Request for Proposals

Pinellas Suncoast Transit Authority

Florida Electric Transit Buses with Charging and Associated Equipment

RFP 21-980369

July 15, 2021

Contents

SECTION 1: NOTICE OF REQUEST FOR PROPOSALS

NR 1. Description of the Work to be Done

The Pinellas Suncoast Transit Authority (the Agency or PSTA) is requesting proposals for the manufacture and delivery of Electric Transit Buses with charging and associated equipment as a Purchase Schedule for the State of Florida , and in accordance with the terms and conditions set forth in this Solicitation. The Contract shall be a firm-fixed-price Contract.

Specifically, the Agency is requesting the following types of buses: Florida Electric Transit Buses with charging and associated equipment.

NR 2. Obtaining Proposal Documents

Proposal documents may be obtained electronically, at https://psta.bonfirehub.com.

NR 3. Proposal Due Date and Submittal Requirements

Proposals must be received by 10:00 am local time on Tuesday, September 14, 2021.

1. Proposals shall be submitted to the following address:
   https://psta.bonfirehub.com

2. 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 will be rejected.

NR 4. Validity of Proposals

Proposals shall remain valid for a period of 180 days.

NR 5. Pre-Proposal Meeting Information (Optional)

A Pre-Proposal Meeting will be held on Tuesday July 27, 2021. The meeting will convene at 10:00 am, via ZOOM meeting: https://us02web.zoom.us/j/85439108385?pwd=V2hPTmxuSzVPTmpiYk5RT2xkcDFLZz09
Meeting ID: 854 3910 8385 Passcode: 1234

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

Contracting Officer's Contact Information:
Name: Alvin R. Burns Jr.
Title: Director of Procurement
Address: 3201 Scherer Drive, St. Petersburg, FL 33716
Email: aburns@psta.net

Additional contact: Edith Randle

Title: Purchasing Agent I
Address: 3201 Scherer Drive, St. Petersburg, FL 33716
Email: erandle@psta.net

Identification of Source of Funding
Financial support for this Project is provided through financial assistance grants from the Federal Transit Administration (FTA), State of Florida, and other local funding sources.

Signed and Dated for Posting

_____ _____
Signature/Title Date

SECTION 2: INSTRUCTIONS TO PROPOSERS

IP 1. Proposed Schedule for the Procurement

The following is the solicitation schedule for Proposers:

- Pre-Proposal Meeting/teleconference: Tuesday July 27, 2021, at 10:00 am local time.
- Deadline for Proposer questions, "clarifications and requests for deviations" : Tuesday September 7, 2021, at 10:00 am local time.
- Responses to Proposer's questions, communications and/or Agency addenda: Friday, September 10, 2021.
- Proposal Due Date: Tuesday, September 14, 2021, at 10:00 am local time.

IP 2. Obtaining Proposal Documents

Proposal documents may be obtained electronically at https://psta.bonfirehub.com .

IP 3. Pre-Proposal Meeting/Information for Proposers

A Pre-Proposal Meeting will be held on Tuesday, July 27, 2021, at 10:00 am. The meeting will convene at 10:00 am. Proposers can also participate via ZOOM. The instructions are as follows: https://us02web.zoom.us/j/85439108385?pwd=V2hPTmxuSzVPTmpiYk5RT2xkcDFLZz09 Meeting ID: 854 3910 8385 Passcode: 1234. 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, in advance of the Pre-Proposal Meeting. In addition, questions may be submitted up to the date specified in "Proposed Schedule for the Procurement." Responses will be shared with all prospective Proposers. Prospective Proposers are reminded that any changes to the RFP will be by written addenda only, and nothing stated at the Pre-Proposal Meeting shall change or qualify in any way any of the provisions in the RFP and shall not be binding on the Agency.

IP 4. 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, Alvin R. Burns Jr. and Edith Randle. Unless otherwise instructed by the Contracting Officer, Proposers and their representatives shall not make any contact with or communicate with any member of the Agency, or its employees and consultants, other than the designated Contracting Officer, in regard to any aspect of this solicitation or offers.

