shall also disclose the name of any registrant under the Lobbying Disclosure Act of 1995 who has made lobbying contacts on its behalf with non-federal funds with respect to that federal Contract, grant or award covered by 31 USC 1352. Such disclosures are forwarded from tier to tier up to the recipient.

FR 12. Buy America

The Contractor agrees to comply with 49 USC 5323(j) and 49 CFR Part 661, which provide that federal funds may not be obligated unless steel, iron and manufactured products used in FTA-funded projects are produced in the United States, unless a waiver has been granted by FTA or the product is subject to a general waiver. General waivers are listed in 49 CFR 661.7.A general public interest waiver from the Buy America requirements applies to microprocessors, computers, microcomputers, software or other such devices, which are used solely for the purpose of processing or storing data. This general waiver does not extend to a product or device that merely contains a microprocessor or microcomputer and is not used solely for the purpose of processing or storing data.

Separate requirements for rolling stock are set out at 49 USC 5323(j)(2)(C) and 49 CFR 661.11. Rolling stock must be assembled in the United States and have a 70 percent domestic content. NOTICE must be adhered to for any Federal modifications to the Buy America standards, and adjustments to the percentage requirements will be met by all manufacture for the life of this contract.

A Bidder or Proposer must submit to the Agency the appropriate Buy America Certification with all offers on FTA-funded contracts, except those subject to a general waiver. Proposals that are not accompanied by a properly completed Buy America certification are subject to the provisions of 49 CFR 661.13 and may be rejected as nonresponsive.

FR 13. Testing of New Bus Models

The Contractor agrees to comply with 49 USCA 5323(c) and FTA's implementing regulation at 49 CFR Part 665 and shall perform the following:

1. A manufacturer of a new bus model or a bus produced with a major change in components or configuration shall provide a copy of the final test report to the recipient at a point in the procurement process specified by the recipient, which will be prior to the recipient's final acceptance of the first vehicle.
2. A manufacturer who releases a report under Paragraph 1 above shall provide notice to the operator of the testing facility that the report is available to the public.
3. If the manufacturer represents that the vehicle was previously tested, the vehicle being sold should have the identical configuration and major components as the vehicle in the test report, which must be provided to the recipient prior to recipient's final acceptance of the first vehicle. If the configuration or components are not identical, the manufacturer shall provide a description of the change and the manufacturer's basis for concluding that it is not a major change requiring additional testing.
4. If the manufacturer represents that the vehicle is "grandfathered" (has been used in mass transit service in the United States before October 1, 1988, and is currently being produced without a major change in configuration or components), the manufacturer shall provide the name and address of the recipient of such a vehicle and the details of that vehicle's configuration and major components.

FR 14. Pre-Award and Post-Delivery Audits

The Contractor agrees to comply with 49 USC § 5323(l) and FTA's implementing regulation at 49 CFR Part 663 and to submit the following certifications:

1. **Buy America requirements:** The Contractor shall complete and submit a declaration certifying either compliance or noncompliance with Buy America. If the recommended Bidder/Proposer certifies compliance with Buy America, it shall submit documentation that lists (1) component and subcomponent parts of the rolling stock to be purchased identified by manufacturer of the parts, their country of origin and costs; and (2) the location of the final assembly point for the rolling stock, including a description of the activities that will take place at the final assembly point and the cost of final assembly.
2. **Solicitation specification requirements:** The Contractor shall submit evidence that it will be capable of meeting the bid specifications.
3. **Federal Motor Vehicle Safety Standards (FMVSS):** The Contractor shall submit (1) manufacturer's FMVSS self-certification, Federal Motor Vehicle Safety Standards, that the vehicle complies with relevant FMVSS or (2) manufacturer's certified statement that the contracted buses will not be subject to FMVSS regulations.

FR 15. Cargo Preference

The Contractor agrees to the following:

- To use privately owned U.S.-flag commercial vessels to ship at least fifty (50) percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners and tankers) involved, whenever shipping any equipment, material or commodities pursuant to the underlying Contract to the extent such vessels are available at fair and reasonable rates for U.S.-flag commercial vessels;
- To furnish within twenty (20) working days following the date of loading for shipments originating within the United States or within thirty (30) working days following the date of leading for shipments originating outside the United States, a legible copy of a rated, "on-board" commercial ocean bill of lading in English for each shipment of cargo described in the preceding paragraph to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590 and to the FTA recipient (through the Contractor in the case of a Subcontractor's bill-of-lading.)

- To include these requirements in all subcontracts issued pursuant to this Contract when the subcontract may involve the transport of equipment, material or commodities by ocean vessel.

FR 16. Fly America

The Contractor agrees to comply with 49 USC 40118 (the "Fly America" Act) in accordance with the General Services Administration's regulations at 41 CFR Part 301-10, which provide that recipients and sub recipients of federal funds and their Contractors are required to use U.S. flag air carriers for U.S. government-financed international air travel and transportation of their personal effects or property, to the extent such service is available, unless travel by foreign air carrier is a matter of necessity, as defined by the Fly America Act. The Contractor shall submit, if a foreign air carrier was used, an appropriate certification or memorandum adequately explaining why service by a U.S.-flag air carrier was not available or why it was necessary to use a foreign air carrier and shall, in any event, provide a certificate of compliance with the Fly America requirements. The Contractor agrees to include the requirements of this section in all subcontracts that may involve international air transportation.

FR 17. Exclusionary or Discriminatory Specifications

The Contractor agrees that it will comply with the requirements of 49 U.S.C. Sect. 5325(h) by refraining from using any funds derived from FTA in performance of this Contract to support procurements using exclusionary or discriminatory specifications.

FR 18. Geographic Preference

Procurements shall be conducted in a manner that prohibits the use of statutorily or administratively imposed in-State or local geographical preferences in evaluation or award of bids or bids, except where applicable Federal statutes expressly mandate or encourage geographic preference. This does not preempt State licensing laws.

FR 19. Contract Work Hours and Safety Standards Act

1. **Overtime requirements:** No Contractor or Subcontractor contracting for any part of the Contract Work that may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such Work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.
2. **Violation; liability for unpaid wages; liquidated damages:** In the event of any violation of the clause set forth in paragraph 1 of this section, the Contractor and any Subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such Contractor and Subcontractor shall be liable to the United States for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph 1 of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by the clause set forth in paragraph 1 of this section.
3. **Withholding for unpaid wages and liquidated damages:** AppalCART shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any monies payable on account of work performed by the Contractor or Subcontractor under any such contract or any other federal contract with the same Prime Contractor, or any other federally assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same Prime Contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or Subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph 2 of this section.

4. **Subcontracts:** The Contractor or Subcontractor shall insert in any subcontracts the clauses set forth in paragraphs 1 through 4 of this section and also a clause requiring the Subcontractors to include these clauses in any lower-tier subcontracts. The Prime Contractor shall be responsible for compliance by any Subcontractor or lower-tier Subcontractor with the clauses set forth in paragraphs 1 through 4 of this section.

SECTION 6: DOUBLE DECKER TECHNICAL SPECIFICATIONS

1. Scope

AppalCART intends to establish a Master Contract for the purchase of heavy-duty double decker transit buses that will provide the best value and selection to purchasers that maximizes passenger appeal in appearance, comfort, and safety, combined with excellence in reliability, operating characteristics, and economy of operation.

Heavy-duty buses purchased under this RFP will be diesel low floor, double deck transit bus. The buses will not to exceed forty- three (43) feet in length, with an overall height of not more than 14 feet including all GPS and communication antennas, as per North Carolina law. Maximum height of antennas is 3 inches.

Buses shall have a minimum expected life of twelve (12) years or 500,000 miles, whichever comes first, and are intended for a wide possible spectrum of passengers, including children, adults, the elderly, and people with disabilities. Where brand names or specific items are used in these specifications, consider the term "or equivalent" to follow. The buses must be Altoona tested and meet any other bus testing requirements under MAP-21.

2. Definitions

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.

Audible Discrete Frequency: An audible discrete frequency is determined to exist if the sound power level in any 1/3-octave band exceeds the average of the sound power levels of the two adjacent 1/3- octave bands by 4 decibels (dB) or more.

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

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

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).

Code: A legal requirement.

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

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 bus, including maximum fuel, oil and coolant; and all equipment required for operation and required by this Specification, but without passengers or driver.

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

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

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

Defueling: The process of removing fuel from a tank.

Defueling Port: Device that allows for bus 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.

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

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

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

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

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

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

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 sq. ft. shall be allocated for the feet of each seated passenger protruding 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).

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

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

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

GVWR (Gross Bus Weight Rated): The maximum total weight as determined by the bus manufacturer, at which the bus can be safely and reliably operated for its intended purpose.

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

Hose: Flexible line.

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

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

Leakage: Release of contents through a defect or a crack. See *Rupture*.

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

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

Local Regulations: Regulations below the state level.

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

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

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

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

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

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

Module: An assembly of individual components .

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

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

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

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 an 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 bus proportional to operator commands. Includes, as applicable, engine, transmission, traction motors, the hybrid drive system (HDS), energy storage system (ESS), and system controllers including all wiring and converter/inverter.

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

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

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

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

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

SLW (Seated Load Weight): 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 V systems).

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

Special Tools: Tools not normally stocked by the Purchaser.

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

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

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

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

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

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

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

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 mobility aid belonging to any class of three- or more-wheeled devices, usable indoors, designed or modified for and used by individuals with mobility impairments, whether operated manually or powered.

3. Referenced Publications

The documents or portions thereof referenced within this specification shall be considered part of the requirements of the specification. The most recent published edition applies, unless otherwise specified.

4. Legal Requirements

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.

Buses shall meet all applicable FMVSS regulations and shall accommodate all applicable FMCSR regulations in effect at the location of the Purchaser and the date of manufacture. Bus shall meet all applicable BMCS and ADA regulations in effect at the date of manufacture.

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.

5. Overall Requirements

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

5.1 General Dimensions

Dimensions used throughout this specification are U.S. standard units (e.g., inches, pounds).

5.2 Miscellaneous Technical Specifications

a. Any sharp corners on each bus shall be slightly rounded and filed smooth so that they do not cause injury to passengers.

b. Welds shall be free of slag inclusions and undercut. Fillet weld size shall be equal to the thickness of the least of the joined parts. Spot welds are not permitted.

c. All materials installed shall be new and free of rust.

d. No wires shall be visible on the exterior or interior of the bus. Wires that are spares shall be capped at the ends.

e. The body shall be free of all cracks, dents, and defects due to metal fatigue or any other physical damage.

f. All switches shall be permanently labeled.

g. All buses shall be thoroughly cleaned and weather sealed prior to inspection.

h. All interior and exterior signs shall be painted with decals applied. Signage information shall be provided per the Purchaser's request and approval.

i. All hoses supplied in assembling the unit described in these specifications shall be silicone-grade hose and psi ratings in excess of maximum operating temperatures and pressure of fluids or materials being transferred.

j. Only new and unused components, parts and models in current production shall be acceptable.

k. Buses shall be delivered with a complete set of "as built" operator's, maintenance and parts manuals describing in detail all bus components and wiring. The "as built" manual shall be complete with trouble-shooting guide, lubrication and adjustment procedures, wiring diagrams, air brake system diagrams, warranty, and service instructions, etc. A copy of the Manufacturer's "as built" manual for generally similar buses shall be included with each bid.

l. Manufacturer to supply #798, safety, reflective-triangle kit in each bus. The kits shall be mounted in an equipment box, in close proximity to the operator (position and box size to be approved by the Purchaser before production).

TS 5.3 Weight

A design goal shall be to construct each bus as light in weight as possible without degradation of safety, appearance, comfort or performance. Buses at a capacity load shall not exceed the tire factor limits, brake test criteria or structural design criteria. All buses will be weighed at a certified scale and weight slips will be included in the packet from the builder with each coach.

TS 5.4 Capacity

The bus shall be designed to carry the gross bus weight, which shall not exceed the bus GVWR. Gross Vehicle Weight Rating (GVWR) for buses supplied shall be sufficient to accommodate fully loaded bus (fuel, oil and coolant as well as all equipment specified herein) plus full passenger (seated and standing) load for safe and normal in-service transit operation.

TS 5.5 Service Life

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

TS 5.6 Maintenance and Inspection

Scheduled maintenance tasks shall be related and shall be in accordance with the manufacturer's recommended preventative maintenance schedule (along with routine daily service performed during the fueling operations).

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

The Contractor shall give prime consideration to the routine problems of maintaining the bus. 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. The rear seat in front of the engine shall be hinged to gain the necessary access to the engine compartment access panels and shall be equipped with a bar to hold the seat in the up position during maintenance. 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.

Individual panels or other equipment that may be damaged in normal service shall be able to be replaced or repaired. Ease of repair shall be related to an item's vulnerability to be damaged during service. Interior and exterior finishes shall be designed to avoid accumulation of dirt and debris. Trash deflectors shall be installed where necessary.

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 that may be damaged in normal service shall be repairable or replaceable. Ease of repair shall be related to the vulnerability of the item to damage in service.

Contractor shall submit a list of all special tools and pricing required for maintaining this equipment with the bid. Said list shall detail the part number and cost of the tool. Tools such as compartment door keys, bellows gauges and other tools that are required for daily maintenance and inspections shall not be included in the special tool list and shall be furnished for each bus.

TS 5.7 Interchangeability

Unless otherwise agreed, all units and components procured under this Contract, whether provided by suppliers or manufactured by the Contractor, shall be duplicates in design, manufacture and installation to ensure interchangeability among buses in each order group in this procurement. This interchangeability shall extend to the individual components as well as to their locations in the buses. These components shall include, but are not limited to, passenger window hardware, interior trim, lamps, lamp lenses and seat assemblies. Components with non-identical functions shall not be, or appear to be, interchangeable.

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

secure approval for any changes in components or unit construction provided within a Contract.

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

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

TS 5.8 Training

The Contractor shall be required to provide training for Basic Bus Familiarization Training and Basic Maintenance Familiarization Training with each group of buses procured under this contract. This training shall have an audience of drivers, mechanics, and training instructors. This training is priced into the delivered price of the bus.

TS 5.8.1 General Training Requirements

Training shall be administered by qualified trainers. This can be accomplished by the Contractors own staff or by outside vendors including, but not limited to, original equipment manufacturers upon approval by the Purchaser. Contractor is responsible for scheduling and the cost of the vendor presenters.

Contractor shall provide the Purchaser with a schedule and lesson plan for each program (Basic Familiarization for maintenance and operators), a minimum of thirty (30) calendar days before the delivery of the first bus for review and approval. The Contractor shall include, as part of the lesson plan, the name of instructors and vendor presenters. The utilization of vendor presenters is encouraged and supported by the Purchaser. The Contractor shall also note on the lesson plan any equipment required, such as audio-visual equipment, blackboards, wipe board, flip charts, overhead or slide projectors needed to make the presentation.

Training shall be delivered, for the most part, at the Purchaser's designated location.

The Basic Bus Familiarization and Maintenance Familiarization shall begin within 10 days after delivery of the first bus of any particular order or as agreed upon during the pre-production meeting.

TS 5.8.2 Basic Bus Familiarization Training

Contractor shall provide complete training and instruction for the Purchaser's instructors, mechanics, and drivers. This instruction or training program shall be designed to familiarize personnel with the bus and its driving characteristics. All training shall be reproducible. This program shall include, but is not be limited to, the following:

1. Cockpit Orientation
    - Controls and switches
    - Warning indicators
    - Seat adjustment
    - Door controls
    - Climate control system
    - Camera system
2. Walk around Inspection
    - Compartment by compartment explanation
    - Mirror adjustment
    - Trouble signs

3. Driving Instruction - On Site
    - Turns (turning radius)
    - Braking (air)
    - Transmission shifting patterns
    - Backing the bus

TS 5.8.3 Basic Maintenance Familiarization Training

This will be a continuation from above training outlined for maintenance and maintenance training instructor.

- Location of major components
- Explanation of major components
- Basic reading of electrical schematics
- Fluid and lubrication points
- Torque chart and specification locations

TS 5.8.4 Technical Training

This section briefly outlines possible training topics for pricing on an hour basis and/or by class basis. Course/s shall be selected at a later date according to the Purchaser's needs, pricing of selected training, and availability of instructors.

1. Pricing includes the classes that are proposed for on-site training. Purchaser's may choose to negotiate for off-site training at the time of contract. If off-site training is requested, the price shall only include the cost of the class and not travel or other amenities.
2. Possible training topics shall include, but not limited to the following;
    - Electrical Orientation
    - Engine (Including Electronic Control System, Familiarization, Overhaul, Tune-up, and Trouble Shooting)
    - Transmission (Including Electronic Control System, Trouble Shooting, Overhaul, and Familiarization)
    - Air Conditioning System
    - Doors
    - Chassis/Brakes including ABS and ATC, Steering, and Suspension
    - Body
    - Parts, Warranty, Application and Service
    - Wheelchair Ramp System
    - Fire Suppression
    - Programmable Logic Control System
    - Axles
    - Air System
    - Destination System
    - Security Camera System
    - Closed Circuit Monitor System

- Brakes (Foundation)
- Hydraulic System

3. Class and class sizes shall be based on training up to approximately 50 mechanics as well as two instructors.
4. Contractor shall provide a listing of their recommended training of their bus in conjunction with a more complete listing of what's available.
5. The successful Contractor shall also provide visual and other teaching aids for use by the Purchaser 's own training staff.

TS 5.9 Manuals

TS 5.9.1 Maintenance Manuals

The Contractor shall provide:

- One current maintenance manual to include preventative maintenance procedures
- One diagnostic procedures or troubleshooting guides
- One major component service manuals
- One current parts manual
- One standard operator's manual per bus

The Contractor also shall exert its best efforts to keep maintenance manuals, operator's manuals and parts books up to date for a period of fifteen (15) years. The supplied manuals shall incorporate all equipment ordered on the buses covered by this procurement. In instances where copyright restrictions or other considerations prevent the Contractor from incorporating major components information into the bus parts and service manuals, separate manual sets as published by the subcomponent Supplier will be provided.

1. Draft Manuals

Upon the Purchaser's request, the Contractor shall provide the Purchaser with one (1) hardcopy and one (1) electronic copy of representative "as built" maintenance manuals per type/model purchased at least 45 calendar days prior to the scheduled delivery of the first bus for approval. Within 90 days, the Purchaser shall review the manuals for completeness, clarity of the illustrations and to verify that the manuals have a complete index. Based upon the Purchaser's comments, the Contractor shall make all necessary revisions to the manuals. All final "as built" manuals shall be provided no later than receipt of the last bus. Manuals shall be constructed so that any pages may be easily removed and/or inserted. Each manual shall have plastic laminated pages.

As part of the draft manuals, the Contractor shall provide large as built wiring diagrams of all electrical equipment complete with wiring codes, wiring numbers, and terminal codes. The diagrams shall include, but not be limited to, electrical controls for the exterior and interior lights, door controls, heating and air conditioning, transmission control and charging systems. These diagrams shall also be plastic laminated.

Note: Electrical diagrams are considered a component part of the maintenance manual.

a. All diagrams and schematics, as built, shall note where electrical harnesses are located.
b. As built drawings (two (2) sets, plastic coated):
    - Electrical System/Wiring Schematics
    - Air System
    - Fuel System
    - Heating System

2. Final Manuals

Following final approval of draft manual, the Contractor shall provide two (2) complete manuals per bus type/model purchased. This shall include manuals for but not limited to, engines, transmissions, HVAC systems, ABS system, fire suppression, destination sign system, farebox, camera system, and multiplex system to include any components that are not included in the maintenance/parts manuals. Any additional manuals shall be priced separately and the Purchaser shall select the type and amount of training based on its needs.

Every maintenance manual shall contain all data required for routine and periodic maintenance of the buses as manufactured, including but not limited to the following:

- Trouble shooting guide
- Lubrication and adjustment procedures
- Replacement and repair procedures
- Wiring diagrams as built including special provisions
- Air brake system diagrams
- Air conditioning systems diagrams
- Diagnostics repair and rebuild illustrated procedures for all re-buildable components

The manuals shall be in English and written so that a mechanic with a basic reading ability can clearly understand the manuals

The contractor shall provide updates to the maintenance manuals to include all changes made during production and post-delivery retrofits authorized or requested by the contractor and to correct all errors and omissions found by the Purchaser. Changes required to the manuals due to warranty and/or post-delivery retrofits shall be completed in 90 days from the date of modification approval. Manuals shall be updated as necessary with service letters during the life of the bus. Maintenance/Parts manuals shall be available from the contractor for a minimum of ten years following the acceptance of the last bus. Revised parts price lists shall be provided as pricing changes.

TS 5.9.2 Parts Manuals

The Contractor shall provide the Purchaser with one representative electronic copy of “as built” parts manuals per bus type/model purchased for review and approval at least 45 calendar days prior to the scheduled delivery of the first bus. The Purchaser shall review the manuals for completeness, clarity of the illustrations and to verify that the manual had a complete alpha and numeric listing. Based on the Purchaser’s comments, the Contractor shall make all necessary revisions to the book. All required “as built” parts manuals shall be provided no later than receipt of the last bus. Note manuals shall be available in CD-ROMs.

Sixty (60) days before the delivery of the first bus, the Contractor shall provide a recommended initial list of parts for the Purchaser’s purchase (indicating part numbers, quantities, and prices) to support six months of operation.

The Contractor shall provide two (2) final complete parts books in electronic format and two (2) printed copies as approved by the Purchaser prior to the scheduled delivery of the last bus. These manuals shall have a plastic reinforcement or lamination on the portion of pages that are bound.

Each parts book shall contain sufficient data to allow storeroom and purchasing personnel to provide and order all parts necessary to maintain all purchased buses. Books shall be in English and reflect the exact bus as built. The parts book shall be complete and include all major assemblies including but not limited to, engine, transmission, air conditioning, turn table, ABS System, fire suppression and exhaust system. Updated CD-ROMs and replacement pages with updates shall be sent to maintain current references and shall be available for up to 12 years. Books shall be indexed by part number to page number.

TS 5.9.3 Driver’s Manual

The Contractor shall provide “as built” driver’s manuals for each order, a minimum of ten (10) calendar days before the delivery of the first bus.

The manual shall discuss the location of key components on the bus such as the fuel system, the safety system, and other features. The manual shall be a professionally produced manual on high quality paper. The manual shall be bound together professionally to prevent page loss. The manual shall be in English and written on a fifth grade reading level.

TS 5.10 Technical/Service Representatives

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

TS 5.11 Engineering Support

The Contractor shall provide engineering support prior to bus manufacturing, during bus manufacturing, during acceptance testing and after acceptance testing. Contractor shall provide a description of how engineering support shall be provide during each period, whether the engineering is included in the base bus price and how the Purchaser can access the engineering support.

TS 5.12 Operating Environment

The bus shall achieve normal operation in ambient temperature ranges of -5 ºF to 100 ºF, at relative humidity between 5 percent and 100 percent, and at altitudes up to 4,000 ft. above sea level. Degradation of performance due to atmospheric conditions shall be minimized at temperatures below -5 °F, above 100 °F or at altitudes above 4000 ft. Altitude requirements above 4000 ft. will need separate discussions with the engine manufacturer to ensure that performance requirements are not compromised. Speed, gradability and acceleration performance requirements shall be met at, or corrected to, 77 °F, 29.31 in. Hg, dry air per SAE J1995.

TS 5.13 Noise

TS 5.13.1 Interior Noise

The combination of inner and outer panels and any material used between them shall provide sufficient sound insulation so that a sound source with a level of 80 dBA measured at the outside skin of the bus shall have a sound level of 65 dBA or 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.

The bus-generated noise level experienced by a passenger at any seat location in the bus shall not exceed 80 dBA. The driver area shall not experience a noise level of more than 75 dBA. Measurements of interior noise levels shall be taken in accordance with SAE J2805 and the manufacturer shall conduct noise-level tests in accordance with SAE Recommended Procedure J366b meeting the ANSI Specification S1.4. An exception shall be made for the turntable area, which shall be considered a separate environment.

Electrical and electronic subsystems and components shall not emit electromagnetic radiation that interferes with onboard radio communications or violate Federal Communication Commission regulations.

TS 5.13.2 Exterior Noise

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

TS 5.14 Fire Safety

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.

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 and FTA Docket 90.

TS 5.15 Fire Suppression

TS 5.15.1 Fire Extinguisher

Manufacturer shall furnish, and install, a 5-lb., dry chemical extinguisher Ansul No. A5 extinguisher with "FORAY" dry chemical and 20-inch hose assembly or equivalent. It shall have U.S. DOT certification tag attached to extinguisher at time of acceptance. If fire extinguisher is mounted in a storage compartment, compartment shall be clearly labeled “fire extinguisher inside”.

The fire extinguisher shall be located in easily accessible location. Mounting of the extinguisher shall be rigid and such as to prevent vibration, noise and accidental discharge. Fire extinguisher shall be mounted to allow easy and timely access by the driver. Location shall be approved by the Purchaser.

If the vehicle is equipped with a "water mist" fire suppression system or equivalent, the system manufacturer shall be approved and listed for water mist fire suppression by recognized National Testing Laboratories such as Underwriter’s Laboratories or Factory Mutual. The system must have proven performance on a transit vehicles for a minimum of 10 years.

TS 5.15.2 Fire Protection, Detection, and Suppression

1. Fire Protection
   The passenger and engine compartments shall be separated by a bulkhead(s) which shall be an incorporation of fireproof materials in its construction and be a firewall. This firewall shall preclude or retard propagation of an engine compartment fire into the passenger compartment. Only necessary openings shall be allowed in the firewall, and these shall be fireproofed.

   Any passageways for the climate control system air shall be separated from the engine compartment by fireproof material. Piping through the bulkhead shall have copper, brass, or fireproof fittings sealed at the firewall with copper or steel piping on the forward side.

   Wiring may pass through the bulkhead only if connectors or other means are provided to prevent or retard fire propagation through the firewall. The conduit and/or bulkhead connectors shall be sealed with fireproof material at the firewall.

   Engine access panels in the firewall shall be fabricated of fireproof material and secured with fireproof fasteners. These panels, their fasteners, and the firewall shall be constructed and reinforced to minimize warping of the panels during a fire that will compromise the integrity of the firewall.

2. Fire Detection
   An adequate number of fire detection sensors, as determined by manufacturer's engineering design for total system coverage, shall be located in the engine compartment to monitor the major heat sources and fuel storage areas. The system shall detect fires in critical areas, shall activate fast- acting extinguisher's which releases fire suppression agent to those critical areas, and shall activate the fire alarm bell and fire warning light in the driver's compartment.

   a. The system shall also monitor heat levels within the field of view (range) of the sensors and shall activate an overheat alarm to warn the driver of an overheat situation.

b. The system shall return to normal setting and deactivate the overheat alarms when the temperature returns to normal.

c. The system shall have supervision monitoring to indicate operational status of the sensors, harness, and extinguisher's.

d. Each extinguisher shall have a pressure gauge which is able to be seen without dismantling of panels or covers.

3. Fire Suppression
The engine compartment, battery compartment and fuel compartment areas shall be equipped with an automatic fire extinguishment system. The system shall be an Amerex model V-25 ABC Agent Modular Bus Fire Suppression System or equivalent. The purpose of the suppression system is to ensure bus and passenger safety and survivability in the event of a fire.

a. Sensors shall activate the extinguisher's immediately upon fire detection.

b. Automatic engine shutdown shall take place ten (10) seconds after fire detection.

c. The automatic extinguishment system shall use high-speed valves, attached to DOT certified bottles.

d. Installation of fire suppression systems into the buses shall be completed prior to delivery of the buses to the Purchaser. All work shall be performed by certified technicians in fire suppression installation, as determined by the manufacturer.

e. The automatic detection and actuation system shall provide 24-hour fire detection of the engine compartment.

f. The system shall be designed to operate at 12 or 24 VDC and shall not exceed a current draw of more than 0.1 amps.

g. The entire fire suppression system shall be Factory Mutual Research Corporation approved, and the system manufacturer shall provide a $5 million insurance policy (per bus, per incident) to the Purchaser in the event of system failure and fire damage occurs.

TS 5.16 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.

Dimensions

TS 6. Physical Size

With exceptions such as exterior mirrors, marker and signal lights, bumpers, fender skirts, washers, wipers, ad frames, cameras, object detection systems, bicycle racks, feelers and rubrails, the bus shall have the following overall dimensions as shown in Table 8 at static conditions and design height.

Table 8: General Dimensions

Element	Measure	Min/Max
Front Axle Curb Weight	15,500 Pounds	Min

Tag Axle Curb Weight	14,000 Pounds	Min
Center/Drive Axle Curb Weight	21,000 Pounds	Min
Seating Capacity	80 Passengers	Min
Aisle Width	20 Inches	Min
Length of Body W/O bumpers	43 Feet	Max
Doorway Height - Entrance	76 Inches	Min
Doorway Height - Exit (rear)	76 Inches	Min
Width at Body	102 Inches	Max
Height, including all antenna or other ancillary devices	163 Inches	Max
Wheelbase (front to tag)	225 Inches	Max
Wheelbase (Drive to Tag)	59 Inches	Max
Ground Clearance excluding Axles	12 Inches	Min
Inside Turning Radius	35 Feet	Max
Outside Turning Radius	42 Feet	Max

TS 6.1 Step Height

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

TS 6.2 Underbody Clearance

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

TS 6.3 Ramp Clearances

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

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

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

Table 9: Bus Angles

Angle	Double Deck Bus
Approach	7.4 deg. (min.)
Front breakover	8 deg. (min.)
Departure	8 deg. (min.)

TS 6.4 Interior Headroom

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

Design of the upper level of the bus shall be reviewed and approved by the Purchaser as part of the Purchase Order. Contractors must submit schematics showing height of each floor of the bus.

Bus Performance

TS 7. 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 bus performance data.

TS 7.1 Speed

The bus shall be capable of achieving the following speeds in the corresponding time intervals, starting from stationary condition, with 150% load:

Table 10: Speeds	
Time (seconds)	**Speed (mph)**
5	15
10	25
15	27
20	30

The rate of change shall be minimized throughout the acceleration/deceleration range and shall not exceed 0.3g/sec. This requirement shall be achieved regardless of driver action. The top speed capability of bus shall be 65 miles per hour on a 4% grade road at GVWR with all accessories operating.

TS 7.2 Gradability

All buses shall be capable of operation up and down grades of 17% or less, for up to one mile, with full test loads, making intermediate stops without overload or damage, at a sustained speed of 15 miles per hour, on dry pavement, with all accessories operating.

TS 7.3 Operating Range

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

TS 8. Power plant Compartment

The power plant compartment shall be completely sealed to prevent smoke or fumes from entering the bus interior. The power plant bulkhead shall be insulated to minimize heat transference to the interior and shall have the ability to maintain a maximum 20° degree Fahrenheit differential between the power plant bulkhead and the interior of the bus, additionally noise transfer to the bus interior shall not be above 83 +2 db.

The compartment shall be lighted by a minimum of five (5) LED's producing a minimum of twenty one (21) foot candle power. An additional twenty-one (21) foot candle power LED shall illuminate the rear electrical junction box. LED's shall be enclosed by a clear high temperature resistant lens.

Compartment doors shall be sturdily constructed, well-fitted, and reinforced, where necessary, of material and finish harmonizing with other exterior features of the bus. Doors hinged at top shall be provided with heavy-duty, gas filled lifts equipped with positive means of locking the doors in the open position. Small, spring- loaded access doors shall be provided to check and add engine oil and radiator coolant without necessity of opening a large compartment door.

An oil pressure gauge, coolant temperature gauge, engine "RUN" switch, starter cutout switch, starter switch, lamp switch and throttle control shall be provided in the engine compartment. Coolant temperature gauge shall be moisture resistant and shock-proof. Throttle control shall be automatically switched to the rear compartment position when the engine compartment switch is placed in the "rear start" position. All engine compartment switches and wiring must be environmentally sealed to keep dust and moisture out.

Engine, hydraulic (except power steering), fuel, and oil lines, shall be Aeroquip FC 300 Teflon with wire braid and re-usable fittings or equivalent.

TS 9. Engine

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

The engine shall have a minimum rating horsepower of 380 and minimum torque rating of 1400 ft.-lbs. shall be

installed.

The engine shall be equal to or greater than 8.9-liter, four-cycle unit, complete with starter, alternator, and air compressor. It shall have a capacity of at least 380 BHP and shall be configured like a Cummins ISL or equivalent.

Oil filters shall meet engine manufacturer's specification. Filters shall be readily accessible and serviceable. Engine shall be equipped with engine oil dipstick.

Brass hexagon head plugs with standard piped threads for vacuum and pressure gauge connections shall be installed in, or as near as possible to the air intake and exhaust manifolds.

The engine speed shall be set to limit maximum bus speed to 60 mph. The engine shall be equipped with tachometer adapter or marking for use of an electronic tachometer. Road speed shall be read through engine electronic system.

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

The engine starting system shall be protected by an interlock that prevents its engagement when the engine is running. Special equipment or procedures may be employed to start the bus when exposed to temperatures 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 Purchaser. The integration of all systems on the bus relative to engine idle speed shall be the responsibility of the bus manufacturer to meet the requirements of the transit property.

Engine shall be equipped with a positive engine shut down device. The engine control system shall protect the engine against progressive damage. The system shall monitor conditions critical for safe operation and automatically derate power and/or speed and initiate engine shutdown as needed.

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

An engine fast idle device shall be electronically operated and controlled by a switch mounted on the dash accessible to the operator only when the shift lever is in the neutral position and shall not be overruled by the accelerator interlock. Fast idle device shall have a setting of 950 RPM.

TS 9.1 Alternator

A belt driven with constant self-tensioner alternator is required for the system on the bus. The alternator shall be a 24-volt, 300 ampere (maximum rated output alternator which produces 208 amperes at 500 R.P.M.) at a minimum. Charging system shall have overcharge protection through the bus electronic system rather than a fuse.

TS 10. Cooling Systems

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 be designed with a fail-safe mode of “fan on.” The cooling system shall meet the requirements stated in the operating environment.

Temperature of the main engine and operating fluids on the bus shall be controlled by a cooling system. The cooling system shall be sized to maintain fluids at safe, continuous operating temperatures during the most severe operation with the bus loaded to GVWR and with ambient temperatures from minus twenty degrees up to one hundred ten degrees Fahrenheit. 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. Valves shall permit complete shutoff of both lines for the heating and defroster units. All low points in the cooling system shall be equipped with drain cocks or plugs. Air vent valves shall be fitted at high points in the cooling system unless it can be demonstrated that the system is self-purging.

Adequate access shall be provided for inspection and filling of the cooling system from outside bus without removing any other equipment. A sight glass to determine satisfactory engine coolant level shall be provided and shall be accessible by opening one of the engine compartment access doors.

The water pump shall have a sufficient discharge capacity to maintain proper engine temperature. The water hose connection shall have a substantial bead and surface shall be cleaned and prepared to provide bead leak-proof clamping of hose.

If coolant temperature cannot be maintained to an adequate temperature for optimum engine performance as well as heating system operation, an auxiliary coolant heater shall be provided. This heater shall include electronic control and shall monitor itself as to not create damage to the bus, engine, or coolant. The unit shall be configured like a Wabasto or equivalent.

TS 10.1 Engine Cooling

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 in. above the ground. Both shall be accessible through the same access door.

The cooling fan shall be temperature controlled, allowing the engine to reach operating temperature quickly.

Radiator shall be of durable corrosion-resistant construction with bolted-on removable tanks, or equivalent. The radiator shall be of sufficient size to properly cool the engine, transmission, brake retarder and related components used in heavy service.

Piping leading to and from the radiator shall be stainless steel or brass tubing and use of rubber hoses shall not be accepted. Necessary hoses in the coolant system including heating system shall be premium, silicone rubber type that is impervious to all bus fluids. All hoses shall be secured with premium, stainless steel, worm, inside sleeve, wide band type clamps with a hex drive head approved for silicone grade hose.

Radiator fan shall be thermostatically controlled (electric drive is required) so it will only operate above the minimum engine operating temperature and shall maintain engine temperature but not exceeding the engine manufacturer's recommendations. Fan speed shall be regulated to minimize fan noise. Proper airflow over the radiator shall also be provided. The radiator shall be protected from the road dust and dirt.

TS 10.1.1 Coolant

A correctly sized, stainless steel or corrosion-resistant coolant surge tank shall be provided to store and restore expelled coolant. A sight glass shall be provided on the surge tank to facilitate checking proper coolant level.

The coolant in the buses shall be protected from freezing with ethylene glycol anti-freeze installed to protect the

coolant to minus twenty degrees Fahrenheit. Anti-freeze shall meet engine manufacturer specifications. Coolant shall be treated with Nalcool 2000 or equivalent at level recommended by manufacturer.

Nalcool need-release water filter or equivalent shall be provided on each engine.

TS 10.1.2 Drive Design

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

TS 10.1.3 Mounting

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

TS 10.2 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.

TS 10.3 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 the 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. Unless otherwise noted, the transmission cooler is to be the first component to see cold water from the radiator outlet. In addition, all return water piping, aside from the thermostat bypass line, is to be plumbed in after the transmission cooler.

TS 11. Transmission

Transmission shall be properly mated with the engine furnished. Controls and internal parts shall be adequately designed and adjusted to provide smooth power shift accelerations without damage, and to prevent output torque when the selector level is in neutral position.

The transmission shall be multiple speed, 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.

Transmission shall be electronically controlled, equipped with a retarder and shall be fully automatic power shift, hydraulic drive, heavy-duty type of adequate strength and capacity. It shall have no less than five speeds forward, one reverse and equipped with a lock-up clutch. The transmission shall be equipped with starter interlock to prevent starting of the engine unless transmission is in neutral. Retarder shall be controlled by a minimum 1/3-1/3-1/3, 1/3 application of retarder on engine throttle, 1/3 application on first stage of brake application, and final 1/3 application of retarder on 2nd stage application of brake. Retarder shall have an indicator light in the engine compartment control box, indicating either retarder is "on". A retarder "on/off" switch shall be installed on the driver's side control console. Indicator lights shall be on the dash indicating that the retarder is "on" or "off". Transmission shall be equipped with a running calibration dipstick to allow the fluid level to be checked while the engine is running. The retarder shall not control the maximum road speed. The retarder shall not engage when maximum speed is reached.

Transmission shall be controlled by a key shift pad that shall indicate the selected gear and also provide, electronic readings, of fluid level and failure codes. The shift switch shall meet the requirements of FMVSS102. The transmission control shall be designed to protect the transmission from any possible damage as a result of improper use of controls. The transmission shall be equipped or wired so that it cannot be shifted from forward to reverse or vice versa while the bus is in motion.

Transmission shall be equipped with manufacturer's recommended fluid filter system. Adequate transmission fluid cooling shall be provided for heavy load operation. An auxiliary cooling system shall be provided.

A conveniently located filler and dipstick tube for checking and filling the transmission shall be provided. The transmission oil filter and dipstick shall be located so that it shall not be a burn hazard and be accessible with the rear engine compartment door open.

Transmission shall be an Allison B500R, six speeds, or equivalent. The electronically controlled transmission shall have on-board 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 on-board diagnostic system shall trigger a visual alarm to the driver when the electronic control unit detects a malfunction.

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

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

The transmission shall not incorporate an automatic neutral shift function.

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

TS 12. Retarder

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 activate the brake lights

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

Brake lights shall illuminate when the retarder is activated.

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

The retarder disable switch shall be accessible to the seated driver. Disabling retarder shall be recorded for the Purchaser's data collection.

TS 14. Mounting

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

The power plant shall be arranged so that accessibility for all routine maintenance is assured. No special tools,

other than dollies and hoists shall be required to remove power plant. Quick connectors shall be utilized on all lines, wherever feasible and possible, for ease when removing power plant. The power plant shall be removable as one complete unit. The muffler, exhaust system, air cleaner, air compressor, starter, alternator, radiator, all accessories and any other component requiring service or replacement shall be easily removable and independent of the engine and transmission removal. An engine oil pressure gauge and coolant temperature gauge shall be provided in the engine compartment. All gauges shall be equipped with maximum indicator pointers. These gauges shall be easily read during service and mounted in an area where they shall not be damaged during minor or major repairs.

All radiator filler caps shall be hinged to the filler neck and closed with spring pressure or positive locks. The engine oil fill shall be located inside the engine compartment. All fluid fill locations shall be permanently labeled to help ensure correct fluid is added; and all fills shall be easily accessible with standard funnels and pour spouts. All lubricant sumps shall be fitted with magnetic type, hex head, and drain plugs of a standard size.

Engine and transmission shall be equipped with sufficient heavy-duty fuel and oil filters for efficient operation and protection between scheduled filter changes. The filters shall be of the spin-on, disposable type. All filters shall be easily accessible and the filter bases shall be plumbed to assure correct reinstallation. Fuel lines from tank to the filter shall have a shut off valve. The fuel filter shall be a DAVCO Model 382 Fuel Pro or equivalent filter with water separation, fuel processing filter assembly. Fuel and oil lines within the engine compartment shall be rigidly supported and shall be composed of steel tubing where practical except in locations where flexible lines are specifically required. Flexible fluid lines shall be kept to a minimum and shall be as short as practical. They shall be routed or shielded so that failure of a line shall not allow fuel or oil to spray or drain on any component operable above the auto-ignition temperature of the fluid. Flexible lines shall be Teflon or equivalent hose with braided stainless steel jackets except in applications where premium hoses are required, and shall have standard SAE or JIC brass or steel, reusable, swivel end fittings. Hoses shall be individually supported and shall not touch one another or any part of the bus.

Engine driven accessories shall be unit mounted for quick removal and repair. Critical points in the hydraulic system shall be fitted with service ports so that portable diagnostic equipment may be connected to monitor system operations. All lines shall be compatible with the hydraulic fluid and maximum pressures of the system. Flexible lines shall be minimized in quantity and length. Non-interchangeable lines, both those with the same fittings as those on other piping systems of the bus, shall be tagged or marked for use on the hydraulic system only. Hydraulic lines shall be individually and rigidly supported to prevent chafing damage, fatigue failures and tension strain on the lines and fittings. The hydraulic system shall be configured and/or shielded so that failure of any flexible line shall not allow hydraulic fluid to spray or drain onto any component operable above the auto ignition temperature of the fluid. Hydraulic lines shall be marked, at a minimum at each end, and preferably every 3 feet as to job function "pressure or return."

Morris control or equivalent hand (auxiliary) throttle shall be mounted in the engine compartment for diagnostic purposes, and also shall be equipped with a plug for the engine/transmission electronics for diagnostics.

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

TS 15. Hydraulic Systems

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.

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

1. A hydraulic pump assembly shall be utilized to provide a minimum of 4 gallons per minute at 1750 psi.

2. Noise levels shall not exceed 75 dB, near the pump or ramp mechanism, during any phase of operation, deployment or stowing.

3. All hydraulic components and controls shall be industrially rated, and the rating shall exceed maximum system pressure.

4. All electrically operated hydraulic components shall operate on nominal 12 or 24 + 10% VDC electrical system.

TS 15.1 Fluid Lines

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

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

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

TS 15.2 Fittings and Clamps

All clamps shall maintain a constant tension at all times, expanding and contracting with the line in response to temperature changes and aging of the line material. The lines shall be designed for use in the environment where they are installed (for example, high-temperature resistant in the engine compartment, resistant to road salts near the road surface, and so on).

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

TS 15.3 Charge Air Piping

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

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

TS 16. Radiator

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

TS 17. 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.

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

TS 18. Fuel

TS 18.1 Fuel System General

The fuel system shall consist of the fuel tank, filler provisions, fuel pump, filters, and lines to deliver the fuel to the engine and all auxiliary equipment so the fuel shall function under all loading and operating conditions described in this Specification. When delivered, the engine shall be tuned, utilizing the latest style fuel injectors and No. 2 ultra-low sulfur diesel fuel, to give optimum performance, (unless otherwise instructed). Engine shall be certified and warranted to operate with bio-diesel fuel. The mix that shall be approved shall be at a minimum of B-5 with a maximum of B-50.

TS 18.2 Fuel Lines

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

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

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

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

TS 18.3 Fuel Tank Design and Construction

Fuel tank design and construction shall meet the following criteria:

a. The fuel tank(s) shall be securely mounted to the bus to prevent movement during bus maneuvers, but shall be easily removed for cleaning or replacement. The tank shall have an inspection plate or removable filler neck to enhance cleaning and inspection. The tank shall be baffled internally to prevent fuel sloshing regardless of fuel level.

b. The fuel system shall comply with the specific requirements of FMVSS 301.

c. The fuel tank(s) shall have a minimum usable capacity of at least 130 US gallons. The fuel tank(s) shall be equipped with an external, hex head, drain plug.

d. The fuel tank(s) shall be made of sufficiently heavy gauge material internally to prevent baffled surging. The tank shall be internally braced and externally supported in such a manner to eliminate the possibility of developing vibration fatigue cracks. All openings shall have adequate stiffeners so that a flat surface is presented to the attaching plates.

e. The tank shall either be located between chassis frame members or protected by a steel barrier to provide protection in the event of a side body impact. Fuel tank filler access shall be located on right side of bus.

f. Fuel gauge shall be mounted at the filler access door and the sending unit shall have an access panel to gain access without removing tank.

g. 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.

TS 18.3.1 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.

TS 18.3.2 Fuel Filler

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.

a. The tank filler pipe shall be so designed as to permit a minimum filling rate of 40 gallons per minute filling to the "full" point with no back splash when fuel fill nozzle shuts off.

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

TS 18.3.3 Fuel Filter

A fuel processor filter system shall be installed on all buses. A Davco Fuel Pro #382 See-Check System or equivalent system with necessary check valve for preventing drain back shall be provided.

TS 19. Emissions and Exhaust

TS 19.1 Exhaust Emissions

The engine and related systems shall meet all applicable emission and engine design guidelines and standards in effect at the time of delivery of buses to the Purchaser. The Contractor shall provide a copy of the Engine Emissions Certificate.

TS 19.2 Exhaust System

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

1. The exhaust muffler, or Diesel Particulate Filter (DPF), shall be heavy-plate type designed with proper acoustical qualities, and tailored to the engine requirements and installation. In cases where a DPF is required, the DPF compartment shall be of sufficient insulation and air flow to prevent overheat of the

compartment even in a failure mode.

2. The tail pipe plenum shall be completely sealed and insulated to prevent fumes or smoke from entering the bus interior and to prevent excessive heat from causing a burn or fire hazard. The exhaust shall be emitted from a location on the upper left-hand corner of the bus, or equivalent. If exhausting out the top of the bus, the exhaust stack shall be positioned at a minimum of 45-degree angle, not to allow rainwater to enter.

3. The exhaust and tail pipes shall be so designed to provide sufficient clearance from the running gear under all operating conditions. Exhaust system parts shall not foul the axle or any part of the bus when the bus body is raised on the jacking pads. The tailpipe shall extend slightly beyond the edge of the body to prevent exhaust from being trapped under body and prevent discoloration of body panels.

4. Electrical wiring shall not be routed close to any exhaust component to prevent wiring damage with the exception of the exhaust monitoring system in which case it shall be protected from heat damage.

5. When the bus has idled for 3 minutes and then accelerates to 80% of rated speed under load, the opacity of the exhaust shall not exceed #2 on the Ringlemann Scale thereafter.

6. No public hazard or discomfort shall result from the exhaust location.

TS 19.3 Exhaust After-treatment

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

If required by the engine manufacturer to meet NOx level requirements specified by 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 filler shall accommodate a standard nozzle. The nozzle shall automatically shut off when the tank is essentially full. The DEF filler cap shall be a screw-on cap and located curbside.

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.

TS 19.4 Particulate After-treatment

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

Structure

TS 20. General Design

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

The body shall be reinforced at joints where stress concentration may occur. The bus shall safely withstand road shocks and other conditions found in city service.

The exterior and body features, including grilles and louvers shall be shaped to allow complete and easy cleaning by automatic bus washer without snagging washer brushes. Water and dirt shall not be retained in or on any portion or body feature to freeze on or bleed out onto the bus after leaving the washer.

Bidders shall submit a description of the body structure and construction methods including all materials and fastenings used.

TS 21. Altoona Testing

If available, the Altoona Test Report shall be provided to AppalCART with the Bid submittal. If not available, prior to acceptance of first bus, the bus 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 that any and all such failures will not occur shall be submitted to AppalCART.

Accompanying the Certificate of Compliance with Bus Testing Requirement, the Contractor shall describe any changes that have been made to the bus since the "new model" was tested along with an explanation of why it believes these changes are not major and therefore do not require testing at facility. All fees associated with the testing shall be the responsibility of the Contractor.

TS 22. Distortion

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

TS 23. Resonance, Vibration and Crashworthiness

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.

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

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

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

Bus shall be able to withstand a side leaning condition of a minimum of 27 degrees without the possibility of rollover.

By submitting a bid, Contractor thereby certifies that their bus meets the crashworthiness and other performance specifications as defined by the "White Book/Federal Motor Bus Safety Standards."

TS 24. Corrosion

The bus flooring, sides, roof, understructure and axle suspension components shall be designed to resist corrosion or deterioration from atmospheric conditions and de-icing 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 use of proper cleaning and neutralizing agents.

All materials that are not inherently corrosion resistant shall be protected with corrosion-resistant coatings. All joints and connections of dissimilar metals shall be corrosion resistant and shall be protected from galvanic or electrolytic 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.

1. The main welded structures, i.e. understructure, roof, sides and ends shall be washed and treated with a phosphorous solution. The understructure shall then be undercoated as follows:
    - One coat, 25 micron of Sikkens wash primer SI5/55 black or equivalent
    - One coat, 20-25 micron of Sikkens SI5/84 red or equivalent
    - One coat, 50-60 micron of Sikkens Resincoat DHB white or equivalent
2. Underbody components, i.e. suspension, beams, radius rods and air tanks shall also be undercoated with the Sikkens. Other items (i.e. heater box, fuel tank and air tanks) shall be sprayed with Tectyl CWG 127 prior to installation.
3. After the underbody is assembled and the sides, roof, ends etc. welded to it, the entire upper structure shall be sprayed with Sikkens using the same processes as for the understructure.
4. After completion of assembly, the underbody shall be sprayed with Tectyl 127, CGS* (including inside all open-ended box sections). CGS is white-colored undercoating which is a solvent cut wax-based jelly compound, corrosion preventative and resistant to cracking and peeling. Contractor shall provide an undercoating system program description to the Purchaser.
5. 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.
6. All tubing used in the side frame shall be vented to atmosphere to promote drainage and drying of condensation.
7. The underbody shall be sealed using a caulking compound containing a chromate inhibiter.
8. Also as a corrosion preventative measure, all panel fasteners shall be stainless steel.
9. The outside of the bus shall be painted with polyurethane acrylic enamel paint, and then heat cured.
10. On the interior all fasteners used on the floor areas shall be stainless steel. Any trim used on the floor area shall also be stainless steel.
11. Aluminum panels shall be washed and treated with phosphoric acid and neutralized clean, etched and sealed. After drying, all surfaces shall be sprayed with zinc chromate primer.

TS 25. Towing

Towing system shall accommodate commercial towing methods. The method of towing shall require the specific approval of the Purchaser.

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

1. The towing device shall withstand turning of the bus at its specified turning radius with grades up to six percent (6%) and lifting both front wheels off the ground without causing permanent deformation to the towing device and/or bus.

2. Skid pads shall be installed under engine and transmission as well as all four corners of the bus. Skid plate mounting shall be a minimum of 2 inches below the lowest point of the engine and transmission to prevent damage to the power train or structure.
3. Contractor shall provide towing training to the Purchaser's towing contractor.
4. Shop air connectors shall be provided at the front and rear of the bus and shall be capable of supplying all pneumatic systems of the bus with externally sourced compressed air. The location of these shop air connectors shall facilitate towing operations.
5. 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 bus. The connector shall include a spring-loaded dust- and water-resistant cap.
6. Glad-hand type connectors shall be provided at the front of the bus to allow the towing bus to control and operate the bus braking system during a towing operation.
7. 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.
8. 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. Any tow bar or adapter exceeding 50 lbs. should have means to maneuver or allow for ease of use and application. Each towing device shall accommodate a crane hook with a 1 in. throat.

TS 26. Jacking

It shall be possible to safely jack up the bus, at curb weight, with a common 10-ton floor jack with or without special adapter, when a tire or dual set is completely flat and the bus is on a level, hard surface, without crawling under any portion of the bus. Jacking from a single point shall permit raising the bus sufficiently high to remove and reinstall a wheel and tire assembly in less than two (2) minutes from the time the bus is approached with the jack. Jacking pads located on the axle or suspension near the wheels shall permit easy and safe jacking with the flat tire or dual set on a 6 in. high run-up block not wider than a single tire. The bus shall withstand such jacking at any one or any combination of wheel locations without permanent deformation or damage.

The bus axles or jacking plates shall accommodate the lifting pads of a three-post hoist system. Jacking plates, if used as hoisting pads, shall be approximately five inches (5") square, with a turned-down flange not less than one inch (1") deep on each side 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.

Jacking pads shall be painted safety yellow. Decals shall be applied to identify location of jacking pads.

TS 27. 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.

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

TS 28. Floor

TS 28.1 Design

The floor shall be essentially a continuous plane, except at the wheel housings and platforms. Where the floor

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

The floor design may consist of two levels (bi-level construction). Aft of the rear door extending to the rear settee riser, the floor height may be raised to a height no more than 21 in. above the lower level, with equally spaced steps. An increase slope shall be allowed on the upper level, not to exceed 3.5 deg. off the horizontal.

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

TS 28.2 Strength

The floor deck may be integral with the basic structure or mounted on the structure securely to prevent chafing or horizontal movement and designed to last the life of the bus. Sheet metal screws shall not be used to retain the floor, and all floor fasteners shall be serviceable from one side only. Any adhesives, bolts or screws used to secure the floor to the structure shall last and remain effective throughout the life of the 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.

The floor deck shall be reinforced as needed to support passenger loads. At GVWR, the floor shall have an elastic deflection of no more than 0.375 in. (10 mm) from the normal plane. The floor shall withstand the application of 3 times gross load weight without permanent detrimental deformation. The floor, with coverings applied, shall withstand a static load of at least 150 lbs. applied through the flat end of a ½ in. diameter rod, with 1/32 in. radius, without permanent visible deformation.

TS 28.3 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.

The floor deck may not be integral with the basic structure but shall be mounted on the structure securely to prevent chafing or horizontal movement. Sheet metal screws shall not be used to retain the floor. All floor fasteners shall be secured and protected from corrosion for the service life of the bus. Floor fasteners shall be placed on each side of the splices and shall be secured and protected for the life of the bus. An anti-squeak material shall be placed between the floor and under frame members and around wheel housing. The walking area of the floor shall be as level as practicable in each section.

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 requirements of a Group I Western panel as defined in PS 1-95 (Voluntary Product Standard PS 1-95, “Construction and Industrial Plywood”) and be of a grade that is manufactured with a solid face and back. Plywood 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.

At a minimum, the floor shall be 3/4-inch, 7-ply marine grade plywood treated to resist decay and mold or equivalent. All plywood edges shall be treated or sealed with titanium dioxide sealant or equivalent before installation to prevent entrance of moisture. The plywood sections shall be as large as is practical, free of checks and knots, and all splices of the flooring shall be made directly on a structural member and/or satisfactory

extension thereof. All holes in the floor material (plywood or equivalent), for mounting bolts, seams, etc. shall be caulked and sealed before sanding.

Just prior to the application of the floor covering, the entire floor shall be thoroughly sanded or properly prepared and then completely cleaned of all foreign material. The floor covering shall be butt-joined and cemented to the flooring material to comply with the floor covering and adhesive manufacturer's recommendations. No gaps shall be allowed at any butt joints, and all butt joints shall be sealed/welded to prevent moisture from entering.

TS 29. Platforms

TS 29.1 Driver's Area

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

TS 29.2 Driver's Platform

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

TS 29.3 Rear Step Area to Rear Area

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

Any irregularities in the flooring or elevation of the floor should be identified clearly in the bid submitted.

TS 30. Wheel Housing and Staircase

TS 30.1 Wheel Housing

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

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

a. The wheel-housing shall be trimmed and sealed at its mating edges.

b. Rear wheel-housings shall be sturdy construction, corrosion resistant stainless steel, and a minimum of 14-gauge. Front wheel-housing interior shall be of fiberglass construction with exterior being stainless steel.

c. The finish of the front wheel housings shall complement interior finishes of the bus to minimize the visual impact of the wheel housing. If fiberglass wheel housings are provided, they shall be color- impregnated to match interior finishes.

d. The wheel-housing shall be finished on the bus interior to withstand scuffing and be scratch-resistant, to resist wear and abuse from passenger feet.

e. The lower portion extending to approximately 10 to 12 in. above the floor shall be equipped with scuff-resistant coating or stainless steel trim.

f. All wheel-housings shall be free of protrusions to allow for maximum clearance for cable chains and shall have a minimum of 4 inches clearance for the chains when OEM size tires are installed.

g. 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.

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

TS 30.2 Staircase

The LHS front wheel box housing will be integrated with a staircase assembly. A front straight staircase design shall be fitted in a forward floor position to enable two (2) wheelchair positions to be located adjacent and forward of exit door. Staircase shall be a forward ascending design providing enhanced access to upper deck by incorporating wide parallel steps of equal height and increased upper shoulder width. Staircase shall be manufactured in GRP with structural composite stiffening added where necessary to provide rigidity. Staircase shall incorporate a protective toughened clear barrier panel between stairs and lower deck. The LHS front wheel box housing will be integrated into staircase assembly and shall incorporate a large locker compartment with a locking Southco E3-105-035 with key E3-5-15 (2 keys supplied with every bus), or approved equal, and shall be designed with flush fitted access cover, suitable for a drivers locker or future electronic equipment etc. Locker compartment(s) shall include lighting for serviceability. A second rear staircase shall be fitted at the LHS, forward of the 2nd (drive) axle. Staircase shall incorporate a forward descending (as exiting from the upper saloon) compact spiral design with GRP construction. Stairway shall have fully sealed base beneath staircase to provide a thermal and acoustic barrier. The stairway shall have a sealed locker compartment for storage of 'Decpac' portable ramp, or approved equal and have a flush access door fitted with Southco trigger latches, or approved equal.

Risers shall be vertical and shall be 7.5 inches minimum to 10 inches maximum, and equal within variation of 0.5 inch. Stepwell design and construction shall be approved by the Purchaser.

A waist height pulpit panel will be formed around stairwell and designed to accept a hand pole stanchion and upper guardrails for passenger safety. The pulpit panel will be faced on gangway side and compact board on stairwell side. The pulpit panel will be adequately supported to avoid excessive flexing while using attached handrails.

Chassis

TS 31. Suspension

TS 31.1 General Requirements

The basic suspension system shall last the service life of the bus without major overhaul or replacement. Adjustment points shall be minimized and shall not be subject to a loss of adjustment in service. Routine adjustments shall be easily accomplished by limiting the removal or disconnecting the components.

The general suspension system shall incorporate, but not limited to the following:

- Air suspension on all axles
- A minimum and maximum ride height as designed by Contractor's Engineering
- Compliance with all applicable FMVSS laws and guidelines
- Serviceable bushings in all lateral and radius rods
- Serviceable stabilizer bar bushings, if applicable
- Air style leveling valves to maintain proper bus height
- Shocks on both sides of all axles for a quality ride and comfort

- Kneeling system for front kneel only; this shall only apply if the wheel chair ramp inclination meets with ADA guidelines from street level to bus floor level

TS 31.2 Alignment

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

TS 31.3 Springs and Shock Absorbers

TS 31.3.1 Suspension Travel

The suspension system shall permit a minimum wheel travel of 2.75 in. jounce-upward travel of a wheel when the bus hits a bump (higher than street surface), and 2.75 in. rebound-downward travel when the bus comes off a bump and the wheels fall relative to the body. Elastomeric bumpers shall be provided at the limit of jounce travel. Rebound travel may be limited by elastomeric bumpers or hydraulically within the shock absorbers. Suspensions shall incorporate appropriate devices for automatic height control so that regardless of load the bus height relative to the centerline of the wheels does not change more than ½ in. at any point from the height required. The safe operation of a bus cannot be impacted by ride height up to 1 in. from design normal ride height. All suspension mounting hardware shall be torqued to proper specifications and torque-striped so that any movement of hardware is easily detected.

TS 31.3.2 Damping

Vertical damping of the suspension system shall be accomplished by hydraulic shock absorbers mounted to the suspension arms or axles and attached to an appropriate location on the chassis. Damping shall be sufficient to control bus motion to three cycles or less after hitting road perturbations. The shock absorber bushing shall be made of elastomeric material that will last the life of the shock absorber. The damper shall incorporate a secondary hydraulic rebound stop.

TS 31.3.3 Lubrication

All elements of steering, suspension and drive systems requiring scheduled lubrication shall be provided with standard 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 6000 miles.

TS 31.3.4 Kneeling

A kneeling system shall lower the entrance(s) of the bus a minimum of 4 in. during loading or unloading operations regardless of load up to GVWR, measured at the longitudinal centerline of the entrance door(s) by the driver. The kneeling control shall provide the following functions:

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

Kneeling feature shall be provided for the entire curb side of the bus, or just front kneel when proven that ramp inclination meets with the American with Disabilities Act (ADA), when ramp deployed to street level. It shall be operated in conjunction with front doors, and shall be sequenced with the rear and center axle inter- lock to assure that it is fully raised before the interlock is released. The kneeler shall not be operable until the front door opening is at a minimum of 5 degrees, and the wheelchair lift/ramps shall not operate until the door opening is at a minimum of 85 degrees open. The kneeler shall have the minimum capability to return to normal ride height when loaded to 150% of seated load capacity within 5 seconds when in the kneeled position at normal air pressure of 120 psi. During the lowering and raising operation, the maximum vertical acceleration shall not exceed 0.2g, and the jerk shall not exceed 0.3g/second.

Control switch/switches shall be mounted on dash or to side of operator for ease of operation. An indicator visible to the driver shall be illuminated until the bus is raised to a height adequate for safe street travel. An audible warning alarm will sound simultaneously with the operation of the kneeler to alert passengers and by-standers. A warning light mounted near the curbside of the front door, a minimum 2.5 in. diameter amber lens, shall be provided that will blink when the kneel feature is activated.

TS 32. Wheels and Tires

TS 32.1 Wheels

All wheels shall be the heaviest duty available ventilated one-piece disc type wheels and shall be machined and balanced. The bus shall be equipped with single front, dual drive, and single tag. Wheels and rims shall be hub-piloted Alcoa Dura-Brite aluminum or equivalent (maximum 3.5 mil) and shall resist rim flange wear, stud-mounted wheel and drop center rim type. Wheel stud outer nuts shall be minimum grade 8 and tightened per wheel manufacturer's specifications and torque-striped. No lock rings shall be permitted. All wheels on the bus shall be of the same size and type, interchangeable between front and rear. Wheels shall be compatible with tires in size and load-carrying capacity. No tire-pressure monitoring system should be included. Standard non-locking lug nut should be used.

TS 32.2 Tires

Tires shall be suitable for the conditions of transit service and sustained operation at the maximum speed capability of the bus. Load on any tire at GVWR shall not exceed the tire supplier’s rating. Tires may be provided by the Contractor, unless otherwise requested at preproduction. Tires shall be interchangeable on the bus. Wheels and tires shall be balanced as an assembly per SAE J1986.

The manufacturer shall furnish eight (8) wheels for each three-axle bus.

TS 33. Steering

a. Power steering shall be supplied.

b. Life expectancy of all steering components shall exceed 1,000,000 miles. No element of the steering system should fail before suspension system components when one of the tires strikes a severe road hazard.

c. Steering gear, rotating shaft universal joints and splines shall be protected from wheel spray. Steering shaft, yoke and clamping shall be so designed as to assure positive clamping of the yoke on the shaft. All steering shaft crosses shall have needle bearings. All parts shall be easily removable for replacement or repair.

d. A power steering fluid reservoir that is easily accessible for checking and filling fluid level without removing any equipment shall be provided. Reservoir shall be permanently labeled and accessible with engine access door open.

e. Steering system shall steer bus to a 45 degree angle.

f. Steering system shall be associated with the tag axle to steer in relation, to stop tire scrub, if applicable.

g. Steering system shall utilize tie rods, steering arms, linkage, and steering boxes as approved by FMVSS standards.

h. Steering shall be a hydraulic assist system.

TS 33.1 Steering Axle

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

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

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

TS 33.2 Steering Wheel

TS 33.2.1 Turning Effort

Steering effort shall be measured with the bus at GVWR, stopped with the brakes released and the engine at normal idling speed on clean, dry, level, commercial asphalt pavement and the tires inflated to recommended pressure.

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

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

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

TS 33.2.2 Steering Wheel, General

Wheel geometry and steering arrangement shall be such as to ensure easy steering and to promote equal tire wear. Mounting shall be such as to make the wheel free from road shocks and vibration.

The steering wheel diameter shall be approximately 18 to 20 in.; the rim diameter shall be ⅞ to 1¼ in. and shaped for firm grip with comfort for long periods of time.

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

TS 33.2.3 Steering Column Tilt

The steering column shall have full tilt capability with an adjustment range of no less than 40 deg. from the vertical and easily adjustable by the driver and shall be accessible by a 5th percentile female and 95th percentile male.

TS 33.2.4 Steering Wheel Telescopic Adjustment

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

TS 34. Drive Axle

The bus shall be driven by a heavy-duty axle with a load rating sufficient for the bus loaded to GVWR. The drive axle shall have a design life to operate for not less than 500,000 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. Drive shaft shall be heavy-duty type with lubrication fittings provided for the universal and slip joints. All timing marks that are necessary for the correct alignment shall be installed.

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.

A secured access to the drive shaft from bus interior shall be provided through a panel in floor. The cover shall be attached in a way to not be loose or create a tripping hazard. Cover shall be constructed to a strength that can withstand impacts in the event of a tube or universal joint failure and shall have a seal that shall keep water, dust, dirt, mud, debris, and or smoke from entering the passenger compartment. Cover shall include, as integral part, the flooring material that has been chosen for this bus.

The drive axles shall:

a. Have a gear ratio that shall be suited for a freeway speed of 60 MPH and yet have enough torque to pull from a stop to meet the minimum criteria of performance.
b. Have a differential assembly that can be removed and serviced without removal of the entire axle.
c. Be equipped with disc style brakes, or equivalent.
d. Have spring brakes incorporated in the brake chamber for emergency as well as parking brake use.
e. Have removable axle tubes without the removal of the entire axle, or equivalent.
f. Have a magnetic drain plug located at the bottom of the differential chamber.
g. Have wheel ends be lubricated with differential fluid.
h. Have hub piloted wheels.

TS 35. Steerable Axles

The steerable axle is the drive axle without the drive gear with a load rating sufficient for the load to GVWR. All axle assemblies shall be of the heavy-duty type designed to carry loads imposed upon it by conditions encountered in normal service as designed by M.A.N. or equivalent. Gross axle weight rating shall meet the bus gross bus weight rating and seated plus standee load. Gross axle weight ratings shall meet all local, State and Federal Regulations. It shall also possess a full warranty for a minimum of five years.

TS 35.1 Front Axle

The front axle shall:

a. Be a beam-type axle, or equivalent, with a minimum permissible load carrying capacity of not less than 15,500 pounds and shall be specifically used for buses.
b. Have all rotating or friction points equipped with replaceable bushings or inserts and lubrication fittings.
c. Be equipped with oil bath bearings, or equivalent.
d. Be equipped with disc style brakes.
e. Be the steering axle and equipped with necessary components to include, but not limited to, steering stops, tie rods, steering box, etc.

TS 35.2 Tag Axles

A tag axle shall be located behind the drive axle. To minimize tire scrub, the tag axle shall be a solid beam and steerable type or equivalent with fixed steering. The tag axle shall have single tires the same size as the tires on the front and drive axles. Tag axle weight shall not exceed 14,000 lbs. With full passenger seating capacity,

load on any axle shall not exceed 22,400 lbs. Combined load capacity weight on the drive and tag axles shall not exceed 36,500 lbs. A tag axle unloading feature will allow full or partial unloading, or dumping of air from the tag axle air spring bellows. This feature enables weight to shift to the drive axle for more traction. Manual unloading valves are located inside the RH rear curbside service door.

TS 37. Brakes

The braking system shall be air operated, of the balanced type, and shall be designed to ensure safe braking performances under normal and emergency conditions. The braking system shall meet all current federal, state and local safety standards.

a. Service brakes shall be the disc-type sufficient for GVWR.

b. Brakes shall be self-adjusting. The friction material shall be of heavy-duty design to give maximum life. The friction material should made of non-asbestos material.

c. The complete brake lining wear indicator shall be clearly visible from the hoist or pit without removing backing plate.

d. Routing of brake lines shall be such as to minimize the likely incidence of corrosion from chemicals or susceptible to road hazards.

e. The brake chamber shall have a water drain hole at the bottom in the non-pressure side, if designed with chambers. Diaphragms shall be neoprene. Angle of mounting shall be such that the water shall not tend to run into the brake actuating rod aperture. Brake chamber mounting studs shall be double-nutted. A brass elbow shall be furnished on each brake chamber.

f. The bus shall be equipped with dual low air pressure warning lights and buzzers to indicate loss of air pressure within the front and rear brake systems.

g. Force to activate brake pedal control shall be essentially a linear function of the bus deceleration rate and shall not exceed 50 lbs. at 0.7 inches above heel point of the pedal to achieve maximum emergency braking.

TS 37.1 Actuation

The ECU for the ABS system shall be protected, yet in an accessible location to allow for ease of service. The ABS/EBC controller must support EBC1 (PGN 61441) “Brake Pedal Position” (SPN 521) to support and enhance fuel savings technologies.

The total braking effort shall be distributed among all wheels in such a ratio as to ensure equal friction material wear rate at all wheel locations and to ensure maximum tire mileage. Manufacturer shall demonstrate compliance on each bus by providing a copy of a thermodynamic brake balance test.

TS 37.2 Hubs and Drums/Discs

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

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

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

TS 37.3 Parking/Emergency Brake

Each bus shall be equipped with a parking brake valve and emergency brake overrule valve that are independent of the service brakes and are located to the left of the driver's seat.

TS 37.3.1 Parking Brake

The parking brake, when applied with the bus running, shall illuminate an indicator light on the instrument panel. The (SR) system shall have its own reservoir and be capable of releasing the parking brake a minimum of two times without engine running.

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.

TS 37.3.2 Emergency Brake

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

TS 38. Interlocks

TS 38.1 General

Contractor shall submit complete information about interlock system operation with the bid. This information must establish that the system used is the functional equivalent of that specified.

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 doors are open.

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

TS 38.2 Design

Either a non-adjustable brake interlock regulator or an adjustable pressure regulator to adjust air control to brake interlock may be provided. If an adjustable regulator is offered, the braking effort shall be adjustable with hand tools.

Interlock controls shall be above the door and readily accessible for servicing. Interlock controls may be located below the floor if they are readily accessible for servicing. Interlocks shall apply when doors begin to open.

Front and rear door motors shall be accessible through a top hinged access door, with two quarter-turn spring latches controlled by hand operated knurled knobs.

Interlock equipment shall be mounted together as one assembly with all swivel connections of copper or reinforced nylon (SAE J844 C) tubing. Interlock equipment and its location shall be approved. Door controls shall use proximity switches, no mechanical switches shall be used.

Closing force shall be limited to avoid injury to a passenger caught in a closing door. All doors shall be equipped with sensitive edges. A maximum force of 25 pounds shall be required for a passenger to get free after having either door close upon them, even if the sensitive edge or safety device on the door is inoperative.

In the event of an emergency, the door shall be able to be opened manually from inside the bus using a force

of no more than 25 pounds after actuating an unlocking device at the door. A manually operated passenger emergency valve shall be installed in the door engine compartment, arranged so that when the valve is opened, door control system air is released allowing door to opened manually.

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

TS 38.3 Rear Door

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

The rear axle brakes shall be interlocked to prevent the bus from moving when the wheelchair ramp system is being operated in a loading, unloading, or stowing cycle.

An alarm to sound and a signal to light on the dash shall be provided if a person pushes on the rear door when they are in the closed and locked position.

The rear door shall have an easily accessible emergency opening device located adjacent to the exit door, designed to operate the door regardless of all other controls. This device shall be identified, and instructions for its use shall be posted on or adjacent thereto. The operation of this device shall be interlocked to actuate the brakes to provide a smooth stop at a rate of deceleration equivalent to a stop within seventy five (75) feet from a speed of twenty (20) MPH. The device shall be concealed by an easily breakable clear plastic panel and shall have a hammer or other device provided to gain access to the handle or lever, color to be red. Hammer to be attached to bus by metal chain.

A rear door master switch shall be located in right hand front dash compartment, operator's safety compartment, or front destination sign compartment. If single door master switch controls both doors, master switch may be located in the entry door compartment.