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

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

If it should appear to a prospective Proposer that the performance of the Services 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 Documents or with any federal, state, local or Agency law, ordinance, rule, regulation, or other standard or requirement, then the Proposer shall submit a written request for clarification to the Agency within the time period specified above.

IP 5. Addenda to RFP

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

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

IP 6. 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 DBE Approval Certification that it has on file with the Federal Transit Administration (FTA) an approved or not disapproved annual disadvantaged business enterprise (DBE) subcontracting participation goal.

IP 7. 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 the Agency the appropriate Buy America certification, included in this document, with all offers on FTA-funded contracts. Proposals that are not accompanied by a properly completed Buy America certification are subject to the provisions of 49 CFR 661.13 and will be rejected as nonresponsive.

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

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

product, invoices, or other working documents. The Proposer will simultaneously send a copy of this information to the Agency.

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

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

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

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

Any party may petition the FTA to investigate a successful Proposer's compliance with the Buy America certification. The procedures are set out in 49 CFR Part 661.15. If the FTA determines that the evidence indicates noncompliance, the FTA will require the Agency to initiate an investigation. The successful Proposer has the burden of proof to establish compliance with its certification. If the successful Proposer fails to so demonstrate compliance, then the successful Proposer will be required to substitute sufficient domestic materials without revision of the original Contract terms. Failure to do so will be a breach of the Contract and may lead to the initiation of debarment proceedings under 49 CFR Part 29.

IP 8. Conditions, Exceptions, Reservations or Understandings

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

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

The Form for Proposal Deviation shall be included in the Technical package.

IP 9. Protest Procedures

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

IP 9.1 Address

All protests must be addressed as follows:

- Agency contact: Deborah C. Leous, Chief Financial Officer
- For special delivery or hand delivery: 3201 Scherer Drive, St. Petersburg, FL 33716
- For U.S. mail: 3201 Scherer Drive, St. Petersburg, FL 33716

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

Copies of the Agency's protest procedures and the protest provisions of FTA Circular 4220.1F or its successor may be obtained from Alvin Burns aburns@psta.net or Edith Randle erandle@psta.net . Proposals will be opened and a Notice of Award will be issued by the Agency in accordance with the Agency's protest procedures and the protest provisions of FTA Circular 4220.1F or its successor.

IP 9.2 Pre-Proposal Protests

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

IP 9.3 Protests on the Recommended Award

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

IP 9.4 FTA Review

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

IP 10. Preparation of Proposals

IP 10.1 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 10.2 Multiple Award

PSTA will make the Contract awards, if any, to the responsive and responsible Proposes who are in compliance with the conditions and requirements of this solicitation, and who meets the criteria outlined in the Evaluation Criteria, of this solicitation, as determined by the PSTA Board of Directors. PSTA reserves the right to award multiple contracts.

IP 10.3 Proposal Format Requirements

Proposals shall be submitted to https://psta.bonfirehub.com/portal

Proposals shall be typed. Proposals should be prepared as simply and economically as possible while providing straightforward, concise information of the Proposer's capabilities to satisfy the requirements of this RFP. Fancy colored displays, promotional material, etc. are neither necessary nor desired. Technical literature about the Proposer's experience and qualifications must be included. The emphasis should be on completeness and clarity of content. Unnecessarily elaborate proposals or lengthy presentations are not desired.

Proposals shall include a "Table of Contents" identifying the page numbers of where to find the various sections included in the proposal. Failure by a Proposer to respond to any of the following requirements may be a basis for elimination from consideration during the evaluation. Do not provide promotional or advertising information, unless this information is requested and/or is necessary to support the technical submittal.

Section 1: Technical Proposal Requirements

Proposers shall submit the following information:

1. Letter of Transmittal
2. Technical Proposal
3. Acknowledgement of Addenda
4. Contractor Service and Parts Support Data
5. Form for Proposal Deviation (without price data)
6. Vehicle Questionnaire
7. References and Non-Priced Information
8. Engineering organization chart, engineering change control procedure, field modification process
9. Manufacturing facilities plant layout, other contracts, staffing
10. Production and delivery schedule and other Contract commitments for the duration of this Contract
11. Management Plan This plan shall indicate the key personnel assigned to PSTA's account. Assigned personnel shall include at a minimum, Engineer to conduct pre-build conference, Account Representative, Warranty Administrator, and Parts and Support manager."