TS 39. Pneumatic System

TS 39.1 General

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

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

Check valves shall be provided to isolate the front and rear section of the dual brake system assuring an adequate air supply for braking in the event that one of the systems fail. If the system utilizes a different means of achieving this safety feature, the information of operation shall be supplied by the Contractor.

TS 39.2 Air Compressor

Air compressor shall be a screw type with full ball bearing, 15 ½ CFM minimum or equivalent. The engine driven air compressor shall be sized to charge the air system from 40 psi to the governor cut-off pressure in less than three minutes while not exceeding the engine's rated speed. Air compressor shall have discharge line muffler (ping tank) with one way check valve on discharge side of the muffler, and shall be equipped with a drain cock

and safety valve. The drain shall be plumbed to exterior of bus, or equivalent.

An air compressor governor shall be provided to automatically control air pressure in the system between maximum and minimum pressures. It shall have a cut-out pressure of 120 psi and a cut-in pressure of 85-90 psi.

TS 39.3 Air Lines and Fittings

Air lines, except necessary flexible lines, shall conform to the installation and material requirements of SAE Standard J844-Type 1 for copper tubing (all copper tubing shall be seamless) with standard, brass, flared or ball sleeve fittings, or SAE Standard J844-Type 3B for nylon tubing if not subject to temperatures over two hundred degrees (200)F. Accessory and other non-critical lines may use Type 3A tubing.

The air on the delivery side of the compressor where it enters nylon housing shall not be above the maximum limits as stated in SAE J844. Nylon tubing shall be installed in accordance with the following color-coding standards:

RED - Indicates front brakes
GREEN - Indicates rear brakes and supply
BROWN - Indicates parking and emergency
BLUE - Indicates suspension leveling system
BLACK - Indicates accessories

Copper and stainless tubing shall be color-coded by heat shrink sleeves at the ends to meet the color-coding requirements.

Line supports shall prevent movement, flexing, tension, strain and vibration. Looms shall support copper lines to prevent them from touching each other or any other bus component. 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-binding and installation. Rigid lines shall be supported at a maximum of 5-foot intervals. Nylon lines may be grouped and shall be supported at 30 in. intervals or less.

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

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

Provisions shall be made for air supply connections at the front and rear of bus.

TS 39.4 Air Reservoirs

A minimum of six (6) air reservoirs shall be supplied and shall be mounted to the main frame rail. One reservoir shall be dedicated to the maxi-brake release, and isolated by check valves, or equivalent. Total combined capacity of all air reservoirs shall be a minimum of 7140 cubic inches. All air reservoirs shall meet the requirements of FMVSS Standard 121 and SAE Standard J10.

Air tank for air suspensions shall have valve or valves to regulate and protect air system and shall be equipped with guarded or flush type drain valves.

All air tanks shall be equipped with quality type drain cocks, flush mounted or pet cock drain valve mounted in a protected and accessible location, to ensure complete drainage of tanks. If tanks located in non-accessible location, they shall be equipped with remote mount drain systems as noted above.

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

TS 39.5 Air System Dryer

The air supply system shall be equipped with an air dryer to remove and collect moisture, carbon particles and contaminants that could harm brake system components from the air before delivery to the supply reservoir. The air dryer shall be equipped with a replaceable cartridge and/or an integral, self-cleaning filter element, and a 24-volt heater Bendix Tandem ADIP (or equivalent). The air dryer shall purge itself upon compressor cycle.

Air dryer shall be mounted on left side of each bus or equivalent. The air system shall be equipped with an air dryer located before the no. 1 air tank (or equivalent) and as far from the compressor as possible to allow air to cool prior to entering the air dryer.

Electrical, Electronic And Data Communication Systems

TS 40. Overview

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

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.

Power plant wiring shall be an independent wiring harness. Replacement of the engine compartment wiring harness(es) shall not require pulling wires through any bulk head or removing any terminals from the wires.

TS 41. Environmental and Mounting Requirements

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

Electrical and electronic equipment shall not be located in an environment that will reduce the performance or shorten the life of the component or electrical system when operating within the design operating profile. As a recommendation, no bus 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 (R10).

The Purchaser shall follow recommendations from bus manufacturers and subsystem suppliers regarding methods to prevent damage from voltage spikes generated from welding, jumpstarts, shorts, etc.

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.

All electrical/electronic hardware mounted in the interior of the bus 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.

All electrical/electronic hardware mounted on the exterior of the bus that is not designed to be installed in an exposed environment shall be mounted in a sealed enclosure.

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

TS 42. Battery Electrical Requirements

TS 42.1 Batteries

Contractor shall furnish two (2), 8D style, 12-volt batteries or equivalent. Each battery shall have a minimum of 1400 ampere hour rating.

Contractors may alternatively provide four Odyssey PC2150S, group 31 sealed, maintenance-free batteries or equivalent. Each battery shall have a purchase date no more than 180 days before the date of delivery of the bus. Batteries, while in the Contractor's possession, shall be maintained according to the battery manufacturer's instructions.

The batteries and starter cable shall be properly bracketed and sized to carry maximum loads that may be encountered. Terminals shall be crimped and soldered to the cables.

A battery equalizer shall be installed to provide proper charging voltage to both batteries and still maintain each battery independently. Equalizer shall be protected by a circuit breaker or other industry-approved electrical type equipment to disconnect power in case of failure. Equalizers shall be mounted in a location away from the heat of the engine, preferably in a compartment that is cooled by the bus air conditioning system

TS 42.1.1 Battery Cables

Positive and negative terminal ends shall be different sizes. The battery terminal ends and cable ends shall be color-coded with red for the primary positive, black for negative and another color for any intermediate voltage cables. Positive and negative battery cables shall not cross each other if at all possible, shall be flexible and shall be sufficiently long to reach the batteries with the tray in the extended position without stretching or pulling on any connection and shall not lie directly on top of the batteries. Except as interrupted by the master battery switch, battery and starter wiring shall be continuous cables with connections secured by bolted terminals and shall conform to specification requirements of SAE Standard J1127 – Type SGR, SGT, SGX or GXL and SAE Recommended Practice J541, with 2100 strand 4/0 cable or greater recommended. Provide in-line fuses on the 24 V and 12 V cables as close to the battery terminals as possible.

The color code for voltage is required: red for 24 volt. Blue for 12 volt.

TS 42.1.2 Jump Start

The Jump Start shall be an Anderson Jump Connector (SB 350) or equivalent. A jump-start connector shall be located next to the battery disconnect switch.

TS 42.1.3 Battery Compartment

The battery compartment shall prevent accumulation of snow, ice and debris on top of the batteries and shall be vented and self-draining. It shall be accessible only from the outside of the bus. All components within the battery compartment, and the compartment itself, shall be protected from damage or corrosion from the electrolyte. The inside surface of the battery compartment's access door shall be electrically insulated, as required, to prevent the battery terminals from shorting on the door if the door is damaged in an accident or if a battery comes loose. The batterycompartment temperature should not exceed manufacturers specification.

The bus shall be equipped with a 12V DC and 24V DC quick disconnect switch(es). The battery compartment door shall conveniently accommodate operation of the12V DC and 24V DC quick disconnect switch(es).

This access door shall not require any special locking devices to gain access to the switch, and it shall be accessible without removing or lifting the panel. The door shall be flush-fitting and incorporate a spring tensioner or equal to retain the door in a closed position when not in use.

The batteries shall be securely mounted on a stainless steel or equivalent tray that can accommodate the size

and weight of the batteries. The battery tray, if applicable, shall pull out easily and properly support the batteries while they are being serviced. The tray shall allow each battery cell to be easily serviced. A locking device shall retain the battery tray to the stowed position. Batteries shall also be secured to the tray with Nylon block or equivalent.

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

TS 42.1.4 Master Battery Switch

A master battery switch shall be provided near the batteries in the battery compartment, mounted to prevent corrosion, for complete disconnecting from all bus electrical systems, with exception to equipment that must remain energized. The equipment mentioned shall be spelled out and agreed upon at pre-production. The master switch shall be capable of carrying and interrupting the total circuit load. Opening the master switch with the power plant operating shall not damage any component of the electrical system but shall shut the engine down. Fusible link shall be installed between batteries and alternator main power supply cable. Master battery switch shall be accessible in less than10 seconds for deactivation and prevent corrosion from fumes and battery acid when the batteries are washed off or during an emergency through an access door located in the battery compartment door which shall be clearly labeled, “Master Battery Switch Disconnect”. Switch location shall be approved by the Purchaser.

TS 42.1.5 Low-Voltage Generation and Distribution

Voltage monitoring and over-voltage output protection (recommended at 32V) shall be provided.

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

TS 42.1.6 Circuit Protection

All branch circuits, except battery-to-starting motor and battery-to-generator/alternator circuits, shall be protected by current-limiting devices such as circuit-breakers, fuses or solid-state devices sized to the requirements of the circuit. 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 Purchaser’s mechanic with visible indication of open circuits. The Purchaser 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. Any manually resettable circuit-breakers shall provide a visible indication of open circuits.

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

TS 42.2 Grounds

The battery shall be grounded to the bus 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 bus to eliminate ground loops. No more than five ground ring/spade terminal connections shall be made per ground stud with spacing between studs ensuring connectivity and serviceability. Electronic equipment requiring an isolated ground to the battery (i.e., electronic ground) shall not be grounded through the chassis.

TS 42.3 Low Voltage/Low Current Wiring and Terminals

All relays, controllers, flashers, automatic circuit breakers and other electrical components shall be mounted in

vibration free and easily accessible junction boxes. If the boxes are mounted externally to the bus, they shall be sealed to prevent moisture from normal sources from entering the boxes and to prevent any fires that may occur inside the boxes from propagating outside the boxes.

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.

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 minimum bend radius shall be prevented.

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

To the extent practicable, wiring shall not be located in environmentally exposed locations under the bus. Wiring and electrical equipment necessarily located under the bus 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 bus.

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

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

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

a. Include a mechanical clamp in addition to solder on the splice.
b. Support no mechanical load in the area of the splice.
c. Be supported to prevent flexing.

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

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.

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

wires.

TS 42.4 Electrical Components

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

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

TS 42.5 Electrical Compartments

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

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

TS 43. General Electronic Requirements

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

All electronic component suppliers shall ensure that their equipment is self-protecting in the event of shorts in the cabling, and also in over-voltage (over 32V DC on a 24V DC nominal voltage rating with a maximum of 50V DC) 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.

All wiring shall be vinyl insulated or both vinyl and fabric insulated and permanently color coded for ease of identification. The engine compartment wiring insulation (except wiring for lights) shall be cross link or cross grain polyethylene, or equivalent. The engine compartment wiring shall be permanently numbered and permanently color coded. The interior light wiring shall be two layer cross link or cross grain polyethylene insulation or aircraft type high voltage wire. The battery cable shall be 4/0 gauge, with minimum of 0.075 inch wall plastic insulation or cross linked polyethylene or equivalent. Cable may be 3/0 gauge for 24 volt applications.

The main wiring harness shall be loom covered and concealed within "C" shaped channels of mainframe or bus body for protection from the elements. All harnesses and wiring shall be securely retained by rubber covered clips or solid nylon straps. The wiring shall terminate at appropriate junction terminals set in Bakelite or molded plastic material. All wiring end connectors shall be of the soldered or machine crimped insulated type. Wiring cables larger than No. 10 will be equipped with soldered or machine-crimped terminals. All circuits shall be protected by manual, reset-type circuit breakers, except the speedometer, backup lights, and engine compartment lights which may use a line fuse. Automatic reset circuit breakers may be used for starter solenoid, headlamps, and dashboard area lights.

Multiple plug and receptacle-type connectors shall be provided to permit rapid disconnect of multiple circuits for engine, closure door wiring, and directional signal switch. Screw terminals for power leads shall be permitted for directional signal switches.

All wiring harnesses shall be designed for this bus and contain only wiring for units thereon, plus sufficient

extras for future use. Different colors for every system with a minimum of five (5) color coded wires shall be installed in the wiring harness that runs from the rear compartments to front operator console. Universal type wiring harnesses will not be accepted.

Contractor shall provide an operator's electrical panel terminal block which shall be accessible from an internal/external access door. External door shall be hinged at top, with door prop up and secured with $^{5}/_{16}$" square key locks.

Multiple plug connectors outside the interior of the bus must be totally weather-proof (i.e., water, dust, moisture) type. EXAMPLE: Body harness to DDEC III controls. A jump start connection, (*Red Connector*), shall be installed in engine compartment, battery compartment or switch box, with easy accessibility, and the location shall be approved by the Purchaser prior to build.

TS 43.1 Discrete I/O (Inputs/Outputs)

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 in. Wiring for each I/O device shall be bundled together. If the I/O terminals are the same voltages, then jumpers may be used to connect the common nodes of each I/O terminal.

TS 43.2 Shielding

All wiring that requires shielding shall meet the following minimum requirements. A shield shall be generated by connecting to a ground, which is sourced from a power distribution busbar or chassis. A shield shall be connected at one location only, typically at one end of the cable. However, certain standards or special requirements, such as SAE J1939 or RF applications, have separate shielding techniques that also shall be used as applicable.

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

TS 43.3 Communications

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. Other equipment provisions shall be provided for:

- (VLU) Bus Logic Unit that includes a Global Positioning System (GPS) with receiver
- Power Management Device
- (DDU) Driver Display Unit
- (ASA) Automatic Stop Annunciation
- 450-250 MHZ radio system for data communication

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

TS 43.4 Radio Frequency (RF)

RF components, such as radios, video devices, cameras, global positioning systems (GPS),etc., shall use coaxial cable to carry the signal. All RF systems require special design consideration for losses along the cable. Connectors shall be minimized, since each connector and crimp has a loss that will 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.

The radio and communication system shall include several systems and shall be integrated as discussed at the pre-production meeting.

a. A plastic conduit with an inside diameter of not less than 3/4 inch shall be installed and run from the communication box to designated locations throughout the buses. These conduits shall be equipped with a pull wire and be of a different color for each line in the bus. They shall be directed as stated below. Each piece shall be of different color and included in the (as built) electrical schematics as stated in this specification.

    1. Two sections of this ¾-inch diameter conduit shall run from the main power panel to the radio/equipment compartment, and from the power panel to underneath the instrument panel.

    2. Two sections shall run from communication box to the front destination sign area. One for the upper deck and one for the lower deck.

    3. Six shall be run from the communication box to six different access plates in the ceiling, locations to be determined at a later date as there are specific distances that antennas need to be placed from one another. These same locations shall have a minimum of a 12 inch by 12 inch ground planes attached to the bus structure.

b. This conduit shall provide for future installation of coaxial antenna and circuit control cables by the "pull through" method. A pull through wire shall be placed in all of these conduit runs.

c. Along with the antenna conduit, an antenna access panel shall be installed in the ceiling of each bus and with exact locations to be determined at pre-production. These access panels shall be located as close to a roof structural member as practical in order to provide a mounting base for the ground planes. If roof is nonmetallic where radio antenna is to be mounted, a 12 inch x 12 inch metal plate shall be affixed under roof to provide ground plane for antenna.

TS 43.5 Audio

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

TS 44. Multiplexing

TS 44.1 General

The primary purpose of the multiplexing system is control of components necessary to operate the bus. This is accomplished by processing information from input devices and controlling output devices through the use of an internal logic program.

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

Ten percent 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.

Multiplex electrical system consisting of but not limited to: bus mounting card cage with power supply, processor and network card(s) and a mix of input and output cards, block input/output module(s), located throughout the bus typically two in the side console, and one in the dash and exit door compartments, to have configuration capacity of thirty two (32) point blocks. The engine, transmission and climate control systems are to be controlled by their own dedicated control system, but all other systems are controlled by the multiplex system. This includes all lights, doors, engine starting and fast idle controls, lifting and kneeling, retarder and climate control interfaces, etc. Each switch or other input device and each light, valve or other output device is to be

wired to the closest input or output card or block. Each input or output point is to have a status LED.

The control logic is to be software-based. The documentation for the logic shall consist of ladder logic with each device identified by name and logical address. Comments describing the program are to be included where necessary before each rung of the ladder. This documentation in conjunction with the status LED's are for ease of rapidly troubleshooting the bus.

Logic shall be of the command feedback (action/position) type. Loss of electrical power shall not permit an unsafe condition to exist when power is restored. All functions shall be controlled with a momentary type switch, which shall be maintained in the "on" position by the driver and shall be spring-loaded to the "off" position.

The system shall be capable of being displayed, modified and diagnosed via a personal computer, utilizing user friendly, menu driven software program. This program shall also be used for troubleshooting by providing real-time information on the status of each input and output, and can be used to force inputs and outputs on or off. It shall also be used to modify timer values.

The system and all wiring provided shall be completely modular for expansion. All input/output modular blocks, if required, and other system components shall be easily removable and changeable, including the dash area. All wiring to the system shall be via removable terminal blocks so a defective unit can be changed without having to disturb any wiring.

The Contractor is to furnish the multiplex diagnostic programs and any software/firmware required to diagnose, operate and maintain the electronic systems on the buses. The Contractor shall provide all required registration(s) / license(s) and ongoing support for each software package as required. Local training for this system shall also be provided as part of bus orientation for the maintenance staff.

TS 44.2 System Configuration

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

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

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

Onboard system componentry must be included in the base bus. In addition the following systems shall have wiring brought into the communication box and terminated at different posts on one of the terminal strips:

1. APTS provisions delivered to the electrical compartment that will house the Purchaser's APTS equipment are:

    - Battery ground
    - 10 amp Fused: 12VDC Ignition
    - 15 amp Fused: 12VDC Battery
    - 10 amp Fused: 24VDC Battery
    - Foot switch: 0 volt or open switching to battery neg.
    - Boom Mic + (Boom mic should not have its own switch) GFI p/n 181 335-72

- Boom Mic –
- Interior speaker select
- Exterior speaker select
- Both speaker select
- Interior speaker positive. +
- Speaker negative –
- Exterior speaker positive +
- Front door: negative to 12 volt signal
- Rear door: negative to 12 volt signal
- Stop request: negative to 12 volt signal
- Wheel chair deploy: negative to 12 volt signal
- Square wave Speedometer
- SAT switch N.O. INIT (Switch containing No.19-22 provided by INIT)
- SAT switch N.O. INIT
- SAT switch N.C. Two way radio
- SAT switch N.C. Two way radio
- Reset switch 4 conductor

2. Provisions delivered to the electrical compartment that will house the APTS equipment are:

- Battery ground
- 10amp Fused: 12VDC Ignition
- 10amp Fused: 24VDC Battery
- Reset switch 4 conductor

3. Auxiliary 3 Pos. Buses bars in the electrical compartment are:

- 10 amp Fused: 12VDC Ignition
- 25 amp Fused: 12VDC Battery
- 25 amp Fused: 24VDC Battery
- Battery ground

4. Antenna Cables for all roof mounted antenna units, Radio/GPS

- Actual aerials and connectors to be free-shipped in bus for installation after delivery

TS 45. Data Communications

TS 45.1 General

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

a. 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)

b. Data definition requirements that ensure access to diagnostic information and performance characteristics

c. The capability and procedures for uploading new application or configuration data

d. Access to revision level of data, application software and firmware

e. The capability and procedures for uploading new firmware or application software

f. Evidence that applicable data shall be broadcast to the network in an efficient manner such that the overall network integrity is not compromised

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

TS 45.2 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 bus operation with data using SAE Recommended Communications Protocols such as J1939 and/or J1708/J1587 with forward and backward compatibilities or other open protocols. At a minimum, drivetrain components consisting of the engine, transmission, retarder ASR, and anti-lock braking systems shall be powered by a dedicated and isolated ignition supply voltage to ensure data communication among components exists when the bus ignition is switched to the “on” position.

TS 45.2.1 Diagnostics, Fault Detection and Data Access

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

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

TS 45.2.2 Programmability (Software)

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

TS 45.3 Multiplex Level

TS 45.3.1 Data Access

At a minimum, information shall be made available via a communication port on the multiplex system. The location of the communication port shall be easily accessible. A hardware gateway and/or wireless communications system shall be priced as options (see Section IP 17 Supplemental Equipment and Services Pricing and FRM 20 Pricing Schedule) if requested by the Purchaser. The communication port(s) shall be located as specified by the Purchaser.

TS 45.3.2 Diagnostics and Fault Detection

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

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

logic function. The diagnostic data can be incorporated into the information level network or the central data access system.

TS 45.3.3 Programmability (Software)

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

a. Password protection
b. Limited distribution of the configuration software
c. Limited access to the programming tools required to change the software
d. Hardware protection that prevents undesired changes to the software

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

a. Hardware component identification where labels are included on all multiplex hardware to identify components
b. Hardware series identification where all multiplex hardware displays the current hardware serial number and firmware revision employed by the module
c. Software revision identification where all copies of the software in service display the most recent revision number
d. A method of determining which version of the software is currently in use in the multiplex system
e. Revision control labels shall be electronic.

TS 45.4 Electronic Noise Control

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

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 buses.

Driver Provisions, Controls And Instrumentation

TS 46. Driver's Area

TS 46.1 Controls, Switches and Signals

The intent of this section is to require the manufacturer to supply state of the art ergonomics engineering to the bus operator's environment to maximize driver comfort and ease of operation for extended periods of time. In general when designing the driver's area, it is recommended that SAE J833, "Human Physical Dimensions," be used.

Switches and controls shall be divided into basic groups and assigned to specific areas, in conformance with SAE 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."

All switches and controls necessary for the operation of the bus, including door master, shall be conveniently located in the driver's area and shall provide for ease of operation. Controls shall be located so the boarding passengers may not easily tamper with control settings. A complete drawing/layout of the driver's compartment shall be included with bids.

The instrument panel shall be illuminated and located directly in front of operator's seat for easy reading. Speedometer shall have prominent markings in Miles per Hour (MPH). Instrument Panel shall include the following:

- Voltmeter
- Two (2) air gauges (150 *psi*), (Engler, VDO, Forster, or equivalent), to monitor Primary and Secondary air pressure
- Speedometer driven by the transmission electronics
- Telltale lights to indicate door unlocked (emergency door unlatched if door is required), stop lights on, headlight high beam on, auxiliary heater
- Transmission and engine microprocessors (amber indicators for check engine or transmission, red for shutdown modes)
- Low air pressure warning (audio and visual)
- Air-conditioning malfunction
- Directional signal action
- Indicator light warning failure of 12 Volt system, if battery equalizer fails
- On-Board Diagnostics

Malfunction and other indicators listed in the following table shall be supplied on all buses and visible in all lighting conditions. Space shall be provided on the panel for future additions of no less than three (3) indicators as the capability of on-board diagnostic systems improves.

Table 11: Indicators

Visual Indicator	Audible Alarm	Condition or Malfunction
ABS	None	ABS system malfunction
A/C Stop	None	Compressor stopped due to high/low pressure or loss of refrigerant
Check Engine	None	Engine electronic control unit detects a malfunction
Check Transmission	None	Transmission electronic control unit detects a malfunction
Fire	Bell	Over-temperature condition in engine compartment
Generator Stop	None	Loss of generator output
Hot Engine	Buzzer	Excessive engine coolant temperature
Low Air	Buzzer	Insufficient air pressure in either primary or secondary reservoirs
Low Oil	Buzzer	Insufficient engine oil pressure

The bus shall be equipped with an on-board diagnostic system that will indicate conditions that require immediate action by the operator to avoid an unsafe condition or prevent further damage to the bus. This diagnostic system shall have visual and audible indicators. The diagnostic indicator lamp panel shall be located in clear sight of the operator but need not be immediately in front of the driver. The intensity of indicator lamps shall permit easy determination of on/off status in bright sunlight but shall not cause a distraction or visibility problem at night. 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. Wherever possible, sensors shall be of the closed circuit type, so that failure of the circuit and/or sensor shall activate the malfunction indicator.

Engine shutdown with spring-loaded overrule toggle switch or push-button (momentary-on) shall be provided for the following engine and transmission conditions:

- Low Oil Pressure (Engine)
- High Coolant Temperature
- Low Coolant level (Shutdown shall not occur until after thirty (30) seconds duration)
- High Transmission Oil Temperature

A front control switch panel shall be located in a panel directly to the left of operator and shall be designed for simplification of electrical controls and shall be inclined for easy access to control switches. Top surface of control panel shall have main control or master switch with four positions:

- "ENGINE STOP"- All systems "OFF", EXCEPT power available for interior, stop, turn and hazard lights, silent alarm, horn and farebox
- "DAY RUN" - All systems and engine "ON", EXCEPT headlights, park, tail and marker lights
- "NIGHT RUN" - All systems and engine "ON"
- "NIGHT PARK"- All systems "OFF", EXCEPT those listed in Engine Stop and power to radio and marker lights

A separate switch shall control operator's heater and defroster motor. Engine starter switch shall be push button type. Normal control of all electrical units, except stop lamps, turn signals, hazard flashers, horn, and destination signs, shall be obtained through positioning of main control switch. Toggle type switches for alternate control of interior and sign lighting, passenger buzzer, and any special equipment shall be installed.

Both front and rear control panels shall be hinged from the top and shall be equipped with door gas props. A side hinged panel shall be permissible with gas filled props only.

An operators "panic" or (SAT) or “silent” switch shall be installed at a location approved by the Purchaser, this switch shall be used for the radio system. This switch shall be a dual circuit switch with one side being normally open and the other side being normally closed. A second switch shall be installed for use with the video camera system and shall be a push button type "normal open" switch with a shroud to prevent accidental activation by the operator.

All operating controls, light switches, and controls for auxiliary equipment shall be clearly and permanently marked and identified by means of metal or oil resistant plastic identification plates. The plates or stamping shall spell out, in American English, with lettering, filled with contrasting color paint, the words of the system or function. All switches shall be rotated or flipped in the same direction for the On and/or Off positions.

TS 46.2 Glare

The driver’s work area shall be designed to minimize glare to the extent possible. Objects within and adjacent to this area shall be matte black or dark gray in color wherever possible to reduce the reflection of light onto the windshield. The use of polished metal and light-colored surfaces within and adjacent to the driver’s area shall be avoided.

TS 46.3 Visors/Sun Shades

An adjustable roller type sunscreen shall be provided over the driver’s windshield and/or the driver’s side window. The sunscreen shall be capable of being lowered to the midpoint of the driver’s window. When deployed, the screen shall be secure, stable, and shall not rattle, sway or intrude into the driver’s field of view due to the

motion of the 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 driver. Sunscreen shall be shaped to minimize light leakage between the visor and windshield pillars to the extent possible.

The windshield shall have a fully adjustable, sun visor for operator's use. The installation shall preclude vibration in normal street operation. Sun visor shall be a New-View Industries product, “Roll A Visor,” or equivalent. The visor shall be a full see-through, mesh style for two thirds of the full length with the bottom third being a solid material. The visor shall have a release cord that allows the visor to return to the normal position.

Driver’s side window shall have a see-through pull down shade. The installation shall preclude vibration in normal street operation. The shade shall be a New-View Product, “Roll A Visor” or equivalent, all mesh design with a release cord which allows for the visor to return to the normal position.

TS 46.4 Driver’s Controls

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

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

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

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

The transmission shift selector shall be mounted in an angled panel steep enough to discourage drivers from using it as a personal storage area for electronic devices such as cell phones, music players, navigation systems, etc.

TS 46.5 Normal Bus Operation Instrumentation and Controls

The following list identifies bus controls used to operate the bus. These controls are either frequently used or critical to the operation of the bus. They shall be located within easy reach of the operator. The operator shall not be required to stand or turn to view or actuate these controls unless specified otherwise.

Systems or components monitored by onboard diagnostics system shall be displayed in clear view of the operator and provide visual and/or audible indicators. The intensity of indicators shall permit easy determination of on/off status in bright sunlight but shall not cause a distraction or visibility problem at night. All indicators shall be illuminated using backlighting. Unless otherwise approved, indicators in red should indicate a high level of warning requiring immediate attention; amber indicators should indicate caution and watch mode.

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.

On-board 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 12 represents

instruments and alarms. The intent of the overall physical layout of the indicators shall be in a logical grouping of systems and severity nature of the fault.

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

Table 12: Instruments and Alarms

Device	Description	Location	Function
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	Momentary switch	Side console	Activates engine starter motor
Engine start, rear	Momentary switch	Engine compartment	Activates engine starter motor
Engine run, rear	Three-position toggle switch	Engine compartment	Permits running engine from rear start, normal front run position and off
Drive selector	Touch panel switch	Side console	Provides selection of propulsion: forward, reverse and neutral
HVAC	Switch or switches to control HVAC	Side console	Permits selection of passenger ventilation: off, cool, heat, low fan, high fan or full auto with on/off only
Driver's ventilation	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

Table 12: Instruments and Alarms			
Device	**Description**	**Location**	**Function**
WC ramp/ kneel enable	Two-position switch[1]	Side console or dash right wing	Permits operation of ramp and kneel operations at each door remote panel
Front door ramp/kneel enable	Two-position keyed switch[1]	Front door remote or dash right wing	Permits ramp and kneel activation from front door area, key required[1]
Front door ramp	Three-position momentary switch	Right side of steering wheel	Permits deploy and stow of front ramp
Front kneel	Three-position momentary switch	Front door remote	Permits kneeling activation and raise and normal at front door remote location
Rear door ramp/kneel enable	Two-position keyed switch[1]	Rear door remote	Permits ramp and kneel activation from rear door area; key required[1]
Rear kneel	Three-position momentary switch	Rear door remote	Permits kneeling activation and raise and normal at rear door remote location
Silent alarm	Recessed push button, NO and NC contacts momentary	Side console	Activates emergency radio alarm at dispatch and permits covert microphone and/or enables destination sign emergency message
Video system event switch	Momentary on/off momentary switch with plastic guard	Side console	Triggers event equipment, triggers event light on dash
Left remote mirror	Four-position toggle type	Side console	Permits two-axis adjustment of left exterior mirror
Right remote mirror	Four-position toggle type	Side console	Permits two-axis adjustment of right exterior mirror
Mirror heater	Switch or temperature activated	Side console	Permits heating of outside mirrors when required
Passenger door control	Five-position handle type detent or two momentary push buttons	Side console, forward	Permits open/close control of front and rear passenger doors
Rear door override	Two-position switch in approved location	Side console, forward	Allows driver to override activation of rear door passenger tape switches
Engine shutdown override	Momentary switch with operation protection	Side console	Permits driver to override auto engine shutdown

Table 12: Instruments and Alarms			
Device	**Description**	**Location**	**Function**
Hazard flashers	Two-position switch	Side console or dash right wing	Activates emergency flashers
Fire suppression	Red push button with protective cover	Dash left wing or dash center	Permits driver to override and manually discharge fire suppression system
Mobile data terminal	Mobile data terminal bus operator interface panel	Above right dash wing	Facilitates driver interaction with communication system and master log-on
Destination sign interface	Destination sign interface panel	In approved location	Facilitates driver interaction with destination sign system, manual entry
Turn signals	Momentary push button (two required) raised from other switches	Left foot panel	Activates left and right turn signals
PA manual	Momentary push button	In approved location	Permits driver to manually activate public address microphone
Low-profile microphone	Low-profile discrete mounting	Steering column	Permits driver to make announcements with both hands on the wheel and focusing on road conditions
High beam	Detented push button	In approved location	Permits driver to toggle between low and high beam
Parking brake	Pneumatic PPV	Side console	Permits driver to apply and release parking brake
Park brake release	Pneumatic PPV	Side console	Permits driver to push and hold to release brakes
Hill holder	Two-position momentary switch	Side console	Applies 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 driver override to disable door and brake/throttle interlock

Table 12: Instruments and Alarms			
Device	**Description**	**Location**	**Function**
Warning interlocks deactivated	Red indicator light	Dash panel center	Illuminates to warn driver that interlocks have been deactivated
Retarder disable	Multi-pole switch detented	Within reach of operator or approved location	Permits driver override to disable brake retardation/regeneration
Alarm acknowledge	Push button momentary	Approved location	Permits driver to acknowledge alarm condition
Indicator/ alarm test button	Momentary switch or programming[1]	Dash center panel	Permits driver to activate test of sentry, indicators and audible alarms
Speedometer	Speedometer, odometer, and diagnostic capability, 5-mile increments	Dash center panel	Visual indication of speed and distance traveled, accumulated bus mileage, fault condition display
Air pressure gauge	Primary and secondary, 5 psi increments	Dash center panel	Visual indication of primary and secondary air systems
Fire detection	Bus operator display	Property specific or dash center	Indication of fire detection activation by zone/location
Door obstruction	Sensing of door obstruction	Dash center	Indication of rear door sensitive edge activation
Door ajar	Door not properly closed	Property specific or dash center	Indication of rear door not properly closed
Low system air pressure	Sensing low primary and secondary air tank pressure	Dash center	Indication of low air system pressure
Engine coolant indicator	Low coolant indicator may be supplied as audible alert and visual and/or text message	Within driver's sight	Detects low coolant condition
Hot engine indicator	Coolant temperature indicator may be supplied as audible alert and visual and/or text message	Within driver's sight	Detects hot engine condition and initiates time delay shutdown

Table 12: Instruments and Alarms			
Device	**Description**	**Location**	**Function**
Low engine oil pressure indicator	Engine oil pressure indicator may be supplied as audible alert and visual and/or text message	Within driver's sight	Detects low engine oil pressure condition and initiates time- delayed shutdown
ABS indicator	Detects system status	Dash center	Displays system failure
HVAC indicator	Detects system status	Dash center	Displays system failure
Charging system indicator (12/24 V)	Detect charging system status	Dash center	Detects no charge condition and optionally detects battery high, low, imbalance, no charge condition, and initiates time-delayed shutdown
Bike rack deployed indicator	Detects bike rack position	Dash center	Indication of bike rack not being in fully stowed position
Fuel tank level	Warning light	Dash	Indication of fuel tank level/pressure
DEF gauge	Level Indicator	Dash center	Displays level of DEF tank and indicates with warning light when low
Active regeneration	Detects status	Dash center	Indication of electric regeneration

TS 46.6 Horn

Minimum dual heavy-duty 12-volt or 24-volt horns shall be furnished and installed to be protected from wheel wash. Horns shall have loudest available volume. Horn shall be activated by a button located in the center of the steering wheel. It shall be installed to keep transfer punch debris from falling into or collecting under the button, making horn inoperative. The horn shall be two tone (1 horn high; 1 low) and easily distinguishable from a standard automobile or truck and have a pitch that is in compliance with FMVSS.

TS 46.7 Starter

The starter shall be minimum 24-volt and capable of turning the engine over under all climate conditions encountered in Washington State. Delco Starter or equivalent must have over crank protection built in to the starter housing. The starter shall be designed to work with a solenoid. The solenoid switch shall be interlocked so that:

a. Starting motor switch is to be wired so that engine cannot be started when bus is in gear.

b. Engine can be started in neutral position of the transmission control only, in accordance with FMVSS 102.

c. Other major electrical loads are disconnected while cranking.

TS 46.8 Driver Foot Controls

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

TS 46.8.1 Pedal Angle

The vertical angle of the accelerator and brake pedals shall be determined from a horizontal plane regardless of the slope of the cab floor. The accelerator and brake pedals shall be positioned at an angle of 37 to 50 deg. at the point of initiation of contact and extend downward to an angle of 10 to 18 deg. at full throttle.

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

a. TS 46.8.2 Pedal Dimensions and Position

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

The accelerator and brake pedals shall be positioned such that the spacing between them, measured at the heel of the pedals, is between 1 and 2 in. Both pedals should be located approximately on the same plane coincident to the surface of the pedals.

TS 46.9 Driver Foot Switches

The angle of the turn signal platform shall be determined from a horizontal plane, regardless of the slope of the cab floor. The turn signal platform shall be angled at a minimum of 10 deg. and a maximum of 37 deg. It shall be located no closer to the seat front than the heel point of the accelerator pedal.

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

The control switches for the turn signals shall be mounted on an inclined, floor-mounted stainless steel enclosure or metal plate mounted to an incline integrated into the driver's platform, located to the left of the steering column. The location and design of this enclosure shall be such that foot room for the operator is not impeded. The inclined mounting surface shall be skid-resistant. All other signals, including high beam and public address system, shall be in approved locations.

The foot switches shall be UL-listed, heavy-duty type, of a rugged, corrosion-resistant metal construction. The foot switches for the directional signals shall be momentary type, while those for the PA system and the high beam shall be latching type. The spacing of the switches shall be such that inadvertent simultaneous deflection of switches is prevented.

TS 47. Driver's Amenities

TS 47.1 Coat Hanger

A hook and loop shall be provided to secure the driver's coat in an approved location.

TS 47.2 Storage Box

An enclosed driver storage area shall be provided with a positive latching door. The minimum size is 2750 cubic inches.

TS 48. Windshield Wipers and Washers

TS 48.1 Windshield Wipers

The bus shall be equipped with a windshield wiper for each half of the windshield. At 60 mph, no more than 10 percent of the wiped area shall be lost due to windshield wiper lift. For two-piece windshields, both wipers shall park along the center edges of the windshield glass. For single-piece windshields, wipers shall park along the bottom edge of the windshield. Windshield wiper motors and mechanisms shall be easily accessible for repairs

or service. The fastener that secures the wiper arm to the drive mechanism shall be corrosion- resistant.

Two (2) electric-operated heavy-duty windshield wipers with self-parking feature shall be furnished for the lower windshield. The wiper motors shall be variable speed having at least a high and low speed setting with an intermittent system. A combination switch shall be installed to allow the wipers to operate in a “mist” mode where the wipers shall make a minimum of 2 swipes wait and then recycle again. Electric wiper motors shall have metal style gears. Wiper arms shall be Bosch (L.H. 3398100090, R.H. 3398100096), or equivalent, and be equipped with the largest wiper blade possible for windshield design. Wiper motors and windshield reservoir shall be installed in an easily accessible location for ease in maintenance and inspection. Wiper motors shall be accessible from exterior of bus and properly sealed. Wiper motors/arms shall be adjusted to stay on windshield area; shall not go past windshield rubber harness. The sweep shall be large enough to clear the windshield for vision of the right mirror.

TS 48.2 Windshield Washers

The windshield washer system, when used with the wipers, shall deposit washing fluid evenly and completely wet the entire wiped area.

Reservoir capacity shall be a minimum of 5 gallons filled through filler neck located outside on the front of the bus. Spray shall be air operated pump, or equivalent, utilizing a wet wiper arm. Reservoir pumps, lines and fittings shall be corrosion-resistant and must include a means to determine fluid level.

TS 49. Operator’s Seat

The operator's seat shall be a USSC G2 or equivalent with headrest, high back, dual air lumbar, air operated side bolsters, air operated fore and aft slide. The operator’s seat shall come equipped with a three- point seat belt that pulls from left to right, and built-in parking alarm indicating that the parking brake has not been applied when driver takes pressure off the seat regardless of master switch position. Seat shall be upholstered in all black, cloth fabric. The seat shall be fully adjustable fore and aft with minimum nine (9") inch travel. Seat shall be provided without arm rests.

TS 49.1 Dimensions

The driver’s seat shall be comfortable and adjustable so that people ranging in size from a 95th-percentile male to a 5th-percentile female may operate the bus.

TS 49.1.1 Seat Pan Cushion Length

Measurement shall be from the front edge of the seat pan to the rear at its intersection with the seat back. The adjustment of the seat pan length shall be no less than 16.5 in.at its minimum length and no more than 20.5 in.at its maximum length.

TS 49.1.2 Seat Pan Cushion Height

Measurement shall be from the cab floor to the top of the level seat at its center midpoint. The seat shall adjust in height from a minimum of 14 in., with a minimum 6 in. vertical range of adjustment.

TS 49.1.3 Seat Pan Cushion Slope

Measurement is the slope of the plane created by connecting the two high points of the seat, one at the rear of the seat at its intersection with the seat back and the other at the front of the seat just before it waterfalls downward at the edge. The slope can be measured using an inclinometer and shall be stated in degrees of incline relative to the horizontal plane (0 deg.). The seat pan shall adjust in its slope from no less than plus 12 deg. (rearward “bucket seat” incline) to no less than minus 5 deg. (forward slope).

b. TS 49.1.4 Seat Base Fore/Aft Adjustment

Measurement is the horizontal distance from the heel point to the front edge of the seat. The minimum and

maximum distances shall be measured from the front edge of the seat when it is adjusted to its minimum seat pan depth (approximately 15 in.). The seat base shall travel horizontally a minimum of 9 in. It shall adjust no closer to the heel point than 6 in.

TS 49.1.5 Seat Pan Cushion Width

Measurement is the horizontal distance across the seat cushion. The seat pan cushion shall be 17 to 21 in. across at the front edge of the seat cushion and 20 to 23 in. across at the side bolsters.

TS 49.1.6 Seat Suspension

The driver's seat shall be appropriately dampened to support a minimum weight of 380 lbs. The suspension shall be capable of dampening adjustment in both directions**.**

Rubber bumpers shall be provided to prevent metal-to-metal contact.

TS 49.1.7 Seat Back

Measurement is the distance between the outermost points of the front of the seat back, at or near its midpoint in height. The seat back width shall be no less than 19 in. Seat back will include dual recliner gears on both sides of the seat.

Seat back shall have standard height.

TS 49.1.8 Headrests

Headrest shall be adjustable.

TS 49.1.9 Seat Back Lumbar Support

Measurement is from the bottom of the seat back at its intersection with the seat pan to the top of the lumbar cushioning. The seat back shall provide adjustable-depth lumbar back support with three individual operating lumbar cells within a minimum range of 7 to 11 in.

TS 49.1.10 Seat Back Angle Adjustment

The seat back angle shall be measured relative to a level seat pan, where 90 deg. is the upright position and 90 deg.-plus represents the amount of recline.

The seat back shall adjust in angle from a minimum of no more than 90 deg. (upright) to at least 105 deg. (reclined), with infinite adjustment in between.

TS 49.1.11 Seat Belt

The belt assembly should be an auto-locking retractor (ALR). All seat belts should be stored in automatic retractors. The belts shall be mounted to the seat frame so that the driver may adjust the seat without resetting the seat belt.

The seat and seatbelt assemblies as installed in the bus shall withstand static horizontal forces as required in FMVSS 207 and 210.

Seat belts color shall be designated at pre-production meeting. Seat belts shall be provided across the driver's lap and diagonally across the driver's chest. The driver shall be able to use both belts by connecting a single buckle on the right side of the seat cushion. Three-point seatbelts must be emergency locking retractor (ELR) in design.

The lap belt assembly shall be a minimum of 72 in. in length.

TS 49.2 Seat Control Locations

While seated, the driver shall be able to make seat adjustments by hand without complexity, excessive effort or being pinched. Adjustment mechanisms shall hold the adjustments and shall not be subject to inadvertent changes.

TS 49.3 Seat Structure and Materials

Cushions shall be fully padded with at least 3 in. of materials in the seating areas at the bottom and back and be open-cell polyurethane (FMVSS 302).

TS 49.4 Pedestal (Platform Riser)

The operator's platform riser shall be anodized aluminum or stainless steel. This shall also have openings to the underside of the dash compartment protected against the possibility of accumulation of debris behind the panels or around the operators' foot controls. The foot controls shall accommodate up to a size 14 shoe without interference for ease of operation.

TS 49.5 Mirrors

TS 49.5.1 Exterior Mirrors

The bus shall be equipped with corrosion-resistant, outside rearview mirrors mounted with stable supports to minimize vibration. Mirrors shall be firmly attached to the bus to minimize vibration and to prevent loss of adjustment with a breakaway mounting system. Mirrors shall permit the driver to view the roadway along the sides of the bus, including the rear wheels. Mirrors should be positioned to prevent blind spots.

Mirrors shall retract or fold sufficiently to allow bus washing operations but avoid contact with windshield.

Mirrors shall meet the requirement of FMVSS 111. The mountings of the exterior mirror shall be with 3/8-inch stud or bolts affixed to the bus structure. Mirror thickness shall be a minimum of 3/16 inch. Mirror locations shall not create a safety hazard for passengers or a person standing on curb. The mirrors shall be fully electrically adjustable to give the driver a full view of the required area. Frame style shall be shock-absorbing type.

Buses shall be equipped with two outside rear view mirrors, mounted on front corner posts and affixed to the bus structure. The mirrors shall be designed for the look and concept of the double deck bus. Contractor shall provide the styling for approval by the Purchaser before production. However, some criteria shall be followed as listed:

a. Mirrors shall be motorized and heated and shall be 24 volt. When in heat mode, the heat switch shall illuminate showing that the circuit is on.
b. Curb side mirror assembly shall have a minimum size of 7 inches wide by 10 inches high, all convex. Convex shall be minimum of 6-degree angle and fully electrically adjustable and heated. Mirror shall be mounted to have a minimum of 80 inches from the ground (tire level) to the bottom of the mirror head.
c. Left side mirror shall be a minimum of 7 inches wide by 10 inches high split mirror head with the top half being a flat mirror and bottom portion being convex with a minimum of 6-degree angle. The mirrors shall be operated independently with one switch. This mirror shall be mounted 70 inches from the ground (tire level) to the top of mirror head.
d. Control switches shall be mounted on the left side of the driver's seat on side console.
e. Both mirrors shall be mounted on swivel arms to prevent damage from automatic bus washers. Mirror arms shall be long enough so that the right side mirror can be viewed within the shadow of the windshield wiper. Arm shall be vibration free, possible 2-point attachment.

f. All mirror arms shall be as vibration resistant as possible. They shall be made and mounted as solid to the bus as possible. Small tubular arms are unacceptable.

1. Right Side Exterior Mirror

   The right side mirror shall be mounted according to Contractor's style and configuration. However, they shall be approved by the Purchaser before production. They shall also be mounted to provide a full range of vision from location in front of the right front wheel to beyond the rear of the bus. They shall not be mounted to doors and shall be mounted to have no vibration movement. They shall be convex.

2. Left Side Exterior Mirror

   The left side mirror shall be mounted on the outside left front corner of body as to give the operator a view of traffic alongside and beyond the bus. It shall be structure mounted and have a stiff arm to prevent vibration. Location of mirror shall be in accordance with Contractor style but approved by the Purchaser prior to production.

TS 49.5.2 Inside Mirrors

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

A flat, minimum 6-inch by 10-inch, interior rearview mirror shall be mounted ahead of, and above the operator's position to provide a general view of the interior of the bus. This mirror shall have a center support capable of supporting the weight of the mirror.

Other mirrors shall be provided to supplement the driver ability to observe passengers. With a full standee load, including standees in the vestibule, he/she shall be able to observe passengers in the front and rear stepwells, anywhere in the aisle, and in the rear seats. Inside mirrors shall not be in the line of sight to the right outside mirror.

Contractor may suggest a combination of mirrors and CCTV cameras. The configuration will be approved by the Purchaser.

Windows

TS 51. Windshield

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 deg., measured above the horizontal and excluding any shaded band. The vertically downward view shall permit detection of an object 3½ft high no more than 2 ft. in front of the bus. The horizontal view shall be a minimum of 90 deg. above the line of sight. Any binocular obscuration due to a center divider may be ignored when determining the 90 deg. requirement, provided that the divider does not exceed a 3 deg. angle in the operator's field of view. Windshield pillars shall not exceed 10 deg. of binocular obscuration. The windshield shall be designed and installed to minimize external glare as well as reflections from inside the bus.

The windshield shall be easily replaceable by removing zip-locks from the windshield retaining moldings. Bonded-in-place windshields shall not be used. Winglets may be bonded.

The windshield(s) shall be set in rubber glazing channels and shall be easily replaceable. Windshield(s) shall be angled sufficiently to reduce glare from the interior bus lighting. Each windshields shall be glazed with 1/4-inch laminated safety glass or equivalent conforming to the requirements of ANSI Z26.1 Test Grouping AS-1 and the recommended practices defined in SAE J673. Windshield(s) shall be tinted and sun glazed to meet FVMSS standards.

TS 52. Driver's Side Window

The driver's side window shall be the sliding type, requiring only the rear half of the sash to latch upon closing, and shall open sufficiently to permit the seated operator to easily adjust the street-side outside rearview mirror. When in an open position, the window shall not rattle or close during braking. This window section shall slide in tracks or channels designed to last the service life of the bus. The operator's side window shall not be bonded in place and shall be easily replaceable. The glazing material shall have a single- density tint.

The driver's view, perpendicular through operator's side window glazing, should extend a minimum of 33 in. (840 mm) to the rear of the heel point on the accelerator, and in any case must accommodate a 95th percentile male operator. The view through the glazing at the front of the assembly should begin not more than 26 in. (560 mm) above the operator's floor to ensure visibility of an under-mounted convex mirror. Driver's window construction shall maximize ability for full opening of the window.

The driver's side window glazing material shall have a ¼ in. nominal thickness laminated safety glass conforming to the requirements of ANSI Z26.1-1996 Test Grouping AS-2 and the recommended practices defined in SAE J673.

The design shall prevent sections from freezing closed in the winter. Light transmittance shall be 75 percent on the glass area below 53 in. from the operator platform floor. On the top-fixed-over-bottom-slider configuration, the top fixed area above 53 in. may have a maximum 5 percent light transmittance.

TS 53. Side Windows

The side window (and rear window, if application) areas shall be as large as possible to give the seated and standing passengers an unobstructed exterior view. Side windows shall have the look of a seamless or continuous window (hidden frame or flush "Euro-look")when viewed from exterior of the bus. All windows shall be ¼ inch Safety Glass or equivalent. It shall be unacceptable to have any glass bonded to the bus body or frame.

All glass shall be tinted to a minimum of 76% light transmission. SHGC and light transmission performance shall be defined by the National Fenestration Rating Council.

This style of window shall comply with FMVSS as well as DOT safety regulations and have window frames incorporated for strength. The window assembly shall be approved by the Purchaser before build.

A positive lock type emergency latch meeting FMVSS No. 217 regulations shall be furnished on each large window frame on the lower level. Each window shall have a permanent metal decal describing emergency window operation procedures. Location shall be reviewed and approved by the Purchaser.

Exterior of the windows shall withstand damage and scratching from use of the Purchaser's bus wash system. This would include, but not limited to soaps, spinning brushes, as well as hand brushes. All side windows shall be fixed in position, except as necessary to meet the emergency escape requirements.

Side windows shall be designed to prevent the entrance of air and water under all conditions (wind, rain, etc.) when windows are closed. The window seal rubber shall be installed so that passengers cannot remove it and rubber shall be of such quality to resist vulcanizing to other sash or sills.

All glazing material that is aft of the standee line shall be equipped with a three-layer laminated polyester film (3M or equivalent). Material shall be easily installed and removed without the use of specialized tools. Polyester film shall adhere to the window and be resistant to peeling, curling and discoloration by ultraviolet rays. The film shall withstand normal cleaning operations.

Heating, Ventilating And Air Conditioning

TS 54. Capacity and Performance

Upper deck and lower deck will be separate zones to maintain comfortable temperatures independently.

The bus climate control system shall be designed to provide passenger comfort by heating, cooling, dehumidifying and filtering the air that shall be force circulated within the bus. The system shall be a Thermo King Intelligair IV or equivalent. It shall be designed to maintain bus interior temperature to a minimum of 70 degrees F (heating mode) with a relative humidity of 50% or less at all locations in the bus, cooling to be able to maintain 68 degrees F, and function under all operating and climate conditions. System shall not require special tools to gain access, however shall be computer based as to adjustments, settings, and trouble shooting.

The HVAC unit shall be rear-mounted.

If bus profile is diesel, the bus shall have fully AC high-voltage electric-driven A/C system with full hermetic AC compressor, condenser fan, evaporator blower motors and brushless AC generators.

When the bus is operated in outside ambient temperatures of 95 to 115 °F, the interior temperature of the bus shall be permitted to rise 0.5°F for each degree of exterior temperature in excess of 95 °F.

When the bus is operated in outside ambient temperatures in the range of -10 to 10 °F, the interior temperature of the bus shall not fall below 55 °F while the bus is running on the design operating profile.

System capacity testing, including pull-down/warm-up, stabilization and profile, shall be conducted in accordance to APTA's *Recommended Practice* "Transit Bus HVAC System Instrumentation and Performance Testing."

Additional testing shall be performed as necessary to ensure compliance to performance requirements stated herein. The manufacturer shall submit test data substantiating the heating and ventilating system's ability to adequately comply with performance requirements under varying ambient and operating conditions. All test data shall show compliance with all federal, state and local requirements.

Engine temperature shall be within the normal operating range at the time of start-up of the cool-down test, and the engine speed shall be limited to fast idle, which may be activated by a driver-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 in. from the surface of the coil, shall be less than 45 °F above the condenser inlet air temperature. The appropriate solar load as recommended in the APTA "Recommended Instrumentation and Performance Testing for Transit Bus Air Conditioning System," representing 4 p.m. on August 21, shall be used. No passengers shall be on board, and the doors and windows shall be closed.

TS 55. Controls and Temperature Uniformity

The HVAC system excluding the driver's heater/defroster shall be centrally controlled with an advanced electronic/diagnostic control system with provisions for extracting/reading data. The system shall be compliant with J1939 Communication Protocol for receiving and broadcasting of data.

Total output of heating system shall be a minimum of 200,000 British thermal units (BTU's). Passenger heating units shall be a minimum 120,000 BTU's heater. A front heater and defroster, 65,000 BTU capacity, shall be located in the dash area to provide heat for the operator and to provide the air to defrost the windshields. Fan or fans shall draw air from body interior and/or outside through a control device and pass it through the heater core, and by means of suitable ducts deliver it over the windshield to act as a defroster and over the operator's pedals. A damper with its operating handle conveniently located for operation by the operator shall be installed in the duct to divert the air to both of the above mentioned locations. The damper control handle shall not be blocked by the fare box, transfer cutter bar or any other components.

Hot engine coolant water shall be delivered to the HVAC system driver's defroster/heater and other heater cores by means of an auxiliary coolant pump, sized for the required flow, which is brushless and seal-less having a minimum maintenance-free service life for both the brushless motor and the pump of at least 40,000 hours at full power. The auxiliary pump shall be installed to ensure circulation of heated water. Pump shall be energized only when the driver's heat or passenger's heat is on. The pump shall have shut off valves installed in the inlet and outlet sides of the pump. Climate control system shall be equipped with a water-circulating pump with a rated capacity of 15 gallons per minute.

The climate control system shall have the provision to allow the driver 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 driver.

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

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

TS 55.1 Auxiliary Heater

The climate control system shall have at least three (3) auxiliary unit type heaters with one (1) located in the driver's area and two (2) located in the passenger's area. If warm wall is available, it shall be incorporated into this system.

TS 56. Air Flow

Climate control system shall comply with the EPA inside clean air act by having fresh air introduction. This shall be documented from the CCS manufacturer.

The front heater and defroster shall provide air to windshield, driver, and to the forward portion of the passenger compartment. This air shall either be re-circulated or outside air circulated by two (2) centrifugal fans delivering 415 CFM each. The front heater core shall be rated at 65,000 BTU's. G. Two (2) dash- mounted fans with separate control switches running through the master switch shall be installed on the front dash in such a manner as to assist in the defrosting of the entire windshield, and shall be controlled by separate three position switches, (Off, Low, High).

Main heating core shall be rated at 120,000 BTU's. Heat shall be provided along the floor on both sides of the passenger compartment. The main heater core shall maintain 70 degree F mean temperature with an outside temperature of 0 degrees F. Main under floor blower motors shall be heavy-duty, ¾-horsepower, 2- speed with minimum output between 500 CFM and 800 CFM. Blower motors shall be shielded for dust and dirt in a filtered air plenum. Blowers shall only operate when generator is charging. Blowers shall direct warm air across all of the lower step areas to alleviate any snow or ice accumulation and to keep front door glass from fogging.

Heating vents shall be provided near the floor in the wheelchair securement areas.

TS 56.1 Passenger Area

Blower shall be of sufficient size to evenly distribute air without creating drafts or blowing excessively on any

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

Airflow may be reduced to 15 cfm per passenger (150 percent of seated load) when operating in the heating mode. The fans shall not activate until the heating element has warmed sufficiently to ensure at least 70 °F air outlet temperature. The heating air outlet temperature shall not exceed 120 °F under any normal operating conditions. Distribution of heated air to interior shall keep side windows free from frost and inside condensation.

The climate control blower motors and fan shall be designed such that their operation complies with the interior noise level requirements.

The air shall be composed of no less than 10 percent outside air. All fresh-air intakes shall positively preclude the ingress of any rainwater or obstructions from outside.

TS 56.2 Driver's Area

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

TS 56.3 Controls for the Climate Control System (CCS)

A control switch shall be provided at the driver's position to choose heating, climate control (automatic) or ventilating. A manual override switch for the HVAC system shall be located on the drivers' side control console. The climate control system shall be powered up as soon as a charging signal is received; it shall not take an operator to touch the control unit to start.

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

a. 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 Purchaser, an "on/off" switch shall be located to the right of or near the main defroster switch.

b. A manually operated control valve shall control the coolant flow through the heater core.

c. If a cable-operated manual control valve is used, then the cable length shall be kept to a minimum to reduce cable seizing. Heater water control valves shall be "positive" type, closed or open. The method of operating remote valves shall require the concurrence of the Purchaser's project manager.

d. Decals shall be provided, indicating "operating instructions" and "open" and "closed" positions.

TS 56.4 Driver's Compartment Requirements

A separate heating, ventilation and defroster system for the driver's area shall be provided and shall be controlled by the driver. Driver's heater-defroster shall operate independent of the passenger's climate control system. A driver's control switch shall provide for a high, low and off position of the blower. Defroster shall meet requirements of FMVSS 103.

The system shall meet the following requirements:

a. The driver's area shall have air outlet to ensure driver's comfort.

b. Approximately 20% outside air shall be mixed in with heated air. All fresh-air intakes shall positively preclude the ingress of any rainwater or obstructions from outside.

c. A manual operator's ventilator shall be installed in the front dash area to provide ample ventilation at operator's brake and accelerator pedal locations. The adjustment of this ventilator shall be easy and convenient to operate. Door shall be sealed against weather at all times when in closed position. A second fresh air ventilator shall be above the driver's position (windshield) to maximize airflow. Doors shall be sealed against weather at all times when in closed position.

d. Distribution of heated air to interior shall keep side windows free from frost and inside condensation. Adjustable ball vents or louvers shall be provided at the left of the driver’s position to allow direction of air onto the side windows.

e. 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.

TS 57. Air Filtration

Air shall be filtered before entering the AC system and being discharged into the passenger compartment. The filter shall meet the ANSI/ASHRAE 52.1 requirement for 5 percent or better atmospheric dust spot efficiency, 50 percent weight arrestance, and a minimum dust holding capacity of 120 g per 1000 cfm cell. Air filters shall be easily removable for service.

The front heater, defroster and passenger's heater shall have easily replaceable air inlet filters to protect the cores. Filtering media shall be fire-retardant, disposable type and provide good filtering efficiency. Air filters shall be cleanable.

TS 59. Maintainability

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

High and low refrigerant pressure electronic gauges to be located in the return air area.

Maintenance personnel shall be able to trouble shoot, change parameters, and monitor the system from a laptop computer.

Exterior Panels, Finishes And Exterior Lighting

TS 62. Exterior Design

The bus shall have a clean, smooth, simple design, primarily derived from bus performance requirements and passenger service criteria. The exterior and body features, including grilles and louvers, shall be shaped to facilitate cleaning by automatic bus washers without snagging washer brushes. Water and dirt shall not be retained in or on any portion or body feature to freeze or bleed out onto the bus after leaving the washer. The body and windows shall be sealed to prevent leaking of air, dust or water under normal operating conditions and during cleaning in automatic bus washers for the service life of the bus.

Exterior panels shall be sufficiently stiff to minimize vibration, drumming or flexing while the bus is in service.

When panels are lapped, the upper and forward panels shall act as a watershed. However, if entry of moisture into the interior of the bus 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 buses wheels shall be minimized on windows and mirrors.

All exterior panels shall be bonded or welded to the body frame.

Each Purchaser will discuss their graphic requirements and reserve the right to amend the graphic design as needed.

TS 62.1 Materials

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

Materials shall meet the following criteria:

a. All exterior side panels between window belt and rub-rail and rear of bus shall be 22-gauge galvanized steel, aluminum, and stainless steel or equivalent; treated and painted the Purchaser's colors.
b. Reinforced fiberglass and plastic materials may be considered for the basic body construction, except for replaceable panels or doors.
c. Chromium-plated trim pieces are not acceptable. Any bright metal exterior trims shall be stainless steel or anodized aluminum.
d. No sheet metal screws shall be permitted on body panels.

TS 62.2 Roof

Roof shall be of all fiberglass (or equivalent) construction in accordance with the manufacturer's standard and of sufficient strength and stiffness to prevent vibration, drumming or flexing in service. The lines of the roof shall be arched typed and shall present a pleasing symmetrical contour.

Special care shall be taken with the outside sheathing, roof, roof bonnets and the interior finish so that all kinks and buckles are removed before assembly and so that they present a true, smooth finish without grinding or cutting material below its standard thickness.

TS 62.3 Rubrails and Tree Guard

Rubrails composed of flexible, resilient materials shall be provided, if necessary, to protect both sides of the bus body from damage caused by minor, sideswipe accidents with automobiles. Rubrails shall have vertical dimensions of approximately 2 1/4inches with the centerline approximately thirty-four inches (34") above the ground.

Limb guards shall be mounted on the top front of the bus and in such a way to not come loose. This guard shall protect, both streetside and curbside corners, as well as all the way across the front to protect front upper mask assembly including all clearance and marker lights on the upper level.

TS 63. Pedestrian Safety

Exterior protrusions along the side and front of the bus greater than ½ in. and within 80 in. of the ground shall have a radius no less than the amount of the protrusion. The exterior rearview mirrors, cameras and required lights and reflectors are exempt from the protrusion requirement. Grilles, doors, bumpers and other features on the sides and rear of the bus shall be designed to minimize toeholds or handholds.

Exterior protrusions shall not cause a line-of-sight blockage for the driver.

TS 65. Rain Gutters

Rain gutters shall be provided to prevent water flowing from the roof onto the passenger doors and driver's side window. When the bus is decelerated, the gutters shall not drain onto the windshield, driver's side window, exterior mirrors or door boarding area. Cross-sections of the gutters shall be adequate for proper operation. Cross-section of the gutters shall be approximately .25 square inch.

TS 66. License Plate Provisions

Provisions shall be made to mount standard-size U.S./Canada license plates per SAE J686 on the front and rear of the bus. These provisions shall direct-mount or recess the license plates so that they can be cleaned by automatic bus-washing equipment without being caught by the brushes. The rear license plate provision shall be illuminated per SAE J587. No plate or holder provision is required.

TS 68. Splash Aprons

Splash aprons, made of 1/4 inch composition or rubberized fabric, shall be installed the full width of the bus on the rear of each wheel housing, projecting downward to a point approximately 3 inches above the ground. The full width splash apron may consist of 3-section design. The installation of the splash apron and the wheel housing design shall preclude the accumulation of dirt and ice. Contractor shall submit a description of the splash apron to be used. Other splash aprons shall be installed where necessary to protect bus equipment.

TS 69. Service Compartments and Access Doors

TS 69.1 Access Doors

Access doors shall be provided, where necessary, for the easy maintenance of equipment and safety of the public. This includes, but is not limited to the engine compartment, steering gear box, surge tank or radiator fill, side access to engine compartment (radiator etc.), A/C condenser, fuel door. No tools shall be required to gain access to any access door with exception for engine compartment, transmission compartment, radiator compartment, and radio compartment doors. T-key style tool is acceptable for these compartments.

Access doors shall be provided with positive hold open devices and corrosion resistant latches. Side access doors shall have flush type latches. Doors shall be hinged at the top or forward edge and shall be prevented from coming loose or opening during transit service and during bus washing operation. Doors shall be of a rugged construction and shall be capable of withstanding severe abuse. Interior access doors shall blend in with the appearance of the bus interior.

Access openings in the floor shall be avoided with the exception of access for the fuel tank sending unit and driveshaft. Any access openings in the floor, if required for maintenance, shall be sealed to prevent the entry of fumes, water, or dust, and shall be securely fastened with approved fasteners, and shall not create a tripping hazard.

All exterior access doors larger than 2 square feet in size shall be retained in the open and closed position by gas-filled springs or equivalent. Smaller access doors shall be retained in the open and closed position by methods approved by the Purchaser.

TS 69.1.1 Engine Compartment Access Door Exterior

When engine access door is open, it shall not obstruct the rear bus lights, or equivalent. A grab handle shall be provided to assist in the opening of the engine compartment door.

An access door, which requires no tools to gain access, for emergency workers to access to the "battery disconnect" shall be provided and it shall be labeled as such.

Compartment doors shall be sturdily constructed, well-fitted, and reinforced, where necessary, of material and finish harmonizing with other exterior features of the bus. Doors hinged at top shall be provided with heavy-

duty, gas filled lifts equipped with positive means of locking the doors in the open position. Small, spring- loaded access doors shall be provided to check and add engine oil and radiator coolant without necessity of opening a large compartment door.

TS 69.1.2 Engine Compartment Access Door Interior

A minimum of 3 access panels shall be provided to gain access to the engine compartment through the rear seat, or equivalent. Locations shall be left, center, and right sides under rear seat, or approved by the Purchaser.

TS 69.2 Roof Escape Hatches

Two emergency roof escape hatches shall be provided in each bus. One located in the front and one in the rear, (or approved by FMVSS and the Purchaser). The hatches shall have an extruded rubber seal around the opening, and shall be opened by pulling the release handle downward, or equivalent. Instruction decals shall be placed on the underside of the hatch.

If break glass style emergency exits are provided, a break glass hammer with retractable cord shall be provided at each and every location.

TS 69.3 Access Door Latch/Locks

Access doors larger than 100 sq. in. in area shall be equipped with corrosion-resistant flush-mounted latches or locks except for coolant and fuel fill access doors. All such access doors that require a tool to open shall be standardized throughout the bus and will require a nominal 5/16 in. square male tool or equivalent to open or lock.

TS 70. Bumpers

TS 70.1 General Design

Bumpers shall provide impact protection for the front and rear of the bus with the top of the bumper being 27 in., ±2 in., above the ground. Bumper height shall be such that when one bus is parked behind another, a portion of the bumper faces will contact each other. Bumpers shall be blended into the body with rounded and an appealing look. The exterior surface shall be discussed and viewed after award due to the body styling differences between manufacturers. Excessive gaps between bumper and the body and between modules shall be avoided.

TS 70.2 Front Bumper

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

Bumper shall Romeo Rim Help or equivalent.

Bike rack system, if applicable, shall not impede the headlights or turn signals in either the stowed position or lowered position. The rack system shall be stainless steel and plastic construction and it shall be protected from wash rack damage. The rack system shall have instruction decal as per the Purchaser's design. Bike rack shall not have to be removed for towing of the bus.

TS 70.3 Rear Bumper

No part of the bus, including the bumper, shall be damaged as a result of a 2 mph impact with a fixed, flat barrier perpendicular to the longitudinal centerline of the bus. The bumper shall return to its pre-impact shape within 10 minutes of the impact. When using a yard tug with a smooth, flat plate bumper 2 ft. wide contacting the

horizontal centerline of the rear bumper, the bumper shall provide protection at speeds up to 5 mph, over pavement discontinuities up to 1 in. high, and at accelerations up to 2 mph/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 lbs., at 4 mph parallel to or up to a 30 deg. angle to the longitudinal centerline of the bus. The rear bumper shall be shaped to preclude unauthorized riders standing on the bumper. The bumper shall not require service or maintenance in normal operation during the service life of the bus. The bumper may increase the overall bus length specified by no more than 7 in.

TS 70.4 Bumper Material

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

TS 71. Finish and Color

Bus exteriors shall be painted to the general graphic design of the Purchaser which include black, white and three additional color paints. Minor variations to this general graphic design scheme may be required in order to accommodate the specific styling or construction of buses. Any variations shall be approved by the Purchaser. Final design shall be provided during pre-production meeting.

All exterior surfaces shall be smooth and free of wrinkles and dents. All metals and exterior surfaces, including all wheel rims, shall be thoroughly cleaned and prepared by methods in accordance with the paint manufacturer's recommendations immediately before the first coat of the overall sealer is applied to ensure a proper bond between the basic surface and successive coats of original paint for the service life of the bus. Drilled holes and cutouts in exterior surfaces shall be made prior to cleaning, priming and painting, where possible, to prevent corrosion. The bus shall be painted prior to installation of exterior lights, windows, mirrors and other items that are applied to the exterior of the bus. Body filler materials may be used for surface dressing, but not for repair of damaged or improperly fitted panels.

Fiberglass shall be free of air, dry fiberglass chop, matt or roving.

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

- orange peel, fish eyes, and areas of no gloss
- blisters or bubbles appearing in the topcoat film
- chips, scratches or gouges of the surface finish
- cracks in the paint film
- craters where paint failed to cover due to surface contamination
- overspray
- peeling
- runs or sags from excessive flow and failure to adhere uniformly to the surface
- chemical stains and water spots
- dry patches due to incorrect mixing of paint activators
- buffing swirls

All exterior finished surfaces shall be impervious to diesel fuel, gasoline and commercial cleaning agents. Finished surfaces shall resist damage by controlled applications of commonly used graffiti-removing chemicals.

Proper adhesion between the basic surface and successive coats of the original paint shall be measured using an Elcometer adhesion tester as outlined in ASTM D4541-85. Adhesion shall be a minimum 300 ft.-lbs. 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 bus.

The exterior of the buses shall be finished with base coat/clear coat or equivalent. All primers, sealers, wax and grease removers, paint and any other systems used shall be of the same manufacturer to assure chemical bond, adhesion, overall gloss retention, and to assure full warranty by manufacturer and contractor. Finish coat thickness and application methods shall be as specified by the finish coat manufacturer. All bare metal treatment, primers, and sealers applied before the finish coat shall be approved as to material, thickness, and application by the manufacturer of the final finish. All surface preparations shall be similarly approved by the manufacturer of the final finish. No bare or exposed metal surfaces shall be showing on the exterior of the buses, exclusive of ornamentation, accessories, and bumpers. No contractor's name or insignia shall show on the exterior of the bus.

Purchasers will negotiate their own colors design at time of contract.

TS 72. Decals, Numbering and Signing

All work performance and services provided by the design-manufacturer under this contract and the final graphic work products shall become the property of the Purchaser. All reports, specifications, drawings, photographs, graphical representations, and electronic data pertaining to same, developed by the design-manufacturer or in conjunction with this contract, shall be surrendered to the Purchaser at time of initial payment of first order. If requested, this artwork will be provided to the Purchaser in digital formats that can be read, altered, or utilized on an office computer. The design-manufacturer expressly waives all copyright privileges to such information, and the Purchaser may use or modify same without any additional payment to the design-manufacturer. Any reuse of work prepared by the design- manufacturer shall be solely at the Purchaser's risk with no liability to the design-manufacturer. Any data used in, or developed as a result of, this contract shall be revealed to no other parties except the Purchaser, without the expressed consent of the Purchaser.

Monograms, numbers, overall graphic design and other special signing as specified by the Purchaser shall be supplied and installed by Contractor, at Contractor's cost, however all graphics and design shall be owned by the Purchaser at time of initial bus payment. Signs shall be durable and fade, chip, and peel resistant. Interior signs may be decals or pressure sensitive appliqués. Exterior numbers/graphic design shall be decals.

All materials and signs shall be subject to the Purchaser's approval. Contractors shall supply all exterior decals per the Purchaser's design. Street side shall mirror curb side. Roof bus numbers shall be installed by Contractor before delivery. They shall be 20 in. numbering reflecting the property bus number. Property bus numbers to be determined by pre-production meeting.

TS 72.1 Interior Decal List

The following table contains a tentative list of interior decals; others may be proposed by Purchasers or by the Contractor. Purchasers may negotiated changes to the interior decals listed below.

Table 13: Interior Decals				
Qty	**Decal Name**	**Size**	**Colors**	**Approx. Location**
TBD	Press To Signal	TBD	TBD	where needed
4	Maintain Firm Hand-hold While Bus is in Motion	108 mm wide x 133 mm High	red lettering, read border white background	Front and rear of both levels
1	Diagram for multiplex	TBD	OEM Standard	on inside of access door to electrical box
1	Do Not Place Items in the Area	TBD	TBD	on top driver's box, centered, facing ceiling
1	Emergency Equipment	TBD	TBD	on side of driver box above "Fire Extinguisher"
4	Camera symbols	TBD	TBD	Front and rear of both levels
4	Coach Number	TBD	TBD	Front and rear of both levels
2	Symbol for No Weapons, Smoking, Vaping, Eating, Drinking, and Radio Playing Prohibited	TBD	blue symbols white background red circle and cross	Front of bus on upper and lower deck
1	Bus Height [insert number]	40 mm wide x 30 mm high	black lettering, white background	In front of driver
1	VIN Plate	TBD	OEM Standard	near driver's area
2	Emergency Exit	TBD	OEM Standard	on each Hatch
1	Do Not Lean Against Door	TBD	TBD	on rear door glass panels, head-height
1	Exit	TBD	TBD	on access door above rear door, centered
2	Manual Exit Instructions	TBD	OEM Standard	at each door
1	Wheechair Ramp Operating Instructions (Small Print)	TBD	OEM Standard	on front bulkhead,above steering wheel, lower edge
1	Front Door Air Power On/Off	TBD	OEM Standard	on outside wall, in driver area near floor

Table 13: Interior Decals				
Qty	**Decal Name**	**Size**	**Colors**	**Approx. Location**
1	In Case of Fire 1. Pull Locking Pin, 2. Push Red Fire Button	TBD	OEM Standard	on driver side panel, side facing
1	Stand Behind Line while Bus is in Motion	108 mm wide x 133 mm high	red lettering, red border, white panel	On staircase partition panel (fwd)
1	Fire Extinguisher Symbol	5” x 5” approx-imate size	red symbol, white back-ground	At fire extinguisher lo-cation
1	Seated Passengers Only on Upper Deck	TBD	TBD	Stairwell near lower deck
1	Prohibited Area	108 mm wide X 47 mm high	red lettering, red border white background	On staircase partition
1	Staircase warning	144 mm wide x 210 mm high	black lettering, red symbol, white back-ground, and black	Staircase wall border
1	Use Handrails for Safety	157 mm wide x 57 mm High	red lettering & border white background	On step riser at eye level from lower level
1	Watch Your Head	282 mm wide x 40 mm high	red lettering red border and white background	On pulpit adjacent to 1st step above head
1	Low Ceiling 5’7”	177 mm wide x 67 mm high	black/red lettering, red border, white back-ground	Upper deck rear grp seat/decency panel
2	Mobility Device Se-curement Instructions (Small Print)	TBD	OEM Standard	under side of dual aisle-facing seats in wheel-chair area
2	Warning Use of this Securement System in a Manner Inconsistent with These Instruc-tions May Result in Personal Injury or Death	TBD	OEM Standard	underside of double aisle facing wheelchair area seats
4	Please Allow Seniors and Persons with Dis-abilities to Use the Seat When Requested	Per ADA stand-ards	TBD	on window below tran-som above side facing seats in wheelchair ar-ea and on side wall over first forward facing seats

Table 13: Interior Decals				
Qty	**Decal Name**	**Size**	**Colors**	**Approx. Location**
TBD	Window Emergency Exit instructions	TBD	OEM Standard	for each exit window location
20	Pull to Close	93 mm wide x 20 mm High	white letters and border, clear background	On opening passenger windows
1	Emergency Exit, Pull Out and Down	TBD	OEM Standard	on corner pillar of driver window

TS 72.2 Passenger Information

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

Requirements for a public information system in accordance with 49 CFR shall be provided.

TS 73. Exterior Lighting

All exterior lights shall be designed to prevent entry and accumulation of moisture or dust. Lamps, lenses and fixtures shall be interchangeable to the extent practicable. Light lenses shall be designed and located to prevent damage when running the bus through an automatic bus washer.

All exterior lights shall be LED and shall meet State and Federal Department of Transportation requirements. All lens colors shall comply with all federal, state, and local regulations. All lenses shall have smooth outside surfaces to prevent collection of dirt and/or other accumulation. All exterior lights shall be able to be tested by pushing both turn signal switches down at the same time. This shall activate all exterior lights in test mode for operators to check on walk-around. This test shall be on timers to go to normal operation after a two (2) minute time period or if the bus is put into gear.

1. Headlamps

   Headlamps required shall be equipped with high and low beam controlled from foot switch on floor that is sealed and protected from moisture, the foot switch shall be located to the left approximately 6 inches behind the left turn signal switch. Sealed beam units shall have a low beam life rating of 600 hours minimum. Headlamps shall be designed for ease of replacement. Standard OEM headlight installation shall be provided in accordance with federal regulations.

   Headlamps shall incorporate a daytime running light feature. Headlamps shall be LED/halogen, sealed beam.

2. Door Light

   White LED Lamps at the front and rear passenger doorways (if applicable) shall comply with ADA requirements and shall activate only when the doors open. These lamps shall illuminate the street surface to a level of no less than 2 foot-candle for a distance of 3 ft. outward from the outboard edge of the door threshold. The lights may be positioned above or below the lower daylight opening of the windows and shall be shielded to protect passengers' eyes from glare.

3. Directional Signals

Directional signals shall meet all federal, state and local motor bus standards. Directional signals shall be operated by foot control switches to the left of the steering column. Also furnished shall be two (2) amber directional lights on each side of bus with metal protective shields, located one (1) above rear duals, and one (1) above front axle, light assembly shall be DELPHI #911062 with Vulcan Guard #2456692 or equivalent.

4. Hazard Warning

   A hazard-warning switch shall be provided to simultaneously flash the directional lights at the front, rear, sides, and dash indicators of the bus. The hazard-warning switch shall be located on the driver's control panel. The switch shall be easily recognizable. If toggle type, switch shall be at least one-half inch longer than other switches, and shall be mounted as far forward as possible. The hazard-warning switch shall overrule the manual directional switch. The indicator lamps on the dash shall flash when hazard signals are flashing. When the 4-ways and/or turn signals are operating, an audible alarm shall sound indicating the signals are on; the audible tones shall be different in sound between the turn signals and 4-ways. Hazard switch location shall be approved by the Purchaser.

   Two hazard lamps at the rear of the bus shall be visible from behind when the engine service doors are opened.

5. Directional Signals

   Front directional signals shall be minimum 4 in. amber. Rear directional signals shall be a minimum of 4 inches amber. Turn-signal lights shall be provided on the front, rear, curb and street sides of the bus in accordance with federal regulations.

6. Marker Lights

   A minimum of four (4) LED marker lights shall be installed, one on each upper corner of the body. The two (2) front fixtures shall have amber-colored lenses and the rear fixtures shall have red-colored lenses. All exterior marker and identification lights shall be recessed or metal shielded to protect from tree limb damage.

7. Clearance Lights

   A minimum of three (3) LED light fixtures shall be mounted on approximately 6-inch centers, near the top of the roof and centered on the body centerline, on the front of the bus with amber lenses and on the rear of the bus with red lenses. All exterior clearance and identification lights shall be recessed or metal shielded to protect from tree limb damage.

8. Reflectors

   Reflectors at the front, rear, and on each side of the bus shall be provided, with amber front and red rear.

9. Rear Lamps

   In addition to directional signals, rear lamps shall consist of 4 in. red combination stop/tail lights. The rear tail-lights shall be LED style and shall be mounted with nutserts for ease of removal.

10. Brake Lights

    Bus shall include red, high and center mount brake lamp(s), also known as a LED Cyclops, along the backside of the bus in addition to the lower brake lamps required under FMVSS. The high and center mount brake lamp(s) shall illuminate steadily with brake application. Its location shall not interfere with the advertising panels. Size and location shall be approved by the Purchaser.

11. Back Up Lights/Signal

    Two (2) LED back-up lights shall be provided. An approved audible back-up alarm shall be initiated whenever bus is in reverse gear. Alarm model and specification shall be approved by the Purchaser.

12. Kneeling Lamp

    A warning light shall be mounted at front door opening and shall be lit upon activation or deployment of the wheelchair ramp or the kneeling function. A concurrent audible reverse operation warning shall conform to SAE Recommended Practice J994 Type C or D.

Interior Panels And Finishes

TS 74. Interior General Requirements

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 operational conditions.

Interior surfaces more than 10 in. below the lower edge of the side windows or windshield shall be shaped so that objects placed on them fall to the floor when the bus is parked on a level surface.

All interior surfaces must be designed to withstand regularly scheduled cleaning using industrial grade cleaners.

TS 75. Interior Panels and Lighting

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. Interior panels are required to meet FMVSS 302.

TS 75.1 Panels

TS 75.1.1 Ceiling Panels

Ceiling trim panels and sections between large side windows down to the bottom of the window openings shall be melamine, consoweld, or equivalent with grey carpeting adhered to it. Thickness shall be no less than .1 in., and applied in sections with trim strips covering panel joints. Ceiling panels shall be installed with no droop or buckling across width of the panels. All interior panels and moldings will be designed to withstand all levels of humidity with temperature variations from 0 deg. Fahrenheit to 200 deg. Fahrenheit, without failure.

TS 75.1.2 Side Panels

Lower side wall trim panels shall be melamine, or equivalent applied in sections with stainless steel or anodized aluminum trim strips covering panel joints. Horizontal trim molding shall cover the top of the side wall trim at the base of the side windows. Sidewall panels shall be firmly attached to prevent panels from buckling, drumming or flexing and shall be secured without loose edges. The color and texture of the panels shall be determined before production.

TS 75.1.3 Rear Bulkhead

The interior side of the rear bulkhead shall be contoured in such a way that it shall not have a tendency to collect trash. The panel, or sections thereof, shall be removable to service components located in the engine compartment. The main rear bulkhead shall be covered in seating material or grey carpeting and shall be determined at time of Pre-production.

TS 75.1.4 Driver Area Configuration

A barrier or bulkhead shall be provided behind the driver area. Location and shape must permit full seat travel and reclining possibilities. The panel should be properly attached to minimize noise and rattles. The finish of the barrier should complement the other interior finishes. All Contractors are required to submit sketches, photographs and/or drawings of the requested barrier.

TS 75.1.5 Modesty Panels

Sturdy divider panels constructed of durable, unpainted, corrosion-resistant material complementing the interior shall be provided to act as both a physical and visual barrier for seated passengers.

Design and installation of modesty panels located in front of forward-facing seats shall include a handhold or grab handle along 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 1½ in. above the floor. Panels forward of longitudinal seats shall extend to below the level of the seat cushion. Dividers positioned at the doorways, where applicable, shall provide no less than a 2½ in. clearance between the modesty panel and a fully open, inward opening door, or the path of a deploying flip-out ramp to protect passengers from being pinched. Modesty panels installed at doorways shall be equipped with grab rails if passenger assists are not provided by other means.

The modesty panel and its mounting shall withstand a static force of 250 lbs. applied to a 4 × 4 in. area in the center of the panel without permanent visible deformation.

TS 75.2 Bulkheads

TS 75.2.1 Front End Dash

The entire front end of the bus shall be sealed to prevent debris accumulation behind the dash and to prevent the driver's feet from kicking or fouling wiring and other equipment. The front end shall be free of protrusions that are hazardous to passengers standing at the front of the standee line area of the bus during rapid decelerations. Paneling across the front of the bus and any trim around the driver's compartment shall be formed metal or composite material. Composite dash panels shall be reinforced as necessary, vandal- resistant and replaceable. All colored, painted and plated parts forward of the driver's barrier shall be finished with a surface that reduces glare. Any mounted equipment must have provision to support the weight of equipment.

TS 75.2.2 Rear Bulkhead

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

The rear bulkhead paneling shall be contoured to fit the ceiling, 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 liter being thrown or drawn through the grille. If it is necessary to remove the panel to service components located on the rear bulkhead, then the panel shall be hinged or shall be able to be easily removed and replaced. Grilles where access to or adjustment of equipment is required shall be heavy duty and designed to minimize damage and limit unauthorized access.

TS 75.2.3 Headlining

Ceiling panels shall be made of durable, corrosion resistant, easily cleanable material. Headlining shall be supported to prevent buckling, drumming or flexing and shall be secured without loose edges. Headlining materials shall be treated or insulated to prevent marks due to condensation where panels are in contact with metal members. Moldings and trim strips, as required to make the edges tamperproof, shall be stainless steel, aluminum or plastic, colored to complement the ceiling material. Headlining panels covering operational equipment

that is mounted above the ceiling shall be on hinges for ease of service but retained to prevent inadvertent opening.

TS 75.3 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.

TS 75.4 Insulation

Any insulation material used between the inner and outer panels shall minimize the entry and/or retention of moisture. Insulation properties shall be unimpaired during the service life of the bus. Any insulation material used inside the engine compartment shall not absorb or retain oils or water and shall be designed to prevent casual damage that may occur during maintenance operations.

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

Roof and sidewalls shall be insulated with minimum 2 in. thick, medium density fiberglass compressed on installation or a hardened Styrofoam with similar density. Sidewall insulation shall be encased in waterproof envelopes. All Contractors shall submit the R-rating for insulation being used.

Complete rear bench seat area shall be heavily insulated for both noise and heat protection with fiberglass blankets or equivalent. Thickness and type of fiberglass shall be as follows:

a. Under rear, cross-seat, riser and rear cross-seat back shall be a minimum total of 1 ½-inch thick, high-density fiberglass blankets. Cover panel behind rear cross-seat shall be 1-inch thick foamed polyurethane with Mylar facing. Area behind and below rear window shall be 2-inch thick, medium density fiberglass with ¾-inch thick, heavy density, fiberglass mat cemented to the inner face of the fiberglass rear window.
b. If a different system or material is to be used, it shall NOT be of Polyurethane materials and shall be approved by the Purchaser prior to production.

TS 75.5 Floor Covering

The floor covering shall have a non-skid walking surface that remains effective in all weather conditions. The floor covering, as well as transitions of flooring material to the main floor and to the entrance and exit area, shall be smooth and present no tripping hazards. Seams shall be sealed/welded per manufacturer's specifications.

Any areas on the floor that are not intended for standees, such as areas "swept" during passenger door operation, shall be clearly and permanently marked.

The floor shall be easily cleaned and shall be arranged to minimize debris accumulation.

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

Flooring material should cover the floor throughout the bus. The floor covering shall closely fit the sidewall in a fully sealed butt joint or extend to the top of the cove.

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 Purchaser 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.

Any irregularities in the flooring or elevation of the floor should be identified clearly in the bid submitted.

The floor aisle shall be covered with one-piece (as much as possible, and welded joints where it cannot be accomplished) 2.7 mm, non-skid, sanded back, flooring material for all of the bus floor sections. This flooring material shall be Altro Transflor or equivalent. Color shall be provided prior to manufacture.

Entrance and rear step treads shall include integral molded yellow noses on stainless steel metal backing. Backing shall be totally enclosed in rubber or equivalent.

A transverse standee line shall be provided at the aft end of the front door entrance plate. The standee line shall be white and approximately 2 in. wide and shall extend across the bus aisle. Stepwell tread shall have a non-skid/non-slip covering or coating. The color and pattern shall be consistent with the remaining floor covering.

The floor under the seats shall extend up the sides of the body approximately 3 inches. The floor covering shall be 2.7 mm thick, sanded back, smooth top flooring material as utilized throughout the bus.

The operator's platform areas shall be covered with the same flooring material used throughout the bus interior.

All step edges, thresholds, and the boarding edge of wheelchair ramps shall be stainless steel construction with minimum thickness 5/16 rubber covering and 4 inch yellow nosing.

TS 75.6 Interior Lighting

The light source shall be located to minimize windshield glare, with distribution of the light focused primarily on the passengers' reading plane while casting sufficient light onto the advertising display. The lighting system may be designed to form part of or the entire air distribution duct.

The lens material shall be translucent polycarbonate. Lenses shall be designed to effectively "mask" the light source. Lenses shall be sealed to inhibit incursion of dust and insects yet be easily removable for service. Access panels shall be provided to allow servicing of components located behind light panels. If necessary, the entire light fixture shall be hinged. Light fixtures shall be front-lighted and dimmable.

TS 75.6.1 Passenger Compartment

LED lighting shall be installed in the cove area on both sides and along the total length of the bus on both levels. Lighting fixture shall not compromise the minimum interior headroom. The lenses shall be of the small rib design to help disperse light evenly. On the lower deck, toward the operator, the lenses shall have a blue tint to help minimize windshield glare.

The power for these LED lights shall be programmable through the PLC system. Programming of interior lighting will be discussed and determined at pre-production meeting. Interior lights shall not be controlled through the run switch and shall be operative without the engine running for a specified length of time. In night position, first and second lamps on both street side and curbside, lower level shall operate only when front door is in the open position.

TS 75.6.2 Driver's Area

One (1) driver's compartment light lamp shall be mounted above steering wheel to illuminate entire driver's area. Switch shall be rheostat-controlled and situated with other interior lighting switches on driver's side control

console. Driver's light shall have full range of dimming from light "out" to "bright".

TS 75.6.3 Seating Areas

Passenger service modules mounted on the ceiling cove available at all passenger seat locations shall include individually controlled and adjustable LED passenger reading lights. These shall have all replaceable parts such as bulbs, lenses, and switches. They shall be equipped with LED style bulbs and lenses to defuse the light such that it may be easily be used for reading. A stop request button, red in color, at each seated position shall be provided. These two systems may be incorporated into a single panel if desired.

Passengers utilizing the securement systems shall be provided identical amenities as provided for all other passengers. Separate and independent notification will be provided on the dashboard indicator panel for stop request notification from securement positions.

TS 75.6.4 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.

TS 75.6.5 Step Lighting

Step lighting for the intermediate steps between lower and upper floor levels shall be a minimum of 5 foot-candles and shall illuminate in all engine run positions. The stepwell lights shall be activated only when the doors are in an open position. Ground surface for a distance of 3 feet from bottom step edge outward in all directions shall be illuminated to a minimum level of 2 foot-candles light source. Stepwell lights shall be shielded to prevent light from directly shining into passenger or driver's eyes.

Light fixtures shall be LED and totally enclosed, splash proof, designed to provide ease of cleaning as well as lamp and housing removal and shall not be easily removable by passengers. Stepwell lights shall be protected from damage caused by passenger kicking the lenses or fixtures and shall not be a hazard to passengers.

TS 75.6.6 Ramp Lighting

Exterior and interior ramp lighting shall comply with federal regulations.

Passenger Accommodations

TS 76. Passenger Seating

TS 76.1 Arrangements and Seat Style

The passenger seating arrangement in the bus shall be such that seating capacity is maximized and in compliance to the following requirements. Passenger seats shall be arranged in a transverse, forward-facing configuration, except at the wheel housings, where aisle-facing seats may be arranged as appropriate with due regard for passenger access and comfort. Other areas where aisle-facing seats may be provided are at wheelchair securement areas and platforms (such as for fuel tank storage space). Rear-facing seats should be limited and may be allowed if approved by the Purchaser.

All materials, as applicable shall conform to the flammability and smoke emission standards in accordance with the DOT and FTA Recommended Fire Safety Practices for Transit Bus and Van Material Selections as contained in the Federal Register, Volume #58, #201 dated Wednesday, October 20, 1993 or as currently amended.

Passenger seating shall be a combination of Lazzerini Mete or equivalent. All passenger seating shall be covered with a high standard fabric for vandal resistant and or damage hiding characteristics.

Contractor shall provide a full technical description of seat arrangement proposed, including dimension for hip to knee room, spacing, and side view. Final seating plan shall be determined at the pre-production meeting.

Other than seating in wheelchair area which is addressed in Section TS 81 Accessibility Provisions, seating shall meet the following general guidelines:

a. All passenger seats shall be equipped with a hand-hold on the aisle side and shall be certified as having passed the testing requirements as specified in the FTA White Book regarding the purchase of Advanced Design Buses and all test results and documentation shall be submitted to the Purchaser.

b. During a 10g deceleration, the HIC number shall not exceed 400 for passengers ranging in size from a six (6) year old child through a 95th-percentile male. The minimum radius of any part of the seat back, handhold, or modesty panel in the head or chest impact zone shall be a nominal ¼ inch.

c. Rear seats shall be spaced out evenly, and hinged to provide easy access to engine compartment.

d. All concealment areas behind and between the seats shall be closed out for security purposes to eliminate the ability for any placement of devices or objects. The seats, under all conditions of occupancy, shall be of a design to minimize dirt catching projections.

e. Under seat area will be properly dressed to facilitate cleaning; projections or ledges are not permitted. Space in back of, between, and at the ends of seats shall be such as to prevent the accumulation of rubbish other debris.

f. Seats shall be the cantilever style throughout both levels of bus, where applicable. Where cantilever cannot be installed, then pedestal style shall be substituted. All seat sub-frames should be mounted without stress or strain, and in no case shall seats be installed so that any passenger extremity can be caught. All fastenings shall be tamper-proof and neat in appearance. Recessed seat tracks for transverse seats shall be heavy-duty anodized aluminum; side wall seat rails shall be anodized aluminum.

g. No obstructions will be permitted which might narrow seating ability. Height of seat from floor will not exceed seventeen and one-half (17½) inches for transverse seats, nineteen (19) inches for settee and flip-up seats, and seats over wheel wells shall not exceed twenty (20) inches. Deviation in seat height from floor will be permitted for proper seat alignment to belt rail.

TS 76.2 Padded Inserts/Cushioned Seats

The passenger seats, seat back handhold, and upper rear surface of the modesty panels located immediately forward of transverse seats shall be padded and/or constructed of energy absorbing materials.

Seating and interior trim shall have features to improve passenger comfort. The seat cushion and back shall be padded with a cellular foam product and be no less than ½ in. thick in areas contacted and loaded by passengers in the normal seated position and shall be covered with vinyl and/or fabric material.

Seats, back cushions and other pads shall be securely attached and shall be detachable by means of a simple release mechanism so that they are easily removable by the maintenance staff but not by passengers. To the extent practicable, seat cushions and pads shall be interchangeable throughout the bus. Materials shall have high resistance to tearing, flexing and wetting.

TS 76.3 Hip-to-Knee Room

Hip-to-knee room measured from the center of the seating position, from the front of one seat back horizontally across the highest part of the seat to a vertical surface immediately in front, shall be a minimum of 27 in. At all seating positions in paired transverse seats immediately behind other seating positions, hip-to- knee room shall be no less than 27 in.

TS 76.4 Foot Room

Foot room, measured at the floor forward from a point vertically below the front of the seat cushion, shall be no

less than 14 in. Seats immediately behind the wheel housings and modesty panels may have foot room reduced.

TS 76.5 Aisles

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

TS 76.6 Structure and Design

The seat assembly shall withstand static vertical forces of 500 lbs. applied to the top of the seat cushion in each seating position with less than ¼ in. permanent deformation in the seat or its mountings. The seat assembly shall withstand static horizontal forces of 500 lbs. evenly distributed along the top of the seat back with less than ¼ in. permanent deformation in the seat or its mountings. The seat backs at the aisle position and at the window position shall withstand repeated impacts of two 40-lb sandbags without visible deterioration. One sandbag shall strike the front 40,000 times and the other sandbag shall strike the rear 40,000 times. Each sandbag shall be suspended on a 36 in. pendulum and shall strike the seat back 10,000 times each from distances of 6, 8, 10 and 12 in. Seats at both seating positions shall withstand 4000 vertical drops of a 40-lb sandbag without visible deterioration. The sandbag shall be dropped 1000 times each from heights of 6, 8, 10 and 12 in. Seat cushions shall withstand 100,000 randomly positioned 3½ in. drops of a squirming, 150-lb, smooth-surfaced, buttocks-shaped striker with only minimal wear on the seat covering and no failures to seat structure or cushion suspension components.

TS 76.7 Construction and Materials

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.

TS 77. 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 standee. Starting from the entrance door and moving anywhere in the bus and out the exit door, a vertical assist shall be provided either as the vertical portion of the seat back assist or as a separate item so that a 5th-percentile female passenger may easily move from one assist to another using one hand and the other without losing support.

Full grip stanchions and grab-rails shall be provided for the safety of the standees and for ingress and egress. Grab-rails and stanchions shall be 1¼ to 1½ inches in diameter and be made of textured, stainless steel that forms to the hand or utilizes a padded hand hold. Stanchions and grab-rails shall have at least 1½ inches of knuckle clearance.

Grab-rails and stanchions shall be properly supported and held in place according to industry standards. Fittings and fasteners used shall be stainless steel.

A diagram of proposed stanchion locations with proposed passenger seating diagram shall be submitted. Number and location of stanchions shall be subject to approval by the Purchaser. All stanchions and grab rails must comply with any ADA requirements where applicable.

Stanchions and grab-rails shall be designed as follows:

a. Handholds on seats shall be designed to allow gripping in a way to maximize the strength of the passenger's hold. A vertical section of the handhold typically provides greater holding ability than diagonal or horizontal.
b. Grab rail ends shall terminate at ceiling connections or in elbows, and no exposed ends shall exist.
c. Vertical stanchions shall be placed to aid passenger safety during standing-load operation.
d. Stanchions shall be placed on aisle side at all barriers, from ceiling to floor.
e. Diagonal grab-rails shall be installed on both sides of the front door.
f. Stanchions and grab-rails at top of stepwells in stepwell area shall be installed to aid ingress and egress.
g. A horizontal passenger assist across the front of the bus to prevent injuries on the farebox or windshield in the event of a sudden stop shall be installed and shall allow passengers to lean against it for assistance and security while paying a fare.
h. Floor to ceiling, or approved design of, stanchion shall be provided at the rear of the lower level to assist passengers on and off of the rear settee seating area without restricting passenger movement.
i. The bus stanchions shall not impede or interfere with wheelchair footrests as per ADA requirements.
j. Color-coordinated handhold straps to be installed on grab rails running length of bus. The material shall be PVC or equivalent and shall have a positive fastening system. A minimum of 20 shall be placed throughout the lower deck.
k. Stanchions near the rear door shall have stop request buttons mounted on them.

The forward-most vertical stanchions on either side of the aisle immediately behind the driver's area shall be powder-coated black. Stanchions and assists near the front door must not introduce glare in the windshield; assists below the level of the windshield including door assists will be powder-coated yellow. Stanchions/assists at the level of the windshield or higher must be stainless steel. Vertical stanchion and diagonal stanchions/assists (such as in doorways or stairwells will be powder-coated yellow. Horizontal assists (including those on barriers) shall be stainless steel.

TS 77.1 Assists

Excluding those mounted on the seats and doors, the assists shall have a cross-sectional diameter between 1¼ and 1½ in. or shall provide an equivalent gripping surface with no corner radii less than ¼ in. All passenger assists shall permit a full hand grip with no less than 1½ in. of knuckle clearance around the assist. Passenger assists shall be designed to minimize catching or snagging of clothes or personal items and shall be capable of passing the NHTSA Drawstring Test.

Any joints in the assist structure shall be underneath supporting brackets and securely clamped to prevent passengers from moving or twisting the assists. Seat handholds may be of the same construction and finish as the seat frame. Door-mounted passenger assists shall be of anodized aluminum, stainless steel or powder-coated metal. Connecting tees and angles may be powder-coated metal castings. Assists shall withstand a force of 300 lbs. applied over a 12in. lineal dimension in any direction normal to the assist without permanent visible deformation. All passenger assist components, including brackets, clamps, screw heads and other fasteners used on the passenger assists shall be designed to eliminate pinching, snagging and cutting hazards and shall be free from burrs or rough edges.

TS 77.2 Front Doorway

Front doors, or the entry area, shall be fitted with ADA-compliant assists. Assists shall be as far outward as practicable, but shall be located no farther inboard than 6 in. from the outside edge of the entrance step and shall be easily grasped by a 5th-percentile female boarding from street level. Door assists shall be functionally continuous with the horizontal front passenger assist and the vertical assist and the assists on the wheel housing or on the front modesty panel.

TS 77.3 Vestibule

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

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

TS 77.4 Rear Doorway

Vertical assists that are functionally continuous with the overhead assist shall be provided at the aisle side of the transverse seat immediately forward of the rear door and on the aisle side of the rear door modesty panel(s). Passenger assists shall be provided on modesty panels that are functionally continuous with the rear door assists. Rear doors, or the exit area, shall be fitted with assists having a cross-sectional diameter between 1¼ and 1½ in. or providing an equivalent gripping surface with no corner radii less than ¼ in., and shall provide at least 1½ in. of knuckle clearance between the assists and their mounting. The assists shall be designed to permit a 5th-percentile female to easily move from one assist to another during the entire exiting process. The assists shall be located no farther inboard than 6 in. from the outside edge of the rear doorway step.

TS 77.5 Overhead

Except forward of the standee line and at the rear door, a continuous, full-grip, overhead assist shall be provided. This assist shall be located over the center of the aisle seating position of the transverse seats. The assist shall be no less than 70 in. above the floor. (repeat)

Overhead assists shall simultaneously support 150 lbs. on any 12in. length. No more than 5 percent of the full grip feature shall be lost due to assist supports.

TS 77.6 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 in. apart or functionally continuous for a 5th percentile female passenger.

TS 77.7 Wheel Housing Barriers/Assists

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

TS 78. Passenger Doors

Doorways will be provided in the locations and styles as follows. Passenger doors and doorways shall comply with ADA requirements. In closed position front entrance and rear exit doors shall fit snugly against bus body and bottom step to prevent drafts and intrusion of dust, water, ice, and snow. All doors shall be controlled from a five (5) position single lever door control valve with a handle operating in a horizontal plane.

If air-powered, the door system shall operate per specification at air pressures between 90 and 130 psi.

TS 78.1 Front door

Door shall be forward of the front wheels and under direct observation of the driver.

The front entrance door shall be equal width, twin leaf inward opening glider door. The doors shall be equipped with framed glass (rubber glazed) with concealed inner frame. The door shall have a sensitized leading edge rubber on door wings. The door wings shall be supplied powder-coated in a black semi-matt finish. Door shall have one piece glazing for the length of the door, to allow grab rail clearance for wheelchair ramp system. The door shall be full air-operated with Vapor Corporation, or equivalent, pneumatic door engine and controls with a shut-off valve. Door operating levels shall be splined to the shafts. The front entrance door opening width between wings shall be a minimum of 46 inches and 51 inches between drive tube centers. The front doors shall have a minimum vertical open clearance of seventy-six (76") inches minimum. The door shall not be able to slam open or slam close under any condition.

TS 78.2 Rear Door

The rear door located on the curbside just ahead of the rear wheels shall be equal-width plug doors fitted flush with the exterior body. The doors shall have a framed glass (rubber glazed) with concealed inner frame. A recessed finger grip will be provided at the bottom of each door wing to ensure emergency “manual open” operation in the event of pneumatic failure. Operated by Vapor or equivalent, and a two (2") inch extruded rubber edge on each door section that overlaps by at least one-half (½") inch. Two (2") inch extruded rubber edge on each door section must also utilize sensitive edge capability. The door opening shall be a minimum of 45 inches between drive tube centers and a clear opening of 41 inches. Door operating levers shall be splined to the shafts. The rear exit doors shall have a minimum vertical open clearance of seventy six (76") inches minimum. Door system shall monitor speed of bus and not allow the doors to operate while in motion at or over (3) three MPH. speed sensor.

TS 78.3 Door Glazing

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

The front door panel glazing material shall have a nominal ¼ in. thick laminated safety glass conforming with the requirements of ANSI Z26.1 Test Grouping 2 and the recommended practices defined in SAE J673. Glazing material in the rear doorway door panels shall be defined by the Purchaser.

TS 78.4 Door Projection

The exterior projection of the front doors beyond the side of the bus shall be minimized and shall not block the line of sight of the rear exit door via the curbside mirror when the doors are fully open. The exterior projection of both doors shall be minimized and shall not exceed 14 in. during the opening or closing cycles or when doors are fully opened.

Projection inside the bus shall not cause an obstruction of the rear door mirror or cause a hazard for standees.

TS 78.5 Door Height Above Pavement

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

TS 78.6 Closing Force

Closing door edge speed shall not exceed 12 in. per second, and opening door speed shall not exceed 19 in.

per second. Power doors shall not slam closed under any circumstance, even if the door is obstructed during the closing cycle. If a door is obstructed during the closing cycle, the pressure exerted on the obstruction shall not increase once initial contact has been made.

Doors closed by a return spring or counterweight-type device shall be equipped with an obstruction-sensing device that, at a minimum, alerts the driver if an obstruction is detected between the closing doors. Doors closed by a return spring or counterweight type device, when unlocked, shall be capable of being pushed to the point where the door starts to open with a force not to exceed 25 lbs. applied to the center edge of the forward door panel.

Whether or not the obstruction-sensing system is present or functional, it shall be possible to withdraw a 1½ in. diameter cylinder from between the center edges of a closed and locked door with an outward force not greater than 35 lbs.

Power-close rear doors shall be equipped with an obstruction-sensing system such that if an obstruction is within the path of the closing doors, the doors will stop and/or reverse direction prior to imparting a 10-lb. force on 1 sq. in. of that obstruction.

TS 78.7 Actuators

Doors shall open or close completely in not more than 3.5 seconds from the time of control actuation and shall be subject to the closing force requirements.

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

Door actuators and associated linkages shall maximize door holding forces in the fully open and fully closed positions to provide firm, non-rattling, non-fluttering door panels while minimizing the force exerted by the doors on an obstruction midway between the fully open and closed positions.

The rear door actuator(s) shall be under the complete control of the bus operator and shall open and close in response to the position of the driver's door control.

Doors that employ a "swing" or pantograph geometry and/or are closed by a return spring or counterweight-type device shall be equipped with a positive mechanical holding device that automatically engages and prevents the actuation mechanism from being back-driven from the fully closed position. The holding device shall be overcome only when the driver's door control is moved to an "Exit Door Enable" position and the bus is moving at a speed of less than 2 mph, or in the event of actuation of the emergency door release.

Locked doors shall require a force of more than 300 lbs. to open manually. When the locked doors are manually forced to open, damage shall be limited to the bending of minor door linkage with no resulting damage to the doors, actuators or complex mechanism.

TS 78.8 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 lbs. after actuating an unlocking device. The unlocking device shall be clearly marked as an emergency-only device and shall require two distinct actions to actuate. The respective door emergency unlocking device shall be accessible from the doorway area. The unlocking device shall be easily reset by the operator without special tools or opening the door mechanism enclosure. Doors that are required to be classified as "emergency exits" shall meet the requirements of FMVSS 217.

TS 78.9 Door Control

The door control shall be located in the operator's area within the hand reach envelope described in SAE Recommended Practice J287, "Driver Hand Control Reach." The front door shall remain in commanded state position even if power is removed or lost.

A five-position driver's door controller or equivalent shall be used. Mounting and location of the door control device handle shall be designed so that it is within comfortable, easy arm's reach of the seated driver and protected from moisture. 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.

Provisions shall be made for operating the curbside front and rear doors independently or in the combinations shown below while providing positive tactile feedback to the operator identifying the door control selection while resisting inadvertent door actuation.

- **Center position:** Front door closed, rear door(s) closed or set to lock
- **First position forward:** Front door open, rear door(s) closed or set to lock
- **Second position forward:** Front door open, rear door(s) open or set to open
- **First position back:** Front door closed, rear door(s) open or set to open
- **Second position back:** Front door open, rear door(s) open or set to open

TS 78.10 Door Open/Close

A control or valve in the operator's compartment shall shut off the power to, and/or dump the power from, the front door mechanism to permit manual operation of the front door with the bus shut down. A master door switch, which is not within reach of the seated operator, when set in the "off" position shall close the rear/center doors (if applicable), deactivate the door control system, release the interlocks and permit only manual operation of the rear/center doors. Door master control shall be located on street side.

TS 79. Accessibility Provisions

Space and body structural provisions shall be provided at the front door of the bus to accommodate a wheelchair loading system. General layout and basic operation details shall be discussed at pre-production.

TS 79.1 Loading System

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

Electrical controls shall be capable of handling loads in each circuit. Circuit design shall allow safe operation of the wheelchair system at all times. The physical configuration of the electrical control design shall be relay or solid state, operating from the bus battery power system. The control components shall be capable of operating for the service life of the bus. Indicator lights or lighted switches shall be incorporated into the controls, and shall identify the following functions:

- W/C Stop Request: accomplished by way of the yellow square push style button attached to sidewalls and or bottom of the flip-up seat in the w/c securement area
- Ramp Deployed

At a minimum, a two in. circular light on the outside of the front door on the side of the bus shall be installed. This light shall have a wheelchair symbol incorporated in the lens and be of an amber color. It shall flash when bus is knelt as well as when ramp is in operation.

The wheelchair loading system shall be located at the front door, with the ramp being of a simple hinged, flip-out type design being capable of deploying to the ground at a maximum 6:1 slope.

An electrical circuit shall be provided to the bus when the ramp is not fully stowed. This circuit shall be utilized to maintain the bus door and accelerator/brake interlock circuits. Also the controls shall be wired so that it shall not operate unless the transmission is in neutral and interlock and parking brake engaged.

The normal door width, door operation or other specified dimensions shall not be compromised. When the system is not in use, the passageway shall appear normal and no portion of the entrance area shall move when the doors open. The controls shall be simple to operate with no complex phasing operations required and the loading operations shall be under the surveillance and complete control of the driver. The incorporation of the wheelchair system shall not present a hazard, nor inconvenience any passenger. The wheelchair platform area shall be no less than 32 in. clear width. The wheelchair platform shall be a minimum of 55 in. in length.

The power source, hydraulic and/or electric shall be an independent system not associated with the power steering pump and controls.

TS 79.2 Ramp Function

The wheelchair ramp shall meet all the requirements of this specification and any other specifications of a bus manufacturer that may be outlined herein or included herein by reference. The wheelchair ramps shall comply with all ADA requirements.

The ramps shall be capable of stopping and reversing direction at any point during operation. The ramp operational pressure should be as low as possible to prevent injury to a person if contact is made. A manual operation shall be provided that takes less than 25 lbs. of force or pressure to operate; the manual override system shall be as simplistic as possible, such as a grab strap. The device shall not retract or fold when a passenger is on the platform.

A complete operating cycle for passenger loading or unloading shall be capable of being accomplished in 30 seconds of motion time. Deployment or storage of the lift or ramp shall require no more than 5 ½ seconds. The device shall function without failure or adjustment for 500 cycles or 10,000 miles in all weather conditions on the design operating profile when activated once during the idle phase. The ramp and controls shall operate within temperature ranges required for the transit bus.

Platform capacity (design load) shall be 750 pounds minimum. Contractor shall submit documentation on the ramp's rating.

The ramp shall be capable of operation with or without the bus-kneeling system activated, however the bus shall not be capable of kneeling once a ramp is deployed. Center and rear axle brake interlock shall be activated whenever the ramp is deployed or deploying.

A passenger on the platform shall be able to easily obtain support during the entire loading or unloading operation by grasping the passenger assist rails located on the doors or other assists provided for this purpose. The passenger assists shall allow a minimum of 32 in. of boarding clearance on the ramp. When platform is in its closed state, the passenger assists shall be available for use and safety.

The ramp shall have operational switches on the right side of dash or may be incorporated into the door control for operator to use and shall not be enabled until front door is open.

TS 79.3 Ramp Construction

The ramp assembly shall be a complete unit containing hydraulic components and lines and all electrical components and wiring. Hydraulic and electrical input shall be terminated in a location as specified by the bus manufacturer.

The platform shall be designed to protect the device from damage and persons on the sidewalk from injury during deployment of the ramp. The surface of the ramp shall be covered with a replaceable or renewable non-skid material and shall be so designed to prevent the wheelchair from rolling off the sides during loading or

unloading.

Ramp, in stowed position, shall be covered with bus flooring material or material that is consistent with the entire bus interior. The ramp shall have yellow nosing and yellow at the leading edge, both of which can be seen in stowed position. In the deployed position, the ramp shall have a non-skid surface and also have yellow on leading edge as well as sides to mark edges. The platform surface shall be even and straight.

Mounting provisions shall have a minimum horizontal adjustment capability of ½ inch. The ramp shall be capable of adjusting to match the bus floor height.

The basic frame structure shall have a safety factor of a minimum three times the design load when material ultimate strength values are utilized. The mechanical linkage moving parts shall have a safety factor of a minimum six times the design load when material ultimate strength values are utilized. The ramp shall withstand, without permanent deformation, a static load of a minimum three times the operating design load with this load equally distributed over the ramp surface.

TS 79.4 Wheelchair Accommodations

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

Two wheelchair positions shall be provide, one with standard Q'straint securement system and one with Q'Pod securement system or equivalent. Each position shall include passenger seats to the rear of the left and/or right forward wheel chair positions (dependent on seating layout). The seats shall be of a folding type manufactured to accommodate most Personal Mobility Aid Devices (PMAD's)/mobility device. The seats shall be American Seating or equivalent and shall be upholstered in same design, color, and material as other passenger seating. The folding mechanism of the seat frame shall be easily activated and positioned by PMAD/mobility device passenger to accommodate a PMAD/wheelchair in a secure manner for traveling.

The folding seat may be longitudinal. The folding seating shall be mounted to bus wall and also to bus floor, with an inch square stainless steel tubular leg on aisle end. Such legs shall be securely mounted to bus floor. Folding seat(s) shall have a positive locking mechanism to maintain seat in upright and normal positions until released by an individual.

The area designated for PMAD/mobility device passengers shall be located a sufficient distance from longitudinal seats, wheel housing, stanchions, or other obstructions to permit easy access and necessary room for maneuvering by PMAD/mobility device passengers to and from PMAD/wheelchair tie-downs.

Maneuvering room inside the bus shall accommodate easy travel for a passenger in a wheelchair from the loading device through the bus to the designated parking area. No portion of the standard wheelchair or its occupant shall protrude into the normal aisle of the bus when parked in the designated parking space(s).

The mobility device securement system shall be easy to access and utilize by the bus operator so as not to require the operator to kneel on the floor or create awkward body movements, exposing the operator to possible strain or back injury. Restraint belts, when not in use, shall retract, fold or stow to give a neat appearance, present no tripping or catching hazard, and cause no interference with the use of the folding seats. Straps shall be mounted with appropriate hand clearance to operate tensioning knobs and retractor release buttons as necessary. The system shall allow unobstructed access of the wheelchair into the securement area.

Load bearing securement straps will be sufficient to hold 2500 lbs. per strap. Related straps and accoutrements shall be congruent with this specification.

The passenger restraint shall be a seat belt/shoulder harness with an inertial/self-retracting belt design. The straps shall be of sufficient length to secure the passenger in the wheelchair when the wheelchair is midway between the front and rear wheelchair securement straps. The straps shall be equipped with a device that

prevents them from sliding into the aisle when not in use.

TS 79.5 Interior Circulation

Maneuvering room inside the bus shall accommodate easy travel for a passenger in a wheelchair from the loading device and from the designated securement area. It shall be designed so that no portion of the wheelchair protrudes into the aisle of the bus when parked in the designated parking space(s). When the positions are fully utilized, an aisle space of no less than 20 in. shall be maintained. No width dimension shall be less than 48 in. Areas requiring 90-degree turns of wheelchairs should have a clearance arc of a minimum 42 in. In the parking area, where 180-degree turns are expected, minimum space should be clear in a 68- inch diameter circle. Approximately 18 in. of vertical clearance above the floor surface shall be provided on the outside of turning areas for wheelchair foot rest clearance. The Contractor shall submit a plan including layout drawings for entry, maneuvering, parking and exiting of wheelchair passengers for the Purchaser 's review and approval.

Signage and Communication

TS 80. Destination Signs

Automatic electronic LED destination sign system shall be furnished and installed in the bus by the manufacturer. This destination sign shall meet all ADA requirements. The destination sign system shall be able to be integrated into the bus communication system and electronic system and consist of:

- Front destination sign, Hanover - Horizon Gen IV, 16 X 160 Gen 4, or equivalent
- Side destination signs, one mounted curb side; one mounted street side, 8 x 96 Gen4, or equivalent
- Rear route sign, Hanover 16 x 48 Gen 4, or equivalent
- Drivers control console and display
- All cables and accessories

The sign system shall have the capability to display a minimum of 4,000 single line 18-character messages. The system shall have the additional ability to sequentially display multi-line destination messages but with the route number portion remaining stable in a constant on mode at all times. All sign display characters shall be sized to enable a person with 20/20 vision to identify the destination displayed on the front sign from a distance of at least 150 feet and the side sign from a minimum of 50 feet in both bright sunlight and night time conditions.

Signs shall be all LED, where the brightness of the LED’s automatically adjusts to the intensity of the outside light. Signs shall be designed to reduce glare during night-time use. All signs shall have a minimum 20- minute shutdown delay, and display last reading after bus is turned off. Sign system shall have the capability of displaying special public relations messages alternately with the regular text and route messages. The system shall incorporate a means of adjusting the length of time the messages are displayed. The interval shall be variable from 1 to 10 seconds in duration.

Power to the sign system shall be controlled by the master bus run switch. The sign shall operate in all positions of this switch except off. The sign shall be internally protected against voltage transients and RF interference. Input power to the sign shall be fused externally to the sign with a 3AG fuse and holder (little fuses 150145 or equivalent). The fuse holder shall be readily accessible in the front sign compartment area. The sign manufacturer shall select the proper size fuse.

TS 80.1 Front Destination Sign

The front destination sign shall be capable of displaying a 15-character alpha text and a 3-digit, alphanumeric, route sign. The text character size shall be a minimum of 6.0 inches high. The route sign number portion to display characters in a double dot (wide stroke) format in both the horizontal and vertical legs of all characters using a ½-inch diameter octagon shaped dot. The front sign and compartment shall be designed to be dust

free. Destination sign shall be completely accessible for maintenance. Front destination sign glass shall be electrically heated.

TS 80.2 Side Destination Sign(s)

The side destination sign(s) shall be capable of displaying the same information as presented on the front sign, minimum 18 characters. The 3-digit route number portion shall be a minimum of 4.1 inches high. The text or route name information, 15 characters, shall be a minimum of 2.7 inches high. The height ratio difference between the route number portion (3 characters) and route name (15 characters) shall be maintained. The route sign shall be capable of being programmed to display characters in either single or double row format.

TS 80.3 Rear Route Sign

A 3-digit rear route sign is required and shall be capable of displaying the same information as presented on the front route sign. This unit shall display alphanumeric characters in a double row format using the same format outlined for the front sign and be a minimum of 8 inches high. The rear route sign shall be easily accessible for inspection and maintenance. All signage shall meet ADA character height, width-to-height, and stroke width-to-height ratios, with a light on dark contrast.

TS 80.4 Drivers Control Console

The control console shall be located within easy reach of an average size driver in a seated position and shall provide the controls and memory for display messages. The controls shall include a switch for selection of preprogrammed messages and a display to monitor the selection. The memory shall include preprogrammed messages and the capability for on-bus programming. The code selector switch shall be a push button switch. In addition to destinations, the code selector switch shall allow the driver to select public relations messages that shall be displayed alternately with the destination messages. The console shall also have the capability to pre-select 2 different route messages.

TS 80.5 Interconnection Cables

The system shall include all required signal interconnect cables. Signal connectors shall be polarized; cables shall have strain relief and contact shall be plated with a minimum of 50 micro-inches of gold.

TS 80.6 Mobil Transfer Unit

The sign system shall be reprogrammable on the bus with the use of an ODK4 to listing upload via USB, wireless or on board AVL system and diagnostic capabilities.

The manufacturer will install all signs with the appropriate dip switch settings as specified by sign manufacturer and or the Purchaser. A list of the Purchaser 's destination sign readings shall be supplied to the manufacturer to allow the signs to be pre-programmed with the correct readings. The manufacturer shall provide the current “dip switch” settings for all signs and provide instructions for setting/resetting the sign addresses.

The sign located near the front door shall not block the driver’s critical horizontal line of sight. Display areas of destination signs shall be clearly visible in direct sunlight and/or at night. Parts shall be commercially available.

All signs shall be controlled via a single human-machine interface (HMI). In the absence of a single mobile data terminal (MDT), the HMI shall be conveniently located for the bus driver within reach of the seated driver.

The driver shall be able to access the sign while seated.

The destination sign compartments shall meet the following minimum requirements:

- Compartments shall be designed to prevent condensation and entry of moisture and dirt.
- Compartments shall be designed to prevent fogging of both compartment window and glazing on the unit itself.
- Access shall be provided to allow cleaning of inside compartment window and unit glazing.

- The front window shall have an exterior display area of no less than 8.5 in. high by 56 in. wide.

TS 81. Passenger Information and Advertising

Provisions shall be made on the rear of the driver's barrier or equipment box located on the wheel well for a frame to retain information such as routes and schedules, preferred is Transit Information Products OBIC (22 in. by 22 in. by 1.72 in.) or equivalent.

Advertising media 11 in. high and 0.09 in. thick shall be retained near the juncture of the bus ceiling and sidewall. The retainers may be concave and shall support the media without adhesives. The media shall be illuminated by the interior light system.

TS 82. Passenger Stop Request/Exit Signal

At the pre-production meeting, the exact location, design and specific programming of passenger signals shall be discussed and refined.

The passenger's stop signal shall be a single tone solenoid type chime that is audible both to the driver and passenger and visible through a "Stop Requested" sign. The chime shall only sound once until reset by opening and closing the doors. The chime "tone" shall be set to the highest level.

The signal shall be activated by passengers utilizing electric switch system. Passenger signal system shall be arranged with push-button switches accessible by each passenger.

The stop request area will be configured with provisions for the INIT PID (Public Information Display) signs. This will include the proper glass and installation brackets.

Stop request shall have an indicator light on dash that is in dissimilar color to distinguish from other lights. Chime shall have a disable switch on side panel, and shall have a reset switch to reset the chime system.

A double chime shall sound anytime the system is activated from wheelchair passenger areas. Exit signals located in the wheelchair passenger area shall be no higher than 4 ft. above the floor. The exit signal shall be a touch pad mounted on either the bottom of a flip seat, or in reach of each person sitting in a wheel chair. This touch pad shall have the standard W/C symbol embossed in the pad. Instructions shall be provided to clearly indicate function and operation of these signals. A separate light on the dash, (different color) shall indicate a W/C stop request.

TS 83. Communications

TS 83.1 Camera Surveillance System

All wiring and mounting locations for a multi-camera surveillance system, including the installation of cameras, recorder, microphone, etc. shall be provided.

Two separate systems shall be installed on the buses. One shall be a video recorder unit and the other shall be a CCTV. Each system shall operate independently and have independent controls. They shall also have separate cameras and view both internal as well as external.

TS 83.1.1 Operator CCTV

Operator compartment shall have a color monitor installed for viewing and shall be reachable by the operator as seated in driver's seat. A minimum of three cameras which shall also provide input into the camera system described below for recording purposes:

- One mounted in rear of bus to view, outside, and behind the bus
- One to be mounted in front interior of bus on the upper deck to view upper deck interior passenger compartment

- One to be mounted in, around, or above the stairway to view the staircase and passengers utilizing the stairway

All cameras shall be a concealed miniature and fully adjustable.

Monitor screen shall be flat and have an automatic brightness sensor in operation.

All software needed and/or available to troubleshoot and make repairs to the system, shall be supplied.

TS 83.1.2 Stairway monitor

A monitor shall be installed so that passengers can see available seating in the upper deck before mounting the stairs.

TS 83.1.3 Digital Video Camera and Recorder

The camera system shall be an SEON/ Safefleet or equivalent with the following provisions with 7 cameras.

The recorder unit shall be installed in communication box. This DVR shall be capable of recording video at the rate of 30 frames per second per camera. The hard drive shall be capable of retaining seven to ten days of recoverable video/data. The recorder shall accommodate a minimum of 10 cameras with a minimum of 1/3 inch CCD.

In addition to the three cameras described above, the remaining seven cameras are described below. However, all positions shall be approved by the Purchaser before manufacture:

- Out front door from above drivers compartment
- Out windshield from under destination sign
- Rearward facing from front destination sign area, lower level
- On ceiling adjacent to rear door to view rear door
- Mounted interior rear of bus looking forward
- On outside of bus, looking aft on curbside
- One mounted on the street side exterior looking down and aft of the bus

Contractor shall supply software for laptop to interface with camera system. This software shall make it possible to have on-board viewing, downloading, and system control using a laptop computer.

TS 83.2 Public Address System

A public address system shall be provided on each bus for facilitating radio system and driver-originated announcements to passengers.

A partial P.A. system, compatible with the Purchaser's APTS system, shall be installed. The system shall include, but not limited to the following:

c. Include one electronic, directional microphone. Microphone shall be mounted in an area and direction to obtain best resolution results with the bus operator speaking in a normal voice.

d. No less than eight (8) ceiling-mounted, 6 in., interior speakers and one exterior speaker shall be supplied. The interior speakers shall have a minimum of four per level and the exterior speaker shall be mounted above or by front door. Interior loudspeakers shall be provided, semi-flush mounted, on alternate sides of the bus passenger compartment, installed with proper phasing. Total impedance seen at the input connecting end shall be 8 Ohms. Mounting shall be accomplished with riv-nuts and machine screws.

e. Operation of the P.A. system shall be controlled by the floor mounted starter type control switch,

mounted between the two turn signal switches on a raised pedestal; the switch shall be a momentary switch and not stay on after release.

f. PA system shall function with the master switch in the "Run," "Park", or “Night Run” positions.

TS 83.3 Automatic Passenger Counter (APC)

Provisions for an Automatic Passenger Counter (APC) system compatible with INIT shall be included for all doors. This shall also have the hardware as well as power supply housed in the communication box. Conduits shall be run from rear door compartment to front door compartment, as well as, from front door compartment to equipment box. Actual passenger counter will be provided and installed by the Purchaser.

TS 83.4 Radio

TS 83.4.1 Drivers Speaker

Each bus shall have a recessed speaker in the ceiling panel above the driver. This speaker shall be the same component used for the speakers in the passenger compartment. It shall have 8 ohms of impedance.

TS 83.4.2 Handset

Contractor will install a handset for driver use, mounted to the left side.

TS 83.4.3 Driver Display Unit (DDU) for Radio Head

Contractor shall install a driver display unit as close to the driver’s instrument panel as possible.

TS 83.4.4 Radio and Power Supply

Radio and all attaching equipment location shall be finalized at pre-production meetings.

Mounted inside the communication box shall be three 8-stud blocks and, to one of the terminals on one block, shall be attached a 12v, 30 amp capacity circuit protected by 30 amp circuit breaker located in main circuit breaker panel; one connected to a 24v supply also protected by a 30 amp breaker in main circuit breaker panel and one connected a battery ground terminal. Both the positive side and ground side wires shall be not less than 10 gauge wires. The radio power supply shall be 10-gauge wire.

TS 83.5 Silent Alarm

Contractor shall install an silent alarm that is accessible to the driver but hidden from view.

SECTION 7: Warranty, Repairs, and Quality Assurance Requirements

WR 1. Warranty Requirements

WR 1.1Contractor Warranty.

Warranties in this document are in addition to any statutory remedies or warranties imposed on Contractor. Consistent with this requirement, Contractor warrants and guarantees to Purchaser each complete bus and specific subsystems and components as follows.

Contractor warrants the buses are of good material and workmanship and agrees to promptly replace any part or parts, at no cost to the Purchaser, which by reason of defective materials or workmanship fail under normal use, free of negligence or accident during the applicable warranty period. Contractor warranties include the replacement of parts and services associated with the replacement and repair, including but not limited to any diagnostic, refurbishment, shipping, or travel costs.

Performance requirements based on design criteria will not be deemed a warranty item. Contractor shall insure in its procurement arrangements that the warranty requirements of this Master Contract are enforceable through and against the Contractor's suppliers, vendors, material men, and subcontractors. Any inconsistency or difference between the warranties extended to Purchasers by Contractor and those extended to Contractor by its suppliers, vendors, material men, and subcontractors, are at the risk and expense of Contractor. Such inconsistency or difference will not excuse Contractor's full compliance with its obligations under this Contract.

WR 1.2 Warranty Information.

Upon Purchaser’s request, Contractor shall promptly provide complete copies of all written warranties or guarantees and documentation of any other arrangement relating to such warranties or guarantees extended by Contractor's suppliers, sub-suppliers, vendors, material men, and subcontractors covering parts, components, and systems utilized in the bus. Contractor shall ensure that such suppliers, sub-suppliers, vendors, material men, and subcontractors satisfactorily perform warranty related work when requested to do so by Purchaser.

WR 1.3 Complete Bus.

The complete bus, propulsion system, components, major subsystems, and body and chassis structure are warranted to be free from Defects and Related Defects for at least two years or 100,000 miles, whichever comes first, beginning on the date of revenue service. The warranty is based on regular operation of the bus under the operating conditions prevailing in Purchaser’s locale.

WR 1.4 Body and Chassis Structure.

Body, body structure, structural elements of the suspension and engine cradle are warranted to be free from Defects and Related Defects for at least three years or 150,000 miles, whichever comes first. Primary load-carrying members of the bus structure, including structural elements of the suspension, are warranted against corrosion failure and/or fatigue failure sufficient to cause a Class 1 or Class 2 Failure for a period of 12 years or 500,000 miles, whichever comes first.

WR 1.5 Propulsion System (Diesel, CNG, Hybrid).

Propulsion system components, including the engine, transmission or drive motors, and generators (for hybrid technology) and drive and non-drive axles are warranted to be free from defects and related defects for at least two years or 100,000 miles, whichever comes first. An extended warranty may be purchased at an additional cost.

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WR 1.6 Emission Control System (ECS).

Contractor warrants the emission control system to be free from defects and related defects for at least five years or 100,000 miles, whichever comes first. The ECS includes, but is not limited to, the following

components:

- complete exhaust system, including catalytic converter (if required)
- after treatment device
- components identified as emission control devices

WR 1.7 Subsystems Warranty.

The Contractor warrants the following subsystems to be free from defects and related defects for at least two years or 100,000 miles, whichever comes first.

- Brake system: Foundation brake components, including advancing mechanisms, as supplied with the axles, excluding friction surfaces.
- Destination signs: All destination sign equipment for the front, side and rear signs, power modules and operator control.
- Heating, ventilating: Roof and/or rear main unit only, excluding floor heaters and front defroster.
- AC unit and compressor: Roof and/or rear main unit only, excluding floor heaters and front defroster.
- Door systems: Door operating actuators and linkages.
- Air compressor.
- Air dryer.
- Wheelchair lift and ramp system: Lift and/or ramp parts and mechanical only.
- Starter.
- Alternator: Alternator only. Does not include the drive system.
- Charge air cooler: Charge air cooler including core, tanks and including related surrounding framework and fittings.
- Fire suppression: Fire suppression system including tank and extinguishing agent dispensing system.
- Hydraulic systems: Including radiator fan drive and power steering as applicable.
- Propulsion cooling systems: Radiator including core, tanks and related framework, including surge tank. Transmission cooler.
- Power electronics: DC/DC converters, inverters, if supplied
- Passenger seating excluding upholstery.
- Fuel storage and delivery system.
- Surveillance system including cameras and video recorders.

The Contractor warrants the following subsystems to be free from defects and related defects for at least twelve years or 600,000 miles, whichever comes first:

- Low voltage and high voltage electrical wiring and harnesses

WR 1.8 Serial Numbers.

Upon delivery of each bus, Contractor shall provide a complete electronic list of serialized units installed on each bus to facilitate warranty tracking. The list will include, but is not limited to the following:

- Engine
- Transmission
- Alternator
- Starter
- Destination/Luminator (Major components)
- Drive axle and non-drive axle(s)
- DVR unit, supporting electronics (Monitors)
- Driver's seat
- Battery equalizer
- Radiator package
- Exhaust emission components
- A/C compressor and condenser/evaporator unit

- Power steering unit
- Fuel cylinders (if applicable)
- Air compressor
- Wheelchair ramp (if applicable)

Contractor shall provide updated serial numbers resulting from warranty campaigns. The format of the list will be approved by Purchaser prior to delivery of the first production bus.

WR 1.9 Extension of Warranty.

If, during the warranty period, repairs or modifications on any bus are made necessary by defective design, materials, or workmanship but are not completed due to lack of material or inability to provide the proper repair for thirty (30) calendar days, then the applicable warranty period shall be extended by the number of days equal to the delay period.

WR 1.10 Voiding of Warranty.

The warranty will not apply to the failure of any part or component of the bus that directly results from misuse, negligence, accident, or repairs not conducted in accordance with the Contractor-provided maintenance manuals and with workmanship performed by adequately trained personnel in accordance with recognized standards of the industry. The warranty will be void if Purchaser fails to conduct normal inspections and scheduled preventive maintenance procedures as recommended in the Contractor's maintenance manuals and if that omission caused the part or component failure. Purchaser should maintain documentation, auditable by Contractor, verifying service activities in conformance with the Contractor's maintenance manuals.

WR 1.11 Exceptions and Additions to Warranty.

Warranties will not apply to the following items:

- scheduled maintenance items
- normal wear-out items, such as brake linings, filters, belts, and wiper blades
- items furnished by Purchaser

Should Purchaser require the use of a specific product and has rejected Contractor's request for an alternate product, then the standard supplier warranty for that product will be the only warranty provided to Purchaser. This product will not be eligible under "Fleet Defects," below.

WR 1.12 Pass-Through Warranty.

Contractor shall request a waiver by the Purchaser, if Contractor elects to not administer warranty claims on certain components and wishes to transfer this responsibility to the sub-suppliers, or to others. The waiver of Contractor's warranty responsibility is at Purchaser's discretion.

Contractor shall state in writing that Purchaser's warranty reimbursements will not be impacted. Contractor also shall state in writing any exceptions and reimbursement including all costs incurred in transport of vehicles and/or components. At any time during the warranty period, Contractor may request approval from Purchaser to assign its warranty obligations to others, but only on a case-by-case basis approved in writing by Purchaser. Otherwise, Contractor shall be solely responsible for the administration of the warranty as specified. Warranty administration by others does not eliminate the warranty liability and responsibility of Contractor.

If any vendor to the Contractor offers, at no additional cost, a warranty on a component that is longer or more comprehensive than the required warranties on this Contract, Contractor shall inform Purchaser of the additional warranty and pass it through to Purchaser at no additional cost.

WR 1.13 Superior Warranty.

Contractor shall pass on to Purchaser any warranty offered by a component supplier that is superior to the warranty required in the relevant section. Contractor shall provide a list to Purchaser noting the conditions and limitations of the superior warranty no later than the start of production. Contractor will not administer the superior warranty.

WR 1.14 Fleet Defects.

"Fleet Defect" means cumulative failures of twenty (20) percent of the same components in the same or

similar application in a minimum fleet size of twelve (12) or more buses where such items are covered by warranty. A Fleet Defect applies only to the base warranty period in sections 12.3 Complete Bus, 12.X Propulsion System, and 12.X Subsystems Warranty. When a Fleet Defect is declared, the remaining warranty period on that item/component stops. The warranty period does not restart until the Fleet Defect is corrected.

For the purpose of Fleet Defects, each order shall be treated as a separate bus fleet. In addition, if there is a change in a major component within the order, the buses containing the new major component will become a separate bus fleet for the purposes of determining Fleet Defects.

Contractor shall correct a Fleet Defect under the warranty provisions defined in Section 13 Repair Procedure. After correcting the Fleet Defect, Purchaser and Contractor shall mutually agree to and Contractor shall promptly undertake and complete a work program reasonably designed to prevent the occurrence of the same Fleet Defect in all other buses and spare parts purchased under the order. Where the specific Fleet Defect is solely attributed to particular identifiable parts, the work program will include redesign and/or replacement of only the defectively designed and/or manufactured parts. In all other cases, the work program will include inspection and/or correction of all the buses in the fleet via a mutually agreed-to arrangement. Contractor shall update, as necessary, technical support information (parts, service and operator's manuals) due to changes resulting from warranty repairs. Purchaser may immediately declare a defect in design resulting in a safety hazard to be a Fleet Defect. Contractor shall be responsible to furnish, install and replace all defective units.

The Fleet Defect warranty provisions do not apply to Purchaser-supplied items, such as radios, fare collection equipment, communication systems, and tires. In addition, Fleet Defects do not apply to interior and exterior finishes, hoses, fittings, and fabric.

WR 2. Repair Requirements

WR 2.1 Repair Performance.

Contractor is responsible for all warranty-covered repair work, including diagnostics of warranty covered parts. To the extent practicable, Purchaser will allow Contractor or its designated representative to perform repair work. At its discretion, Purchaser may perform such repair work if it determines it needs to do so based on transit service or other requirements. Contractor shall reimburse Purchaser for any warranty-covered repair work it performs.

WR 2.2 Repairs by the Contractor.

Purchaser shall notify Contractor's designated representative within thirty (30) days if Purchaser detects a defect within the warranty periods defined in this Master Contract or the applicable Purchaser Order. Contractor or its designated representative shall, if requested, begin repair work on warranty-covered repairs within five (5) calendar days after receiving notification of a defect from Purchaser. Purchaser will make the bus available to complete repairs timely with the Contractor's repair schedule.

Contractor shall provide at its own expense all spare parts, tools, and space required to complete repairs. At Purchaser's option, Contractor may be required to remove the bus from Purchaser's property while repairs are made. If the bus is removed from Purchaser's property, then repair procedures must be diligently pursued by Contractor's representative.

WR 2.3 Repairs by Purchaser: Parts Used.

If Purchaser performs the warranty-covered repairs, then it must correct or repair the defect and any related defects utilizing parts supplied by Contractor specifically for this repair. At its discretion, Purchaser may use Contractor-specified parts available from its own stock if deemed in its best interests.

WR 2.4 Repairs by Purchaser: Contractor-Supplied Parts.

Purchaser may require that Contractor supply parts for warranty-covered repairs being performed by Purchaser. Those parts may be remanufactured but must have the same form, fit and function, and warranty. The parts will be shipped prepaid to Purchaser from any source selected by Contractor within fourteen (14) days of receipt of the request for said parts and shall not be subject to a handling charge.

WR 2.5 Defective Component Return.

Contractor may request that parts covered by the warranty be returned to the manufacturing plant. Contractor will pay the freight costs for this action. Materials should be returned in accordance with the procedures outlined in “Warranty Processing Procedures.”

WR 2.6 Failure Analysis.

Upon specific request of Purchaser, Contractor will provide a failure analysis of Fleet Defect or safety-related parts, or major components, removed from buses under the terms of the warranty that could affect fleet operation. Such reports will be delivered within 60 days of the receipt of failed parts.

WR 2.7 Reimbursement for Labor and Other Related Costs.

Contractor shall reimburse Purchaser for repair labor. The amount is determined by Purchaser for a qualified mechanic at a straight time wage rate per hour, which includes fringe benefits and overhead adjusted for Purchaser’s most recently published rate in effect at the time the repair work is performed, plus the cost of towing the bus if such action was necessary and if the bus was in the normal service area. These wage and fringe benefit rates shall not exceed the rates in effect in Purchaser’s service garage at the time the defect correction is made.

WR 2.8 Reimbursement for Parts.

Contractor shall reimburse Purchaser for defective parts and for parts that must be replaced to correct the defect. The reimbursement will be at the current price at the time of repair and include taxes where applicable, plus fifteen (15) percent handling costs. Handling costs will not be paid if parts are supplied by Contractor and shipped to Purchaser.

WR 2.9 Reimbursement Requirements.

Contractor shall respond to the warranty claim with an accept/reject decision including necessary failure analysis no later than sixty (60) days after Purchaser submits the claim and defective part(s), when requested. Reimbursement for all accepted claims shall occur no later than sixty (60) days from the date of acceptance of a valid claim. Purchaser may dispute rejected claims or claims for which Contractor did not reimburse the full amount. Contractor and Purchaser will review disputed warranty claims during the following quarter to reach an equitable decision to permit the disputed claim to be resolved and closed. Contractor and Purchaser will review all claims at least once per quarter throughout the entire warranty period to ensure that open claims are being tracked and properly dispositioned.

WR 2.10 Warranty after Replacement/Repairs.

If any component, unit, or subsystem is repaired, rebuilt, or replaced by Contractor or by Purchaser with the concurrence of Contractor, then the component, unit, or subsystem will have the unexpired warranty period of the original. Repairs will not be warranted if Contractor-provided or authorized parts are not used for the repair, unless Contractor has failed to respond within five days, in accordance with Section 13.2 Repairs by the Contractor.

If an item is declared to be a Fleet Defect, then the warranty stops with the declaration of the Fleet Defect. Once the Fleet Defect is corrected, the items shall have three (3) months or the remaining time and/or miles of the original warranty, whichever is greater. This remaining warranty period will begin on the repair/replacement date for corrected items on each bus if the repairs are completed by Contractor or on the date Contractor provides all parts to Purchaser if repairs are completed by Purchaser.

WR 2.11 Warranty Processing Procedures.

The following list represents information required by Contractor from the Purchaser for processing warranty claims. One failure per bus per claim is allowed.

- bus number and VIN
- total vehicle life mileage at time of repair
- date of failure/repair
- acceptance/in-service date
- Contractor part number and description
- component serial number

- description of failure
- all costs associated with each failure/repair (invoices may be required for third-party costs):
  - towing
  - road calls
  - labor
  - materials
  - parts
  - handling
  - troubleshooting time

The Purchaser's forms will be accepted by Contractor if all of the above information is included. Electronic submittal may be used if available between Contractor and Purchaser.

WR 2.12 Return of Parts.

When returning defective parts to Contractor, Purchaser will tag each part with the following:

- bus number and VIN
- claim number
- part number
- serial number (if available)

WR 2.13 Timeframe.

Each claim must be submitted no more than thirty (30) days from the date of failure and/or repair, whichever is later. All defective parts must be returned to the Contractor, when requested, no more than forty-five (45) days from the date of repair.

WR 3. Quality Assurance Requirements

WR 3.1 Quality Assurance Organization Establishment.

Contractor shall establish and maintain an effective in-plant quality assurance organization.

WR 3.2 Quality Control.

The quality assurance organization shall exercise quality control over all phases of production, from initiation of design through manufacture and preparation for delivery. The organization shall also control the quality of supplied articles.

WR 3.3 Authority and Responsibility.

The quality assurance organization shall have the authority and responsibility for reliability, quality control, inspection planning, establishment of the quality control system, and acceptance/rejection of materials and manufactured articles in the production of the transit buses.

WR 3.4 Minimum Functions.

The quality assurance organization shall include the following minimum functions:

- Work instructions: The quality assurance organization shall verify inspection operation instructions to ascertain that the manufactured product meets all prescribed requirements.
- Records maintenance: The quality assurance organization shall maintain and use records and data essential to the effective operation of its program. These records and data shall be available for review by the resident inspectors. Inspection and test records for this procurement shall be available for a minimum of one year after inspections and tests are completed.
- Corrective action: The quality assurance organization shall detect and promptly ensure correction of any conditions that may result in the production of defective transit buses. These conditions may occur in designs, purchases, manufacture, tests or operations that culminate in defective supplies, services, facilities, technical data or standards.

WR 3.5 Basic Standards and Facilities.

The following standards and facilities shall be basic in the quality assurance process:

- Configuration control: Contractor shall maintain drawings, assembly procedures and other

documentation that completely describe a qualified bus that meets all of the options and special requirements of each Purchase Order. The quality assurance organization shall verify that each transit bus is manufactured in accordance with these controlled drawings, procedures and documentation.

- Measuring and testing facilities: Contractor shall provide and maintain the necessary gauges and other measuring and testing devices for use by the quality assurance organization to verify that the buses conform to all specification requirements. These devices shall be calibrated at established periods against certified measurement standards that have known, valid relationships to national standards.
- Production tooling as media of inspection: When production jigs, fixtures, tooling masters, templates, patterns and other devices are used as media of inspection, they shall be proved for accuracy at formally established intervals and adjusted, replaced or repaired as required to maintain quality.
- Equipment use by resident inspectors: Contractor's gauges and other measuring and testing devices shall be made available for use by the resident inspectors to verify that the buses conform to all specification requirements. If necessary, the Contractor's personnel shall be made available to operate the devices and to verify their condition and accuracy.

WR 3.6 Maintenance of Control.

Contractor shall maintain quality control of purchases:

- Supplier control: Contractor shall require each supplier to maintain a quality control program for the services and supplies that it provides. Contractor's quality assurance organization shall inspect and test materials provided by suppliers for conformance to specification requirements. Materials that have been inspected, tested and approved shall be identified as acceptable to the point of use in the manufacturing or assembly processes. Controls shall be established to prevent inadvertent use of nonconforming materials.
- Purchasing data: Contractor shall verify that all applicable specification requirements are properly included or referenced in purchase orders of articles to be used on transit buses.

WR 3.7 Manufacturing Control.

Contractor shall maintain quality control of production:

- Controlled conditions: Contractor shall ensure that all basic production operations, as well as all other processing and fabricating, are performed under controlled conditions. Establishment of these controlled conditions shall be based on the documented work instructions, adequate production equipment and special working environments if necessary.
- Completed items: A system for final inspection and test of completed transit buses shall be provided by the quality assurance organization. It shall measure the overall quality of each completed bus.
- Nonconforming materials: The quality assurance organization shall monitor the Contractor's system for controlling nonconforming materials. The system shall include procedures for identification, segregation and disposition.
- Statistical techniques: Statistical analysis, tests and other quality control procedures may be used when appropriate in the quality assurance processes.
- Inspection status: A system shall be maintained by the quality assurance organization for identifying the inspection status of components and completed transit buses. Identification may include cards, tags or other normal quality control devices.

WR 3.8 Inspection System.

The quality assurance organization shall establish, maintain and periodically audit a fully documented inspection system. The system shall prescribe inspection and test of materials, Work in process and completed articles. As a minimum, it shall include the following controls:

- Inspection personnel: Sufficient trained inspectors shall be used to ensure that all materials, components and assemblies are inspected for conformance with the qualified bus design.

- Inspection records: Acceptance, rework or rejection identification shall be attached to inspected articles. Articles that have been accepted as a result of approved materials review actions shall be identified. Articles that have been reworked to specified drawing configurations shall not require special identification. Articles rejected as unsuitable or scrap shall be plainly marked and controlled to prevent installation on the bus. Articles that become obsolete as a result of engineering changes or other actions shall be controlled to prevent unauthorized assembly or installation. Unusable articles shall be isolated and then scrapped. Discrepancies noted by the Contractor or resident inspectors during assembly shall be entered by the inspection personnel on a record that accompanies the major component, subassembly, assembly or bus from start of assembly through final inspection. Actions shall be taken to correct discrepancies or deficiencies in the manufacturing processes, procedures or other conditions that cause articles to be in nonconformity with the requirements of the Contract specifications. The inspection personnel shall verify the corrective actions and mark the discrepancy record. If discrepancies cannot be corrected by replacing the nonconforming materials, then the Purchaser shall approve the modification, repair or method of correction to the extent that the Contract specifications are affected.
- Quality assurance audits: The quality assurance organization shall establish and maintain a quality control audit program. Records of this program shall be subject to review by the Purchaser.

SECTION 8: QUALITY ASSURANCE

QA 1. Contractor's In-Plant Quality Assurance Requirements

QA 1.1 Quality Assurance Organization

QA 1.1.1 Organization Establishment

The Contractor shall establish and maintain an effective in-plant quality assurance organization. It shall be a specifically defined organization and should be directly responsible to the Contractor's top management.

QA 1.1.2 Control

The quality assurance organization shall exercise quality control over all phases of production, from initiation of design through manufacture and preparation for delivery. The organization shall also control the quality of supplied articles.

QA 1.1.3 Authority and Responsibility

The quality assurance organization shall have the authority and responsibility for reliability, quality control, inspection planning, establishment of the quality control system, and acceptance/rejection of materials and manufactured articles in the production of the transit buses.

QA 1.2 Quality Assurance Organization Functions

QA 1.2.1 Minimum Functions

The quality assurance organization shall include the following minimum functions:

- **Work instructions:** The quality assurance organization shall verify inspection operation instructions to ascertain that the manufactured product meets all prescribed requirements.
- **Records maintenance:** The quality assurance organization shall maintain and use records and data essential to the effective operation of its program. These records and data shall be available for review by the resident inspectors. Inspection and test records for this procurement shall be available for a minimum of one year after inspections and tests are completed.
- **Corrective action:** The quality assurance organization shall detect and promptly ensure correction of any conditions that may result in the production of defective transit buses. These conditions may occur in designs, purchases, manufacture, tests or operations that culminate in defective supplies, services, facilities, technical data or standards.

QA 1.2.2 Basic Standards and Facilities

The following standards and facilities shall be basic in the quality assurance process:

- **Configuration control:** The Contractor shall maintain drawings, assembly procedures and other documentation that completely describe a qualified bus that meets all of the options and special requirements of this procurement. The quality assurance organization shall verify that each transit bus is manufactured in accordance with these controlled drawings, procedures and documentation.
- **Measuring and testing facilities:** The Contractor shall provide and maintain the necessary gauges and other measuring and testing devices for use by the quality assurance organization to verify that the buses conform to all specification requirements. These devices shall be calibrated at established periods against certified measurement standards that have known, valid relationships to national standards.
- **Production tooling as media of inspection:** When production jigs, fixtures, tooling masters, templates, patterns and other devices are used as media of inspection, they shall be proved for accuracy at formally established intervals and adjusted, replaced or repaired as required to maintain quality.
- **Equipment use by resident inspectors:** The Contractor's gauges and other measuring and testing devices shall be made available for use by the resident inspectors to verify that the buses conform to

all specification requirements. If necessary, the Contractor's personnel shall be made available to operate the devices and to verify their condition and accuracy.

QA 1.2.3 Maintenance of Control

The Contractor shall maintain quality control of purchases:

- **Supplier control:** The Contractor shall require each Supplier to maintain a quality control program for the services and supplies that it provides. The Contractor's quality assurance organization shall inspect and test materials provided by Suppliers for conformance to specification requirements. Materials that have been inspected, tested and approved shall be identified as acceptable to the point of use in the manufacturing or assembly processes. Controls shall be established to prevent inadvertent use of nonconforming materials.
- **Purchasing data:** The Contractor shall verify that all applicable specification requirements are properly included or referenced in purchase orders of articles to be used on transit buses.

QA 1.2.4 Manufacturing Control

- **Controlled conditions:** The Contractor shall ensure that all basic production operations, as well as all other processing and fabricating, are performed under controlled conditions. Establishment of these controlled conditions shall be based on the documented Work instructions, adequate production equipment and special working environments if necessary.
- **Completed items:** A system for final inspection and test of completed transit buses shall be provided by the quality assurance organization. It shall measure the overall quality of each completed bus.
- **Nonconforming materials:** The quality assurance organization shall monitor the Contractor's system for controlling nonconforming materials. The system shall include procedures for identification, segregation and disposition.
- **Statistical techniques:** Statistical analysis, tests and other quality control procedures may be used when appropriate in the quality assurance processes.
- **Inspection status:** A system shall be maintained by the quality assurance organization for identifying the inspection status of components and completed transit buses. Identification may include cards, tags or other normal quality control devices.

QA 1.2.5 Inspection System

The quality assurance organization shall establish, maintain and periodically audit a fully documented inspection system. The system shall prescribe inspection and test of materials, Work in process and completed articles. As a minimum, it shall include the following controls:

- **Inspection personnel:** Sufficient trained inspectors shall be used to ensure that all materials, components and assemblies are inspected for conformance with the qualified bus design.
- **Inspection records:** Acceptance, rework or rejection identification shall be attached to inspected articles. Articles that have been accepted as a result of approved materials review actions shall be identified. Articles that have been reworked to specified drawing configurations shall not require special identification. Articles rejected as unsuitable or scrap shall be plainly marked and controlled to prevent installation on the bus. Articles that become obsolete as a result of engineering changes or other actions shall be controlled to prevent unauthorized assembly or installation. Unusable articles shall be isolated and then scrapped. Discrepancies noted by the Contractor or resident inspectors during assembly shall be entered by the inspection personnel on a record that accompanies the major component, subassembly, assembly or bus from start of assembly through final inspection. Actions shall be taken to correct discrepancies or deficiencies in the manufacturing processes, procedures or other conditions that cause articles to be in nonconformity with the requirements of the Contract specifications. The inspection personnel shall verify the corrective actions and mark the discrepancy record. If discrepancies cannot be corrected by replacing the nonconforming materials, then the Agency shall approve the modification, repair or method of correction to the extent that the Contract specifications are affected.

- **Quality assurance audits:** The quality assurance organization shall establish and maintain a quality control audit program. Records of this program shall be subject to review by the Agency.

QA 2. Inspection

QA 2.1 Inspection Stations

Inspection stations shall be at the best locations to provide for the Work content and characteristics to be inspected. Stations shall provide the facilities and equipment to inspect structural, electrical, hydraulic and other components and assemblies for compliance with the design requirements.

Stations shall also be at the best locations to inspect or test characteristics before they are concealed by subsequent fabrication or assembly operations. These locations shall minimally include underbody structure completion, body framing completion, body prior to paint preparation, water test, engine installation completion, underbody dress-up and completion, bus prior to final paint touchup, bus prior to road test and bus final road test completion.

QA 2.2 Resident Inspectors

QA 2.2.1 Resident Inspector's Role

The Agency shall be represented at the Contractor's plant by resident inspectors, as required by FTA. Resident inspectors may be Agency employees or outside contractors. The Agency shall provide the identity of each inspector and shall also identify his or her level of authority in writing. They shall monitor, in the Contractor's plant, the manufacture of transit buses built under the procurement. The presence of these resident inspectors in the plant shall not relieve the Contractor of its responsibility to meet all the requirements of this procurement. The Agency shall designate a primary resident inspector, whose duties and responsibilities are delineated in "Pre-Production Meetings," "Authority" and "Pre-Delivery Tests," below. Contractor and resident inspector relations shall be governed by the guidelines included as Attachment A to this section.

QA 2.2.2 Pre-Production Meetings

The primary resident inspector may participate in design review and Pre-Production Meetings with the Agency. At these meetings, the configuration of the buses and the manufacturing processes shall be finalized, and all Contract documentation provided to the inspector.

No less than thirty (30) days prior to the beginning of bus manufacture, the primary resident inspector may meet with the Contractor's quality assurance manager and may conduct a pre-production audit meeting. They shall review the inspection procedures and finalize inspection checklists. The resident inspectors may begin monitoring bus construction activities two weeks prior to the start of bus fabrication.

QA 2.2.3 Authority

Records and data maintained by the quality assurance organization shall be available for review by the resident inspectors. Inspection and test records for this procurement shall be available for a minimum of one year after inspections and tests are completed.

The Contractor's gauges and other measuring and testing devices shall be made available for use by the resident inspectors to verify that the buses conform to all specification requirements. If necessary, the Contractor's personnel shall be made available to operate the devices and to verify their condition and accuracy.

Discrepancies noted by the resident inspector during assembly shall be entered by the Contractor's inspection personnel on a record that accompanies the major component, subassembly, assembly or bus from start of assembly through final inspection. Actions shall be taken to correct discrepancies or deficiencies in the manufacturing processes, procedures or other conditions that cause articles to be in nonconformity with the requirements of the Contract specifications. The inspection personnel shall verify the corrective actions and

mark the discrepancy record. If discrepancies cannot be corrected by replacing the nonconforming materials, then the Agency shall approve the modification, repair or method of correction to the extent that the Contract specifications are affected.

The primary resident inspector shall remain in the Contractor's plant for the duration of bus assembly Work under this Contract. Only the primary resident inspector or designee shall be authorized to release the buses for delivery. The resident inspectors shall be authorized to approve the pre-delivery acceptance tests. Upon request to the quality assurance supervisors, the resident inspectors shall have access to the Contractor's quality assurance files related to this procurement. These files shall include drawings, assembly procedures, material standards, parts lists, inspection processing and reports, and records of Defects.

QA 2.2.4 Support Provisions

The Contractor shall provide office space for the resident inspectors in close proximity to the final assembly area. This office space shall be equipped with desks, outside and interplant telephones, Internet access, file cabinet and chairs.

QA 2.2.5 Compliance with Safety Requirements

At the time of the Pre-Production Meeting, the Contractor shall provide all safety and other operational restrictions that govern the Contractor's facilities. These issues will be discussed and the parties will agree which rules/restrictions will govern the Agency's inspector(s) and any other Agency representatives during the course of the Contract.

QA 3. Acceptance Tests

QA 3.1 Responsibility

Fully documented tests shall be conducted on each production bus following manufacture to determine its acceptance to the Agency. These acceptance tests shall include pre-delivery inspections and testing by the Contractor and inspections and testing by the Agency after the buses have been delivered.

QA 3.2 Pre-Delivery Tests

The Contractor shall conduct acceptance tests at its plant on each bus following completion of manufacture and before delivery to the Agency. These pre-delivery tests shall include visual and measured inspections, as well as testing the total bus operation. The tests shall be conducted and documented in accordance with written test plans approved by the Agency.

Additional tests may be conducted at the Contractor's discretion to ensure that the completed buses have attained the required quality and have met the requirements in "Section 6: Technical Specifications." The Agency may, prior to commencement of production, demand that the Contractor demonstrate compliance with any requirement in that section if there is evidence that prior tests have been invalidated by the Contractor's change of Supplier or change in manufacturing process. Such demonstration shall be by actual test, or by supplying a report of a previously performed test on similar or like components and configuration. Any additional testing shall be recorded on appropriate test forms provided by the Contractor and shall be conducted before acceptance of the bus.

The pre-delivery tests shall be scheduled and conducted with thirty (30) days' notice so that they may be witnessed by the resident inspectors, who may accept or reject the results of the tests. The results of pre-delivery tests, and any other tests, shall be filed with the assembly inspection records for each bus. The underfloor equipment shall be available for inspection by the resident inspectors, using a pit or bus hoist provided by the Contractor. A hoist, scaffold or elevated platform shall be provided by the Contractor to easily and safely inspect bus roofs. Delivery of each bus shall require written authorization of the primary resident inspector. Authorization forms for the release of each bus for delivery shall be provided by the Contractor. An executed copy of the authorization shall accompany the delivery of each bus.

QA 3.2.1 Visual and Measured Inspections

Visual and measured inspections shall be conducted with the bus in a static condition. The purpose of the inspection testing includes verification of overall dimension and weight requirements, that required components are included and are ready for operation, and that components and subsystems designed to operate with the bus in a static condition do function as designed.

QA 3.2.2 Total Bus Operation

Total bus operation shall be evaluated during road tests. The purpose of the road tests is to observe and verify the operation of the bus as a system and to verify the functional operation of the subsystems that can be operated only while the bus is in motion.

Each bus shall be driven for a minimum of fifteen (15) miles during the road tests. If requested, computerized diagnostic printouts showing the performance of each bus shall be produced and provided to the Agency. Observed Defects shall be recorded on the test forms. The bus shall be retested when Defects are corrected and adjustments are made. This process shall continue until Defects or required adjustments are no longer detected.

Attachment A: New Bus Manufacturing Inspection Guidelines

Pre-Production Meeting

Responsibilities

Agency

- Provides conformed copy of technical requirements.
- Recommended staff to be involved may include the following:

Project manager
Technical engineer
Contract administrator
Quality assurance administrator
Warranty administrator

- Process for inspector's role (to deal with Agency) for negotiated changes after freeze date.
- Contractual requirements:

Milestones
Documentation
Title requirements
Deliverables
Payments
Reliability tracking

Manufacturer

- Identifies any open issues.
- Recommended staff to be involved may include the following:

Project manager
Technical engineer(s)
Contract administrator
Quality assurance administrator
Warranty administrator

- Production flow (buses/week, shifts).
- Delivery schedule and offsite component build-up schedule.
- Bus QA documentation (including supplier application approvals and/or any certifications required for the specific production).
- Communication flow/decision making.

Inspector

- Agree on decisions inspectors can and cannot make.
- Primary contact for problems, etc.
- Production flow process (description of manufacturing by station).
- Factory hours (manage inspection schedule based on production hours).
- Plant rules.
- Safety requirements.
- Orientation requirements.
- Work environment.
- Inspector's office space (per contract).

NOTE: As a result of this meeting, documentation should be produced detailing final production requirements and the planned configuration of the bus.

Build Schedule

The bus manufacturer's contract administrator shall supply a fleet build production schedule based on the dates in the Notice to Proceed, and a description of the manufacturer's schedule for plant operations. This schedule should adhere to the set schedule of the originally submitted RFP – no more than fifty-four weeks, and consistent with the schedule submitted by the manufacturer for which was submitted.

The production schedule should contain specific milestone dates, such as the following:

- First vehicle on production line (date on which any work will begin).
- First vehicle off production line.
- First vehicle through manufacturer's quality assurance inspections.
- First vehicle shipped to the Agency.
- Last vehicle on production line.
- Last vehicle off production line.
- Last vehicle shipped to the Agency.

Plant Tour (if Meeting at OEM's Location)

The Agency will review the entire process from start to finish and review the work completed at each line station, including quality control measures.

Prototype/Pilot Vehicle Production

The Contractor shall conduct acceptance tests at its plant on each bus following completion of manufacture and before delivery to the Agency. These pre-delivery tests shall include visual and measured inspections, as well as testing the total bus operation. The tests shall be conducted and documented in accordance with written test plans approved by the Agency. The underfloor equipment shall be available for inspection by the resident inspectors, using a pit or bus hoist provided by the Contractor. A hoist, scaffold or elevated platform shall be provided by the Contractor to easily and safely inspect bus roofs. Delivery of each bus shall require written authorization of the primary resident inspector. Authorization forms for the release of each bus for delivery shall be provided by the Contractor. An executed copy of the authorization shall accompany the delivery of each bus.

Additional tests may be conducted at the Agency's discretion to ensure that the completed buses have attained the required quality and have met the requirements in "Section 6: Technical Specifications." The Agency may, prior to commencement of production, demand that the Contractor demonstrate compliance with any requirement in that section if there is evidence that prior tests have been invalidated by the Contractor's change of Supplier or change in manufacturing process. Such demonstration shall be by actual test, or by supplying a report of a previously performed test on similar or like components and configuration. Any additional testing shall be recorded on appropriate test forms provided by the Contractor and shall be conducted before acceptance of the bus.

The pre-delivery tests shall be scheduled and conducted with 30 days' notice so that they may be witnessed by the resident inspectors, who may accept or reject the results of the tests. The results of pre-delivery tests, and any other tests, shall be filed with the assembly inspection records for each bus.

Visual and Measured Inspections

Visual and measured inspections shall be conducted with the bus in a static condition. The purpose of the inspection testing includes verification of overall dimension and weight requirements, that required components are included and are ready for operation, and that components and subsystems designed to operate with the bus in a static condition do function as designed.

Total Bus Operation

Total bus operation shall be evaluated during road tests. The purpose of the road tests is to observe and verify the operation of the bus as a system and to verify the functional operation of the subsystems that can be operated only while the bus is in motion.

Each bus shall be driven for a minimum of 15 miles during the road tests. If requested, computerized diagnostic printouts showing the performance of each bus shall be produced and provided to the Agency. Observed defects shall be recorded on the test forms. The bus shall be retested when defects are corrected and

adjustments are made. This process shall continue until defects or required adjustments are no longer detected.

Post-Delivery Tests

The Agency shall conduct acceptance tests on each delivered bus. These tests shall be completed within 15 days after bus delivery and shall be conducted in accordance with the Agency's written test plans. The purpose of these tests is to identify defects that have become apparent between the time of bus release and delivery to the Agency. The post-delivery tests shall include visual inspection and bus operations. No post-delivery test shall apply new criteria that are different from criteria applied in a pre-delivery test.

Buses that fail to pass the post-delivery tests are subject to non-acceptance. The Agency shall record details of all defects on the appropriate test forms and shall notify the Contractor of acceptance or non-acceptance of each bus, after completion of the tests. The defects detected during these tests shall be repaired according to procedures defined in the contract.

Prototype/Pilot Vehicle Acceptance

In order to assess the Contractor's compliance with the Technical Specifications, the Agency and the Contractor shall, at the Pre-Production Meeting, jointly develop a Configuration and Performance Review document for review of the pilot vehicle. This document shall become part of the official record of the Pre-Production Meeting.

Potential dimensional/performance tests that may be included in the Configuration and Performance Review include the following:

- Complete electrical system audit
- Dimensional requirements audit
- Seating capacity
- Water test
- Water runoff test
- Function test of systems/subsystems and components
- Sound/noise level tests
- Vehicle top speed
- Acceleration tests
- Brake stop tests
- Airflow tests
- PA function tests
- Air/brake system audit
- Individual axle weight
- Standee capacity
- Body deflection tests
- Silent alarm function test
- Interior lighting
- Exterior lighting
- Gradability test
- Kneeling system function
- HVAC pull down/heat
- Speedometer
- Outside air infiltration (smoke)
- Wheelchair ramps
- Engine performance qualification

This test shall be jointly conducted by the Contractor and the engine manufacturer (including but not limited to charge air cooler performance, air to boil test, loss of coolant, fuel system electrical inputs and engine protection system).

- Transmission performance qualifications

This test shall be jointly conducted by the Contractor and the transmission manufacturer (including but not limited to retarder operation, heat exchanger, interface with ABS and electrical inputs).

Buy America Audit

A post-delivery Buy America audit is required for federally funded bus procurements (see 49 CFR Part 663 for additional information). The onsite resident inspectors are to monitor the production processes to verify compliance with final assembly requirements identified by the Buy America pre-award audit. This audit is to verify compliance with final assembly requirements and final documentation of Buy America compliance and must be completed prior to title transfer. Audit documentation must be supplied to Transit Agency.

Resident Inspection Process for Serial Production

At the discretion of the Agency, a decision is made to perform resident inspection using the Agency's personnel, a contract inspector, or a combination of both. The decision is based on factors such as the availability of personnel, knowledge/expertise in bus build project management, the size of the bus order, etc.

Inspector Responsibilities

The resident inspection process for the serial production of the buses begins following the completion and acceptance of the prototype or pilot vehicle if required, or according to the serial bus production schedule. Resident inspectors should represent the Agency for all build-related issues (quality, conformance, etc.).Resident inspectors can also address contractual type issues but should only do so under the consult of the Agency's contracts administrator. Resident inspectors are sent to the manufacturer's facility according to a Resident Inspection Schedule. Typically, one or two inspectors arrive onsite at the manufacturing facility about one week prior to actual production to setup the resident inspection process and to begin preliminary quality assurance inspections for items such as power plant build-up and wire harness production, and to inspect incoming parts, fasteners, fluids, etc., that will be used in the production of the buses. During the serial production of the buses, the resident inspectors should monitor the production of each bus, verifying the quality of materials, components, sub-assemblies and manufacturing standards. In addition, the configuration of each vehicle should be audited using the vehicle manufacturer's Build Specification and other documents to ensure contract compliance and uniformity.

Inspector Rotation/Scheduling

During the resident inspection phase, a single inspector or multiple inspectors could be used. If it is decided to use multiple inspectors, then the inspectors could be rotated on a biweekly to monthly basis as required. During the rotation of inspectors, a sufficient period of overlap should be provided to guarantee the consistency of the resident inspection process.

Resident Inspector Orientation

A resident inspector orientation by the bus manufacturer should take place upon the arrival of the initial inspection team. The orientation should include expectations for the use of personal protective equipment (safety shoes, safety glasses, etc.), daily check-in and check-out requirements, lines of communication, use of production documents such as speed memos and line movement charts, inspector/production meetings, inspector office arrangements, and anything else pertinent to the inspection team's involvement during the build. Many of the above items should already be formalized during the Pre-Production Meeting.

Audits, Inspections and Tests

The resident inspection process monitors the production of each vehicle. Inspection stations should be strategically placed to test or inspect components or other installations before they are concealed by subsequent fabrication or assembly operations. These locations typically are placed for the inspection of underbody structure, body framing, electrical panels and harnesses, air and hydraulic line routings, installation of insulation, power plant build-up and installation, rust inhibitor/undercoating application, floor installation, front suspension alignment, and other critical areas.

Vehicle Inspections

Each bus is subjected to a series of inspections after the bus reaches the point of final completion on the assembly line. Typically, the vehicle manufacturer performs its own quality assurance inspections following assembly line completion before releasing each bus to the resident inspectors. The inspections for each vehicle are documented, signed off upon passing and included in the vehicle record.

These are the typical inspections performed on each bus by the resident inspectors:

- Water test inspection
- Road test inspection
- Interior inspection (including functionality)
- Hoist/undercarriage inspection
- Exterior inspection (including roof)
- Electrical inspection
- Wheelchair ramp/lift inspection

Water Test Inspection

The water test inspection checks the integrity of the vehicle's body seams, window frame seals and other exterior component close-outs for their ability to keep rainwater, road splash, melting snow and slush, and other exterior water from entering the inside of the vehicle. The vehicle's interior is inspected for signs of moisture and water leaks. To perform the leak inspection, interior ceiling and side panels are removed, and access doors are opened. If any moisture or water is detected, then the source of the leak will be located and repaired by the manufacturer, and the vehicle will be tested again.

Road Test Inspection

The road test inspection checks all the vehicle's systems and subsystems while the vehicle is in operation. Typically, the road test inspection is performed immediately following the water test inspection to reveal any standing water that may be present due to a leak, but was not noticed during the "static" water test .Objectionable vibrations, air leakage and other factors that affect ride quality are recorded and reported to the vehicle manufacturer for resolution. Vehicle stability, performance, braking and interlock systems, HVAC, and other critical areas are checked to ensure that the vehicle is complete and ready to provide safe and reliable service.

The following tests may be performed and recorded during the road test:

- Acceleration test
- Top speed test
- Gradability test
- Service brake test
- Parking brake test
- Turning effort test
- Turning radius test
- Shift quality
- Quality of retarder or regenerative braking action

During the road test, a vehicle may be taken to a weigh station to record the vehicle's front axle weight, rear axle weight and total vehicle (curb) weight.

Interior Inspection

The interior inspection checks the fit and finish of the interior installations.

In addition, the inspection also verifies the installation and function of systems and subsystems according to the Build Specification. All systems and functions accessed from the interior are inspected for functionality, appearance and safety.

Examples of systems/functions inspected include the following:

- Interior and exterior lighting controls
- Front and rear door systems
- Flooring installation
- Passenger and operator's seat systems
- Wheelchair securement and ramp systems
- Fire suppression system
- Electrical installations (multiplex, tell-tale wiring, panels, etc.)
- Window systems and emergency escape portals
- Operator dash/side panel controls/indicators

Hoist/Undercarriage Inspection

The hoist/undercarriage inspection checks the installation of components, wiring, air lines, presence of fluid leaks, etc., located under the vehicle. Typically, this inspection is performed following the road test. The vehicle is lifted onto a hoist or pulled over a pit for the inspection. Areas inspected are the front suspension, air bags, airline routings, electrical connections and routings, drivetrain components, linkages and any other system or component that may be prone to early failure due to inadequate installation techniques. All lines, cables, hoses, etc., are inspected for proper securement and protection to prevent rubbing, chafing or any other condition that could result in a failure. The engine/powerplant and HVAC compartments are also inspected during this time.

Exterior Inspection

The exterior inspection checks the fit and finish of components installed on the exterior of the vehicle. Access panels are opened and accessories are inspected for proper installation. In addition, vehicle paint, graphics and proper decals are also inspected. Acceptable paint finish quality (orange peel, adhesion, etc.) should be agreed on with the vehicle manufacturer prior to production to ensure consistency of inspections.

Electrical Inspection

The vehicle's main electrical panels and other subpanels are inspected for proper components, to include relays, fuses, modules, terminal strips, decals, etc. In addition, electrical harnesses are inspected for proper wiring and termination techniques, bulkhead protection, looming and other items that could result in future electrical failure. Onboard vehicle compartment schematics are verified for accuracy.

Wheelchair Ramp Inspection

The wheelchair ramp assembly is inspected for proper installation and performance. Clearances critical to the operation of the ramp are verified, and the ramp's electrical systems are inspected to ensure appropriate wire routings and protection. The successful integration of the ramp assembly into the vehicle is verified, and the vehicle interlocks are checked during automatic and manual ramp operation.

Audits

During serial production of the bus's quality assurance inspection, tests may be performed to ensure that the manufacturer's quality standards are being followed. These inspection audits could be on items such as torque wrench calibrations, proper techniques for fastener installations, proper use and type of adhesives, use of correct installation drawings on the production line, etc.

Communications

The lines of communications, formal and informal, should be discussed and outlined in the Pre-Production Meeting. As previously discussed, resident inspectors should represent the Agency for all bus-build related issues (quality, conformance, etc.).Resident inspectors can relay communications addressing contractual type issues but should do so only under the consult of the Agency's contract administrator. Actual personnel contacts for the manufacturing facility should be established during resident inspector orientation. These contacts could include quality assurance, production, material handling, engineering and buy-off area personnel.

Documentation

The following documents/reports are typically generated during the bus build process:

- Vehicle build specification
- Sales order
- Pre-Production Meeting notes
- Prototype and production correspondence (vehicle build file)
- Manufacturer's vehicle record (Warranty file)

Vehicle line documents
Serialization documents (Warranty file)
Alignment verification
Brake testing
HVAC testing and checkout
Manufacturer's QA checklist and signoff
Weight slip (prototype and Warranty file)
Prototype performance tests document (vehicle build file)

Acceleration Test
Top Speed Test
Gradability Test
Interior Noise Test A – Stationary
Interior Noise Test B – Dynamic
Exterior Noise Test A – Pull Away
Exterior Noise Test B – Pass-By
Exterior Noise Test C – Curb Idle
Turning Radius Test
Turning Effort Test
Parking Brake Test
Service Brake Test

Vehicle acceptance inspections—production (Warranty file)

Water Test Inspection Report
Road Test Inspection Report
Interior Inspection Report
Hoist/Undercarriage Inspection Report
Exterior Inspection Report
Electrical Inspection Report
Wheelchair Inspection Report

Speed Memos (Warranty file)
Agency Vehicle Inspection record(Warranty file)
Release for delivery documentation (Warranty file)
Post-Production Acceptance – Certificate of Acceptance(Accounting)
Post-Delivery Inspection Report – (Fleet Management & Warranty files)

Vehicle Release for Delivery

Upon satisfactory completion of all inspection, audit and test criteria, and resolution of any outstanding issues affecting the purchase of any or all buses, proper documentation (the Release for Delivery) is signed by the

designated resident inspector authorizing the bus manufacturer to deliver the vehicle to the Agency's facility, where it will undergo a post-delivery inspection process and final acceptance. The satisfactory sign-off of the Release for Delivery should complete the resident inspector's duties for each bus. In final preparation for delivery, the bus manufacturer may request the resident inspector to do a final walk-through of the bus after it has been cleaned and prepped for shipping.

Post-Delivery and Final Acceptance

The Agency shall conduct acceptance tests on each delivered bus. These tests shall be completed within 15 days after bus delivery and shall be conducted in accordance with the Agency's written test plans. The purpose of these tests is to identify defects that have become apparent between the time of bus release and delivery to the Agency. The post-delivery tests shall include visual inspection, along with a verification of system(s) functionality and overall bus operations. No post-delivery test shall apply new criteria that are different from criteria applied in a pre-delivery test.

Buses that fail to pass the post-delivery tests are subject to non-acceptance. The Agency shall record details of all defects on the appropriate test forms and shall notify the Contractor of acceptance or non-acceptance of each bus within five days after completion of the tests. The defects detected during these tests shall be repaired according to procedures defined in the contract after non-acceptance.

Certificate of Acceptance

- **Accepted**
- **Not accepted:** In the event that the bus does not meet all requirements for acceptance. The Agency must identify reasons for non-acceptance and work with the OEM to develop a timeline of addressing the problem for a satisfactory resolution and redelivery.
- **Conditional acceptance:** In the event that the bus does not meet all requirements for acceptance, the Agency may conditionally accept the bus and place it into revenue service pending receipt of Contractor furnished materials and/or labor necessary to address the identified issue(s).

SECTION 9: FORMS AND CERTIFICATIONS

CER 1. Proposer's Checklist

RFP #2022DD

Package 1: Technical Proposal

- ☐ 1. Letter of Transmittal
- ☐ 2. Technical Proposal
- ☐ 3. Acknowledgement of Addenda
- ☐ 4. Form for Proposal Deviation
- ☐ 5. Vehicle Questionnaire
- ☐ 6. References and non-priced information (if provided by Proposer)
- ☐ 7. Engineering organization chart, engineering change control procedure, field modification process
- ☐ 8. Manufacturing facility plant layout, other contracts, staffing
- ☐ 9. Production schedule and other Contract commitments for the duration of this Contract.
- ☐ 10. Quality Assurance Program

Package 2: Price Proposal

- ☐ 1. Letter of Transmittal
- ☐ 2. Pricing Schedule (including option buses, spare parts package, engineering, manuals, training, special tools and test equipment)

– **Package 3: Qualifications Package**

- ☐ 1. Pre-Award Evaluation Data Form
- ☐ 2. A copy of the three (3) most recent audited financial statements or a statement from the Proposer regarding how financial information may be reviewed by the Agency
- ☐ 3. Letter for insurance
- ☐ 4. Letter for performance bond (if applicable)
- ☐ 5. Warranty coverage confirmation within required limits identified
- ☐ 6. Altoona Testing confirmation documents
- ☐ 7. Required Signature pages contained in Section CER 8
- ☐ 8. Proposal Form

– **Package 4: Proprietary/Confidential Information**

- ☐ 1. Proprietary/Confidential Information

There may be items in the first three packages that are included in Package 4 because they are considered to be proprietary/confidential information. When this occurs, the Proposer must note that fact in packages 1 through 3.

CER 2. Request for Pre-Offer Change or Approved Equal

This form must be used for requested clarifications, changes, substitutes or approval of items equal to items specified with a brand name and must be submitted as far in advance of the Due Date, as specified in "Questions, Clarifications and Omissions."

AppalCART
RFP# 2022DD

Request #: **Proposer:** **RFP Section:** **Page:**		
Questions/clarification or approved equal:		
Agency action:	- □Approved □ See addendum	□ Denied □See response below
Agency response:		

CER 3. Acknowledgement of Addenda

Failure to acknowledge receipt of all addenda may cause the Proposal to be considered nonresponsive to the Solicitation. Acknowledged receipt of each addendum must be clearly established and included with the Proposal.

The undersigned acknowledges receipt of the following addenda to the documents: - Addendum No.: – Dated: - Addendum No.: – Dated: – Addendum No.: – Dated: – Addendum No.: – Dated:
– Proposer: Name: Title: Phone: Street address: City, state, ZIP:
– _____ Authorized signature Date

CER 4. Contractor Service and Parts Support Data

– **Location of nearest Technical Service Representative to Agency**

Name:
Address:
Telephone:
Describe technical services readily available from said representative:

– **Location of nearest Parts Distribution Center to Agency:**

Name:
Address:
Telephone:
Describe the extent of parts available at said center:

– **Policy for delivery of parts and components to be purchased for service and maintenance:**

Regular method of shipment:
Cost to Agency:

CER 5. Form for Proposal Deviation

This form shall be completed for each condition, exception, reservation or understanding (i.e., Deviation) in the Proposal according to "Conditions, Exceptions, Reservations or Understandings." One copy without any price/cost information is to be placed in the Technical Proposal as specified in "Technical Proposal Requirements," and a separate copy with any price/cost information placed in the Price Proposal as specified in "Price Proposal Requirements."

AppalCART
RFP# 2022DD

Deviation No.:	**Contractor:**	**RFP section:**	**Page:**
Complete description of Deviation:			
Rationale (pros and cons):			

CER 6. Pricing Schedule

AppalCART
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All pricing should be included on the associated Excel Spreadsheet for submission. No alterations should be made to the format or structure of the pricing pages. Contractors should include their pricing on printed forms for their RFP submission, and include the electronic file on the submitted CD/Flash drive as detailed in the submission instructions.

The following tabs will be included on the Pricing Schedule of the Excel form.

Proposal Pricing Tab A Base Bus Price Per Type / Size
Proposal Pricing Tab B Price Page – Alternate Equipment
Proposal Pricing Tab C Price Page – Optional Equipment
Proposal Pricing Tab D Price Page – Special Tools
Proposal Pricing Tab E Price Page – Spare Parts
Proposal Pricing Tab F Price Page - Training

CER 7. Pre-Award Evaluation Data Form

NOTE: This form is to be completed and included in the Qualification Package. Attach additional pages if required.

AppalCART
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1. Name of firm:

2. Address:

3. □ **Individual** □ **Partnership** □ **Corporation** □ **Joint Venture**

4. Date organized:
State in which incorporated:

5. Names of officers or partners:

a.

b.

c.

d.

e.

6. How long has your firm been in business under its present name?

7.Attach as **SCHEDULE ONE** a list of similar current contracts that demonstrates your available capacity, including the quantity and type of bus, name of contracting party, percentage completed and expected completion date.

8.Attach as **SCHEDULE TWO** a list of at least three similar contracts that demonstrates your technical proficiency, each with the name of the contracting party and number and the type of buses completed within the last five years.

9.Have you been terminated or defaulted, in the past five years, on any Contract you were awarded?
□ Yes □ No
If yes, then attach as **SCHEDULE THREE** the full particulars regarding each occurrence.

10. Attach as **SCHEDULE FOUR** Proposer's last three (3) financial statements prepared in accordance with generally accepted accounting principles of the jurisdiction in which the Proposer is located, and audited by an independent certified public accountant; or a statement from the Proposer regarding how financial information may be reviewed by the Agency (This may require execution of an acceptable non-disclosure agreement between the Agency and the Proposer.)

11. Attach as **SCHEDULE FIVE** a list of all principal Subcontractors and the percentage and character of Work (Contract amount) that each will perform on this Contract.

12. If the Contractor or Subcontractor is a joint venture, submit **PRE-AWARD EVALUATION DATA** forms for each member of the joint venture.

The above information is confidential and will not be divulged to any unauthorized personnel.

The undersigned certifies to the accuracy of all information:
Name and title:
Company:

Authorized signature Date

CER 8. Federal / State Certifications

CER 8.1 Buy America Certification

This form is to be submitted with an offer exceeding the small purchase threshold for federal assistance programs, currently set at $100,000.

Certificate of Compliance

The Proposer hereby certifies that it will comply with the requirements of 49 USC Section 5323(j)(2)(C), Section 165(b)(3) of the Surface Transportation Assistance Act of 1982, as amended, and the regulations of 49 CFR 661.11:

Name and title:
Company:

_____

Authorized signature Date

State of _____

County of _____

Subscribed and sworn to before me this ___ day of _____, 20___.

Notary Public _____

My Commission Expires _____

Certificate of Non-Compliance

The Proposer hereby certifies that it cannot comply with the requirements of 49 USC Section 5323(j)(2)(C) and Section 165(b)(3) of the Surface Transportation Assistance Act of 1982, as amended, but may qualify for an exception to the requirements consistent with 49 USC Sections 5323(j)(2)(B) or (j)(2)(D), Sections 165(b)(2) or (b)(4) of the Surface Transportation Assistance Act, as amended, and regulations in 49 CFR 661.7.

Name and title:
Company:

_____

Authorized signature Date

State of _____

County of _____

Subscribed and sworn to before me this ___ day of _____, 20___.

Notary Public _____

My Commission Expires _____

CER 8.2 Debarment and Suspension Certification for Prospective Contractor

Primary covered transactions must be completed by Proposer for contract value over $25,000.

Choose one alternative:

☐

– The Proposer, [insert name_____], certifies to the best of its knowledge and belief that it and its principals:

1. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any federal department or agency;
2. Have not within a three-year period preceding this Proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (federal, state or local) transaction or Contract under a public transaction; violation of federal or state antitrust statutes or commission or embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
3. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (federal, state, or local) with commission of any of the offenses enumerated in Paragraph 2 of this certification; and
4. Have not within a three-year period preceding this Proposal had one or more public transactions (federal, state or local) terminated for cause or default.

OR

☐

– The Proposer is unable to certify to all of the statements in this certification, and attaches its explanation to this certification. (In explanation, certify to those statements that can be certified to and explain those that cannot.)

The Proposer certifies or affirms the truthfulness and accuracy of the contents of the statements submitted on or with this certification and understands that the provisions of Title 31 USC § Sections 3801 are applicable thereto.

– **Executed in** [insert city and state _____].

Name:

_____

Authorized signature Date

State of _____

County of _____

Subscribed and sworn to before me this ___ day of _____, 20___.

Notary Public _____

My Commission Expires _____

CER 8.3 Debarment and Suspension Certification (Lower-Tier Covered Transaction)

This form is to be submitted by each Subcontractor receiving an amount exceeding $25,000.

– The prospective lower-tier participant (Proposer) certifies, by submission of this Proposal, that neither it nor its "principals" as defined at 49 CFR § 29.105(p) is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any federal department or agency.

If the prospective Proposer is unable to certify to the statement above, it shall attach an explanation, and indicate that it has done so by placing an "X" in the following space: _____

THE PROPOSER, _____, CERTIFIES OR AFFIRMS THE TRUTHFULNESS AND ACCURACY OF EACH STATEMENT OF ITS CERTIFICATION AND EXPLANATION, IF ANY. IN ADDITION, THE PROPOSER UNDERSTANDS AND AGREES THAT THE PROVISIONS OF 31 USC §§ 3801 *ET SEQ*. APPLY TO THIS CERTIFICATION AND EXPLANATION, IF ANY.

Name and title of the Proposer's authorized official:

_____

Authorized signature Date

State of _____

County of _____

Subscribed and sworn to before me this ___ day of _____, 20___.

Notary Public _____

My Commission Expires _____

CER 8.4 Non-Collusion Affidavit

This affidavit is to be filled out and executed by the Proposer; if a corporation makes the bid, then by its properly executed agent. The name of the individual swearing to the affidavit should appear on the line marked "Name of Affiant." The affiant's capacity, when a partner or officer of a corporation, should be inserted on the line marked "Capacity." The representative of the Proposer should sign his or her individual name at the end, not a partnership or corporation name, and swear to this affidavit before a notary public, who must attach his or her seal.

– State of _____, County of _____

I, _____, being first duly sworn, do hereby state that
(Name of Affiant)

I am _____ of _____
(Capacity) (Name of Firm, Partnership or Corporation)

whose business is
_____

and who resides at
_____

and that
_____
(Give names of all persons, firms, or corporations interested in the bid)

is/are the only person(s) with me in the profits of the herein contained Contract; that the Contract is made without any connection or interest in the profits thereof with any persons making any bid or Proposal for said Work; that the said Contract is on my part, in all respects, fair and without collusion or fraud, and also that no members of the Board of Trustees, head of any department or bureau, or employee therein, or any employee of the Authority, is directly or indirectly interested therein.

_____
Signature of Affiant Date

Sworn to before me this _____ day of _____, 20_____.

_____ Seal
Notary public My commission expires

CER 8.5 Lobbying Certification

This form is to be submitted with an offer exceeding $100,000.

The Proposer certifies, to the best its knowledge and belief, that:

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

2. If any funds other than federal appropriated funds have been paid or will be paid to any person for making lobbying contacts to an officer or employee of any agency, a member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with this federal Contract, grant, loan or cooperative agreement, the undersigned shall complete and submit Standard Form LLL, "Disclosure Form to Report Lobbying," in accordance with its instruction, as amended by "Government wide Guidance for New Restrictions on Lobbying," 61 Fed. Reg. 1413 (1/19/96).

3. The undersigned shall require that the language of this certification be included in the award documents for all sub awards at all tiers (including subcontracts, sub grants and contracts under grants, loans and cooperative agreements) and that all sub recipients shall certify and disclose accordingly. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31, USC § 1352 (as amended by the Lobbying Disclosure Act of 1995). Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

THE PROPOSER, _____, CERTIFIES OR AFFIRMS THE TRUTHFULNESS AND ACCURACY OF EACH STATEMENT OF ITS CERTIFICATION AND DISCLOSURE, IF ANY. IN ADDITION, THE PROPOSER UNDERSTANDS AND AGREES THAT THE PROVISIONS OF 31 USC §§ 3801 ET SEQ. APPLY TO THIS CERTIFICATION AND DISCLOSURE, IF ANY.

Name of the bidder or Proposer's authorized official:

_____

Title:

_____

_____

Signature Date

State of _____

County of _____

Subscribed and sworn to before me this ___ day of _____, 20___.

Notary Public _____

My Commission Expires _____

Per paragraph 2 of the included form Lobbying Certification, add Standard Form–LLL, "Disclosure Form to Report Lobbying," if applicable.

CER 8.6 Certificate of Compliance with Bus Testing Requirement

The undersigned certifies that the vehicle offered in this procurement complies and will, when delivered, comply with 49 USC § 5323(c) and FTA's implementing regulation at 49 CFR Part 665 according to the indicated one of the following three alternatives.

Mark one and only one of the three blank spaces with an "X."

1. _____ The buses offered herewith have been tested in accordance with 49 CFR Part 665 on _____ (date). If multiple buses are being proposed, provide additional bus testing information below or on attached sheet. The vehicles being sold should have the identical configuration and major components as the vehicle in the test report, which must be submitted with this Proposal. If the configuration or components are not identical, then the manufacturer shall provide with its Proposal a description of the change and the manufacturer's basis for concluding that it is not a major change requiring additional testing. If multiple buses are being proposed, testing data on additional buses shall be listed on the bottom of this page.

2. _____ The manufacturer represents that the vehicle is "grandfathered" (has been used in mass transit service in the United States before October 1, 1988, and is currently being produced without a major change in configuration or components), and submits with this Proposal the name and address of the recipient of such a vehicle and the details of that vehicle's configuration and major components.

3. _____ The vehicle is a new model and will be tested and the results will be submitted to the Agency prior to acceptance of the first bus.

The undersigned understands that misrepresenting the testing status of a vehicle acquired with federal financial assistance may subject the undersigned to civil penalties as outlined in the Department of Transportation's regulation on Program Fraud Civil Remedies, 49 CFR Part 31. In addition, the undersigned understands that FTA may suspend or debar a manufacturer under the procedures in 49 CFR Part 29.

Company name:
Name and title of the Proposer's authorized official:

_____

Authorized signature Date

State of _____

County of _____

Subscribed and sworn to before me this ___ day of _____, 20___.

Notary Public _____

My Commission Expires _____

CER 8.7 Transit Vehicle Manufacturer (TVM) Certification

Transit Vehicle Manufacturer (TVM) Disadvantaged Business Enterprise Pursuant to the provisions of 49 CFR Part 26.49, each bidder for this contract must certify that it has complied with the requirements of 49 CFR Part 26.49, regarding participation of disadvantaged business enterprises in FTA-assisted procurements of transit vehicles. Absent this certification, properly completed and signed, a bid shall be deemed non-responsive.

Certification: I hereby certify, for the bidder named below, that it has complied with the provisions of 49 CFR Part 26.49 and that I am duly authorized by said bidder to make this certification.

_____

Name of Bidder/Company Name

_____

(Date) (Signature of Representative)

_____

(Signature of Notary & SEAL) (Type or Print Name & Title of that Representative)

CER 8.8 Federal Motor Vehicle Safety Standards

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

Company name:
Name of signer:
Title:

_____

Authorized signature Date

State of _____

County of _____

Subscribed and sworn to before me this ___ day of _____, 20___.

Notary Public _____

My Commission Expires _____

CER 8.9 Additional Federal Compliance

I. During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

(1) Compliance with Regulations: The contractor (hereinafter includes consultants) will comply with the Acts and the Regulations relative to Nondiscrimination in Federally-assisted programs of the U.S. Department of Transportation, Federal Transit Administration (FTA), as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.

(2) Nondiscrimination: The contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, national origin, sex, age, creed (religion), low-income, limited English proficiency, or disability in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor will not participate directly or indirectly in the discrimination prohibited by the Acts and the Regulations, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR Part 21.

(3) Solicitations for Subcontractors, Including Procurements of Materials and Equipment: In all solicitations, either by competitive bidding, or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the contractor of the contractor's obligations under this contract and the Acts and the Regulations relative to Nondiscrimination on the grounds of race, color, or national origin.

(4) Information and Reports: The contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Recipient or the FTA to be pertinent to ascertain compliance with such Acts, Regulations, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the contractor will so certify to the Recipient or the FTA, as appropriate, and will set forth what efforts it has made to obtain the information.

(5) Sanctions for Noncompliance: In the event of a contractor's noncompliance with the Non-discrimination provisions of this contract, the Recipient will impose such contract sanctions as it or the FTA may determine to be appropriate, including, but not limited to:

(a) withholding payments to the contractor under the contract until the contractor complies; and/or
(b) cancelling, terminating, or suspending a contract, in whole or in part.

(6) Incorporation of Provisions: The contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations and directives issued pursuant thereto. The contractor will take action with respect to any subcontract or procurement as the Recipient or the FTA may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the contractor may request the Recipient to enter into any litigation to protect the interests of the Recipient. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

II. During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees to comply with the following nondiscrimination statutes and authorities; including but not limited to:

Pertinent Nondiscrimination Authorities

- Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d et seq., 78 stat. 252), (prohibits discrimination on the basis of race, color, national origin); and 49 CFR Part 21.
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- Federal-Aid Highway Act of 1973, (23 U.S.C. § 324 et seq.), (prohibits discrimination on the basis of sex);
- Section 504 of the Rehabilitation Act of 1973, (29 U.S.C. § 794 et seq.), as amended, (prohibits discrimination on the basis of disability); and 49 CFR Part 27;
- The Age Discrimination Act of 1975, as amended, (42 U.S.C. § 6101 et seq.), (prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982, (49 USC § 471, Section 47123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);
- The Civil Rights Restoration Act of 1987, (PL 100-209), (Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, The Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms "programs or activities" to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);

- Titles II and III of the Americans with Disabilities Act, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. §§ 12131-12189) as implemented by Department of Transportation regulations at 49 C.F.R. parts 37 and 38;
- The Federal Aviation Administration's Nondiscrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
  Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures Nondiscrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;
- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of Limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);
- Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. 1681 et seq);
- Federal transit laws, specifically 49 U.S.C. § 5332 (prohibiting discrimination based on race, color, religion, national origin, sex (including gender identity), disability, age, employment, or business opportunity).

*The Contractor has read and is familiar with the terms above:

_____

Authorized signature Date

State of _____

County of _____

Subscribed and sworn to before me this ___ day of _____, 20___.

Notary Public _____

My Commission Expires _____

CER 8.10 NC E-Verify

STATE OF NORTH CAROLINA
AFFIDAVIT OF COMPLIANCE WITH N.C. E-VERIFY STATUTES

(To be submitted with all quotes/bids)

I, _____ (hereinafter the "Affiant"), duly authorized by and on behalf of

_____ (hereinafter the "Employer") after being first duly sworn deposes and says as follows:

1. I am the _____ (President, Manager, CEO, etc.) of the Employer and possess the full authority to speak for and on behalf of the Employer identified above.

2. Employer understands that "E-Verify" means the federal E-Verify program operated by the United States Dept. of Homeland Security and other federal agencies, or any successor or equivalent program used to verify the work authorization of newly hired employees pursuant to federal law.

3. ☐ Employer employs 25 or more employees, and is in compliance with the provisions of N.C. General Statute §64-26. Employer has verified the work authorization of its employees through E-Verify and shall retain the records of verification for a period of at least one year.

   ☐ Employer employs fewer than 25 Employees and is therefore not subject to the provisions of N.C. General Statute §64-26.

4. All subcontractors engaged by or to be engaged by Employer have or will have likewise complied with the provisions of N.C. General Statute §64-26.

5. Employer shall keep the State of North Carolina informed of any change in its status pursuant to Article 2 of Chapter 64 of the North Carolina Statutes.

This _____day of _____, 20____.

_____
Signature of Affiant

_____
Printed Name and Title

State of _____

County of _____

Subscribed and sworn to before me this ___ day of _____, 20____.

Notary Public _____

My Appointment Expires _____

(SEAL)

CER 9. Other Certifications
CER 9.1 Proposal Form

Proposer shall complete the following form and include it in the price Proposal.

PROPOSAL
By execution below by a duly authorized representative(s) of the Proposer, the Proposer hereby offers to furnish equipment and services, and adhere as specified in its Proposal submitted to the AppalCART in response to Request for Proposal No. 2022DD in its entirety with all terms, conditions, certifications and assurances detailed herein.

Proposer:

_____

Street address:

_____

City, state, ZIP:

_____

Name and title of Authorized Signer(s):

_____

Name and title of Authorized Signer(s):

_____

Phone: _____

_____
Authorized signature Date

_____
Authorized signature Date

State of _____

County of _____

Subscribed and sworn to before me this ___ day of _____, 20___.

Notary Public _____

My Commission Expires _____

CER 9.2 Notice of Award

MANUFACTUER –

ADDRESS –

POINT OF CONTACT –

THIS DOCUMENTATION IS BEING PROVIDED TO _____ FOR THE RECOGNITION OF THE FINAL DOCUMENTATION SUBMITTED UNDER RFP#2022DD

By execution below, the AppalCART accepts Proposal as indicated above.

Contracting officer: Craig Hughes, Director

_____

Authorized signature Date

Board Chair: Frank Bethea David V

_____

Authorized signature Date

CER 10. Vehicle Technical Information

This form must be completed and included in the Technical Proposal.

GENERAL COACH DATA SHEET

☐ 30' Diesel, ☐ 35' D, ☐ 40' D // ☐ 30' Hybrid , ☐ 35' H, ☐ 40' H

Bus manufacturer:	
Bus model:	
Understructure manufacturer:	
Model number:	

Basic Body Construction	
Type:	
Tubing or frame member thickness and dimensions	
Overstructure	
Understructure	
Skin thickness and material	
Roof	
Sidewall	
Skirt panel	
Front end	
Rear end	

Dimensions

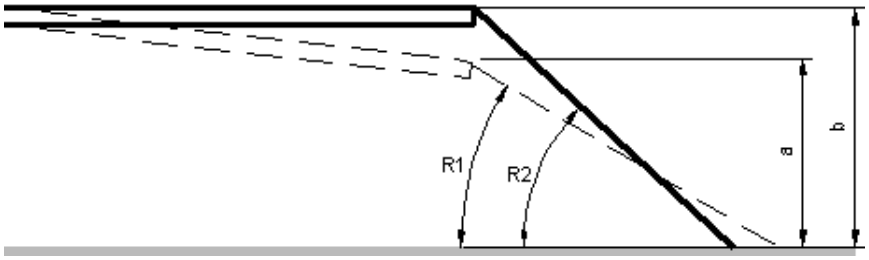
Overall length	Over bumpers		ft		in.
	Over body		ft		in.
Overall width	Over body excluding mirrors		ft		in.
	Over body including mirrors–driving position		ft		in.
	Over tires front axles		ft		in.
	Over tires center axle		ft		in.
	Over tires rear axles		ft		in.
Overall height (maximum)			ft		in.
Overall height (main roof line)			ft		in.

Angle of approach		deg
Breakover angle		deg
Breakover angle (rear)		deg
Angle of departure		deg

Doorway Dimensions	**Front**		**Rear**	
Width between door posts		in.		in.

Door width between panels		in.		in.
Clear door width		in.		in.
Doorway height		in.		in.
Knuckle clearance		in.		in.

Step height from ground measured at center of doorway



	Front doorway, empty		Ramp angle			Rear Doorway, empty	
Kneeled	a.	in.	R1	deg		a.	in.
Unkneeled	b.	in.	R2	deg		b.	in.

Interior head room (center of aisle)

Front axle location		in.
Center axle location		in.
Rear axle location		in.

Aisle width between transverse seats [ ] in.

Floor height above ground (centerline of bus)

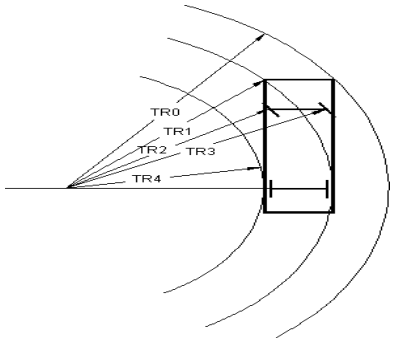
At front door		in.
At front axle		in.
At drive axle		in.
At rear door		in.

Minimum ground clearance (between bus and ground, with bus unkneeled)

Excluding axles		in.
Including axles		in.

Horizontal turning envelope (see diagram below)

Outside body turning radius, TR0 (including bumper)		ft		in.
Front inner corner radius, TR1		ft		in.
Front wheel inner turning radius, TR2		ft		in.
Front wheel outer turning radius, TR3		ft		in.
Inside Body Turning Radius innermost point, TR4 (including bumper)		ft		in.



Wheel base

Front		in.
Rear		in.

Overhang, centerline of axle over bumper

Front		in.
Rear		in.

Floor

Interior length		ft		in.
Interior width (excluding coving)		ft		in.
Total standee area (approximately)		ft^2		
Minimum distance between wheelhouses:	Front			in.
	Rear			in.
	Center			in.
Maximum interior floor slope (from horizontal)		deg		

Passenger capacity provided

Total maximum seating		
Standee capacity		
Minimum hip to knee room		in.
Minimum foot room		in.

Weight

	No. of people	Front axle			Center axle			Rear axle			Total bus
		Left	Right	Total	Left	Right	Total	Left	Right	Total	
Empty bus, full fuel and farebox											
Fully seated, full fuel and farebox											

Fully loaded standee and fully seated, full fuel and farebox											
Crush load (1.5x fully loaded)											
GVWR											
GAWR											

Engine, main

Manufacturer					
Type and weight rating					
Model number					
Bore		in.			
Stroke		in.			
Displacement		$in.^3$			
Compression ratio					
Injector type and size					
Net SAE horsepower		hp	at		RPM
Net SAE torque		lb/ft	at		RPM
Crankcase oil capacity					
New engine, dry		gal			
New engine, wet		gal			
Turbocharger make and model					
Maximum speed, no load		RPM			
Maximum speed, full load		RPM			
Speed at idle		RPM			
Speed at fast idle		RPM			

Engine information/graphs to be attached with this form:

Engine speed vs. road speed
Torque vs. engine speed
Horsepower vs. engine speed
Fuel consumption vs. engine speed
Vehicle speed vs. time (both loaded and unloaded)
Vehicle speed vs. grade (both loaded and unloaded)
Acceleration vs. time
Change of acceleration vs. time

Hybrid drive or transmission

Manufacturer				
Type				
Speeds				
Gear ratios	Forward:		Reverse:	
Shift speeds				
1st–2nd		mph		

2nd–3rd		mph
3rd–4th		mph
4th–5th (if applicable)		mph
5th–6th (if applicable)		mph

Fuel capacity (including heat exchanger and filters	

Voltage regulator

Manufacturer	
Model	

Voltage equalizer

Manufacturer	
Model	

Alternator

Manufacturer		
Type		
Model		
Output at idle		amps
Output at maximum speed		amps
Maximum warranted speed		rpm
Speed at idle (approximately)		rpm
Drive type		

Starter motor

Manufacturer	
Type	
Model	

Air compressor

Manufacturer		
Type		
Rated capacity		CFM
Capacity at idle (approximately)		CFMs
Capacity at maximum speed (engine)		CFM
Maximum warranted speed		rpm
Speed idle		rpm
Drive type		

Governor:

Cut-in pressure		psi
Cut-out pressure		psi

Axles

First

Manufacturer	
Type	

Model number	
Gross axle weight rating	lbs
Axle load	lbs

Second

Manufacturer	
Type	
Model number	
Gross axle weight rating	lbs
Axle load	lbs

Third

Manufacturer	
Type	
Model number	
Gross axle weight rating	lbs
Axle load	lbs
Axle ratio	

Suspension system

Manufacturer		
Type:	First:	
	Second:	
	Third:	
Springs:	First:	
	Second:	
	Third:	

Joint

Manufacturer	
Type	
Model number	

Wheels and tires

Wheels

Make	
Size	
Capacity	
Material	

Tires

Manufacturer	
Type	
Size	
Load range/air pressure	psi

Steering, power

Pump

Manufacturer and model number	
Type	
Relief pressure	psi

Booster/gear box

Manufacturer and model number	
Type	
Ratio	

Power steering fluid capacity	gal
Maximum effort at steering wheel	lbs (unloaded stationary coach on dry asphalt pavement)
Steering wheel diameter	in.

Brakes

Make of fundamental brake system		
Brake chambers vendor size and part number:	First:	
	Second:	
	Third:	
Brake operation effort		

Slack adjuster's vendor's type and part numbers

First:	Right:	
	Left:	
Second:	Right:	
	Left:	
Third:	Right:	
	Left:	
Length:	First take-up:	
	Second take-up:	
	Third take-up:	

Brake drums/discs

First:	Manufacturer		
	Part number		
	Diameter		in.
Second:	Manufacturer		
	Part number		
	Diameter		in.
Third:	Manufacturer		
	Part number		
	Diameter		in.

Brake lining manufacturer	

Type	

Brake lining identification

First:	Forward	
	Reverse	
Second:	Forward	
	Reverse	
Third:	Forward	
	Reverse	

Brake linings per shoe

First	
Second	
Third	

Brake lining widths

First		in.
Second		in.
Third		in.

Brake lining lengths

First		in.
Second		in.
Third		in.

Brake lining thickness _____ in.

Brake lining per axle

First		sq. in.
Second		sq. in.
Third		sq. in.

Cooling system

Radiator/charge air cooler

Manufacturer			
Type			
Model number			
Number of tubes			
Tubes outer diameter		in./	in.
Fins per inch		fins	
Fin thickness		in.	

Total cooling and heating system capacity _____ gal

Radiator fan speed control		
Surge tank capacity		quarts

Engine thermostat temperature setting: Initial opening (fully closed) _____ °F

Fully open [ ] °F

Overheat alarm temperature sending unit setting [ ] °F

Shutdown temperature setting [ ] °F

Air reservoir capacity

Supply reservoir		$in.^3$
Primary reservoir		$in.^3$
Secondary reservoir		$in.^3$
Packing reservoir		$in.^3$
Accessory reservoir		$in.^3$
Other reservoir type		$in.^3$

Heating, ventilation and air conditioning equipment

Heating system capacity		BTU/hr
Air conditioning capacity		BTU
Ventilating capacity		CFM

Compressor

Manufacturer				
Model				
Number of cylinders				
Drive ratio				
Maximum warranted speed				rpm
Operating speed				rpm (recommended)
Weight				lbs
Oil capacity	Dry			gal
	Wet			gal
Refrigerant:	Type			lbs

Condenser

Manufacturer		
Model		
Number of fins/in.		
Outer diameter of tube		in.
Fin thickness		in.

Condenser fan

Manufacturer		
Model		
Fan diameter		in.
Speed maximum		rpm
Flow rate (maximum)		CFM

Receiver

Manufacturer	

Model		
Capacity		lbs

Condenser fan drive motors

Manufacturer		
Model		
Type		
Horsepower		hp
Operating speed		rpm

Evaporator fan drive motors

Manufacturer		
Model		
Type		
Horsepower		hp
Operating speed		rpm

Evaporator(s)

Manufacturer		
Model		
Number of rows		
Number of fins/in.		
Outer diameter of tube		in.
Fin thickness		in.
Number of evaporators		

Expansion valve

Manufacturer	
Model	

Filter-drier

Manufacturer	
Model	

Heater cores

Manufacturer		
Model		
Capacity		Btu/hr
Number of rows		
Number of fins/in.		
Outer diameter of tube		in.
Fin thickness		in.
Number of heater cores		

Floor heater blowers

Front	
Rear	

Controls

Manufacturer	
Model	

Driver's heater

Manufacturer		
Model		
Capacity		Btu/hr

Ventilation system

Type	

Coolant heater

Make		
Model		
Capacity		Btu

Interior lighting

Manufacturer		
Type		
Number of fixtures		
Size of fixtures		
Power pack		

Doors

Front

Manufacturer of operating equipment	
Type of door	
Type of operating equipment	

Rear

Manufacturer of operating equipment	
Type of door	
Type of operating equipment	

Passenger windows

Front

Manufacturer		
Model		
Type		
Number:	Side	

	Rear			
Sizes:				
Glazing:	Type			
	Thickness			
	Color of tint			
	Light transmission			

Mirrors

	Size	Type	Manufacturer	Part no.	Model no.
Right side exterior					
Left side exterior					
Center rearview					
Front entrance area					
Upper-right corner					
Rear exit area					

Seats

Passenger

Manufacturer	
Model	
Type	

Operator

Manufacturer	
Model and part number	
Type	

Paint

Manufacturer	
Type	

Wheelchair ramp equipment

Manufacturer		
Model number		
Capacity		lbs
Width of platform		in.
Length of platform		in.
System fluid capacity		quarts
Type of fluid used		
Operating hydraulic pressure		psi
Hydraulic cylinders:	Size	
	Number	

Wheelchair securement equipment

Manufacturer	
Model number	

Destination signs

Manufacturer	
Type	

Character length

Front destination		in.
Front route		in.
Curbside destination		in.
Rear route		in.

Character height

Front destination		in.
Front route		in.
Curbside destination		in.
Rear route		in.

Number of characters

Front destination	
Front route	
Curbside destination	
Rear route	

Message width

Front destination		in.
Front route		in.
Curbside destination		in.
Rear route		in.

Electrical

Multiplex system

Manufacturer	
Model number	

Batteries

Manufacturer	
Model number	
Type	

Communication system

GPS

Manufacturer	

Model number	

PA system

	Manufacturer	Model number	Number
Amplifier			
Microphone			
Internal speakers			
External speaker			

Energy storage (hybrid drive)

Type		
Number of cells		V
Battery pack voltage		V
Weight		lbs

Security camera system

Manufacturer	
Model number	
Number of cameras	
Storage capacity	

Bike racks

Manufacturer	
Model number	

Fire detection system

Manufacturer	
Model number	
Fire detectors	
Type (thermal or optical)	
Number of detectors	

Automatic voice annunciator system

Manufacturer	
Model and part number	

Annunciator LED sign

Number of signs		
Housing dimensions		
Character length		in.
Character height		in.
Character width		in.

GPS antenna

Manufacturer	

Model and part number	

Automatic passenger counter

Manufacturer		
Model and part number	a.	
	b.	
	c.	
Sensor type		

Real-time bus arrival prediction system

	Manufacturer	Model number
Router		
Cellular modem		
Charge protection		

Electronic tire pressure monitoring system

Manufacturer	
Model number	

Electronic brake stroke/wear indicator system

Manufacturer	
Model number	

NOTE: All information above is accurate to the timeframe upon submission. The Agency reserves the right to update above data if changes occur, upon consultation with the customer.

SECTION 10: CONTRACT EXAMPLE - PENDING

1. Contract Documents and Order of Precedence

The Contract consists of the documents listed below. In case of any conflict among these documents, the order of precedence shall be:

1. Form of Contract
2. Contractor's Best and Final Offer (including Contractor Proposal)
3. Addenda
4. "Section 4: Special Conditions"
5. "Section 3: General Conditions," and "Section 5: Federal Requirements"
6. "Section 6: Technical Specifications," "Section 7: Warranty Requirements," and "Section 8: Quality Assurance"

A modification or change to any Contract document shall take its precedence from the term it amends. All other documents and terms and conditions shall remain unchanged.

2. Compensation

The Agency shall pay _____ [inserted in dollar amount in both words and numbers of the base Contract], and the Contractor shall accept the amount as full compensation for all costs and expenses of completing the Work in accordance with the Contract, including but not limited to all labor and material required, overhead, storage and shipping, risks and obligations, taxes (as applicable), fees and profit, and any unforeseen costs.

3. Contract Term and Period of Performance

The effective date of this Contract shall be the effective date set forth in the Notice to Proceed (NTP). The Contractor shall commence work after the effective date of the Contract, upon receipt of the NTP.

The base Contract will contain orders for [insert number and type of vehicles]. The Contract delivery date for the vehicles, in accordance with the delivery schedule set forth in "Delivery Schedule," shall be [insert date].

If any option is exercised, the option vehicles or other option items shall be delivered in accordance with the schedule contained in the Notice of Exercise of Option.

4. Notices

Any Notice legally required to be given by one party to another under the Contract shall be in writing, dated and signed by the party giving such Notice or by a duly authorized representative of such party.

Notices shall not be effective unless transmitted by any method that provides confirmation of transmission and delivery, such as fax, certified mail or registered mail and addressed to:

AppalCART
305 NC Hwy 105 Bypass, Boone, NC 28640
Attn: AppalCART Director
Re: RFP#2022DD

[Insert Contractor name, address and point of contact]

5. Entire Agreement

This Contract constitutes the complete and entire agreement between the Agency and Contractor and supersedes any prior representations, understandings, communications, commitments, agreements or Proposals, oral or written, that are not incorporated as a part of the Contract.

_____ Contractor name	_____ Agency name
_____ Signature of authorized official	_____ Signature of authorized official
_____ (Print or type name and title)	_____ (Print or type name and title)
_____ Date	_____ Date
_____ Tax ID number	Approved as to form by: _____ Insert name and title

EXHIBIT A
References

SAE #	Title	Date Published
J10	Methods of Test for Paints - Part J10: Determination of Deposition Efficiency of Coating Powders	Sep 15, 1998
J211	Instrumentation for Impact Test—Part 2: Photographic Instrumentation	May 1, 2001
J287	Driver Hand Control Reach	Feb 1, 2007
J366	Exterior Sound Level for Heavy Trucks and Buses	Feb 1, 1987
J382	Windshield Defrosting Systems Performance Requirements - Trucks, Buses, and Multipurpose Vehicles.	Jan 1, 1994
J534	Lubrication Fittings	May 1, 2008
J537	Storage Batteries	Sep 1, 2000
J541	Voltage Drop for Starting Motor Circuits	Oct 1, 1996
J587	License Plate Illumination Devices (Rear Registration Plate Illumination Devices)	Sep 1, 2003
J593	Backup Lamps (Reversing Lamps)	Sep 1, 2005
J673	Automotive Safety Glasses	Oct 1, 2005
J680	Location and Operation of Instruments and Controls in Motor Truck Cabs, Recommended Practice	Sep 1, 1988
J686	Motor Vehicle License Plates	Oct 1, 1999
J689	Curbstone Clearance, Approach, Departure, and Ramp Breakover Angles—Passenger Car and Light Truck	Aug 1, 2009
J833	Human Physical Dimensions	May 1, 2003
J844	Nonmetallic Air Brake System Tubing	Nov 1, 2004
J941	Motor Vehicle Drivers' Eye Locations	Mar 1, 2010
J994	Alarm—Backup—Electric Laboratory Performance Testing	Mar 1, 2009
J1050	Describing and Measuring the Driver's Field of View	Jan 1, 2003
J1113	Electromagnetic Compatibility Component Test Procedure Part 42, Conducted Transient Emissions	Oct 1, 2006
J1127	Low Voltage Battery Cable	Mar 1, 2010
J1128	Low Voltage Primary Cable	Dec 1, 2005
J1149	Metallic Air Brake System Tubing and Pipe	Aug 1, 2007
J1292	Automobile and Motor Coach Wiring	Jan 1, 2008
J1455	Recommended Environmental Practices for Electronic Equipment Design in Heavy-Duty Vehicle Applications	Jun 1, 2006
J1587	Joint SAE/TMC Electronic Data Interchange between Microcomputer Systems in Heavy-Duty Vehicle Applications, Recommended Practice	Jan 1, 1996
J1708	Serial Data Communications Between Microcomputer Systems in Heavy-Duty Vehicle Applications	Oct 1, 2008
J1986	Balance Weight and Rim Flange Design Specifications, Test Procedures, and Performance Recommendations	Jan 1, 2006
J1939	Data Link Layer	Dec 1, 2006
J1995	Engine Power Test Code - Spark Ignition and Compression Ignition - Gross Power Rating, Standard;	Jun 1, 1990
J2402	Road Vehicles—Symbols for Controls, Indicators, and Tell-tales	Jan 1, 2010
J2711	Recommended Practice for Measuring Fuel Economy and Emissions of Hybrid-Electric and Conventional Heavy-Duty Vehicles	Sept 1, 2002

EXHIBIT B

Abbreviation and Acronyms

A/C	air conditioning
ABS	anti-lock braking system
AC	alternating current
ACQ	alkaline copper quaternary
ADA	Americans with Disabilities Act
Ah	amp hour
ALR	auto-locking retractor
APA	The Engineered Wood Association, formerly the American Plywood Association
APC	automatic passenger counter
APTA	American Public Transportation Association
ASTM	ASTM International, formerly the American Society for Testing and Materials
ATC	automatic traction control
AVL	automatic vehicle location
AWG	American Wire Gauge
BAFO	Best and Final Offer
BMS	Battery Management System
BRT	bus rapid transit
CARB	California Air Resources Board
CCS	climate control system
CCTV	closed-circuit television
cfm	cubic feet per minute
CGA	Compressed Gas Association
CNG	compressed natural gas
dB	decibel
DBE	disadvantaged business enterprise
DC	direct current
DDU	driver display unit
DEF	diesel exhaust fluid
DOT	Department of Transportation
DPF	diesel particulate filter
ECM	Engine Control and Monitoring
ECS	emission control system
ELR	emergency locking retractor
EMI	electromagnetic interference
EPA	Environmental Protection Agency
ESS	energy storage system
FEA	Finite Element Analysis
FEMA	failure mode effects analysis
FMCSA	Federal Motor Carrier Safety Administration
FMCSR	Federal Motor Carrier Safety Regulations
FMVSS	Federal Motor Vehicle Safety Standards
FTA	Federal Transit Administration
GAWR	gross axle weight rated
GPS	global positioning system
GVW	gross vehicle weight
GVWR	gross vehicle weight rated
H-point	hip-point
HDS	hybrid drive system
HMI	human-machine interface
HSC	hybrid system controller
HV	high voltage

HVAC	heating, ventilation and air conditioning
I/O	input/output
IEEE	Institute of Electrical and Electronics Engineers
ISO	International Standards Organization
kJ	kilojoule
LEL	LED emergency light
LV	low voltage
mA	milliampere
MDT	mobile data terminal
MPa	mega-Pascal
NC	normally closed
NFPA	National Fire Protection Association
NGV	natural gas vehicle
NOx	nitrogen oxide
NO	normally open
NTP	notice to proceed
OEM	original equipment manufacturer
OSI	Open Systems Interconnect
PA	public address
PMO	project management oversight
PPV	price per vehicle
PRD	pressure relief device
psi	pounds per square inch
RF	radio frequency
RFI	radio frequency interference
RTC	real-time clock
SAE	SAE International, formerly the Society of Automotive Engineers
scf	standard cubic feet
SLW	seated load weight
SOC	state of change
UL	Underwriters Laboratories
UNECE	United Nations Economic Commission for Europe
V DC	volts of direct current
Wh	watt-hours
VIN	vehicle information number