Section 2: Price Proposal Requirements

Each Price Proposal shall be on the prescribed Proposal form(s) and shall be for the entire Contract, including all Proposal items. Proposer shall submit the below items in the Price Proposal section:

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

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

Section 3: Qualification Section Requirements

The following are the requirements for qualifying responsible Proposers:

1. Pre-Award Evaluation Data Form
2. A copy of the three (3) most recent financial statements audited by an independent third party or a statement from the Proposer regarding how financial information may be reviewed by the Agency
3. Letter for insurance, indicating the Proposer's ability to obtain the insurance coverage in accordance with the RFP requirements
4. Form for Proposal Deviation, if applicable (without price data)
5. Proposal Form
6. All federal certifications: Buy America Certification, Debarment and Suspension Certification for Prospective Contractor, Debarment and Suspension Certification (Lower-Tier Covered Transaction), Non-Collusion Affidavit, Lobbying Certification, Certificate of Compliance with Bus Testing Requirement, DBE Approval Certification, and Federal Motor Vehicle Safety Standards

Section 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.

All Proposals submitted are public records subject to production unless specifically exempt by Florida Statutes. Proposals which contain information that is "trade secret" as defined in Section 812.081, Florida Statutes, or otherwise exempt from Chapter 119, Florida Statutes shall be designated as such and the trade secret or exempt information shall be explicitly identified. However, any information marked as "trade secret" or exempt may be produced by PSTA in response to a public records request if PSTA determines, in its sole discretion, that the information does not meet the definition of "trade secret" in Section 812.081 and is not exempt from Chapter 119, Florida Statutes. Proposers may not designate its entire Proposal as confidential. Proposers may not designate its cost Proposal or any required Proposal forms or certifications as confidential.

IP 10.4 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, and email address of the responsible individual(s) who may be contacted during the Proposal evaluation period for scheduling oral presentations and for receiving notices from the Agency. The Proposer shall submit with its Proposal a copy of the joint venture agreement.

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

IP 10.5 Modification or Withdrawal of Proposals

A modification of a Proposal already received will be accepted by the Agency only if the modification is received prior to the Proposal Due Date. All modifications shall be made in writing and executed and submitted in the same form and manner as the original Proposal.

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

IP 10.6 Ownership and Cost of Proposal Development

All Proposals will become the property of the Agency.

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

IP 11. Proposal Evaluation, Negotiation and Selection

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

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

IP 11.1 Duration of the Validity of Proposals

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

IP 11.2 Evaluation Committee

An Evaluation Committee, which will include officers, employees and agents of the Agency, will be established. The Evaluation Committee will carry out the detailed evaluations, including establishing the Competitive Range, and carrying out negotiations. The Evaluation Committee may report its recommendations and findings to the appropriate Agency individual or body responsible for awarding the Contract. The ultimate decision on the contract award shall be made by PSTA's Board of Directors in its sole and absolute discretion.

IP 11.3 Review of Proposals for Responsiveness and Proposers for Responsibility

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

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

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

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

IP 11.4 Proposal Selection Process

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

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

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

Qualification Requirements

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

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

    - Proposer's financial statements prepared in accordance with generally accepted accounting principles of the jurisdiction in which the Proposer is located, and audited by an independent certified public accountant; oral statement from the Proposer regarding how financial information may be reviewed by the Agency.

    - Proposer's ability to secure financial guarantees, if required, as evidenced by a letter of commitment from an underwriter, surety or other guarantor confirming that the Proposer can provide the required guarantee.

- 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 and Services.

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

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

Proposal Evaluation Criteria

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

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

A. Evaluation Methodology

The maximum number of points achievable is :

TOTAL POSSIBLE POINTS: 100

B. Technical Evaluation Criteria (maximum of 80 points)

Proposals will be evaluated using the following principal selection criteria:

1. **Product design and performance (0–30 points):** The information provided by the Proposer in its technical submittal relating to the buses to be provided will be utilized to evaluate the Proposal in relation to this factor. Vehicle construction and system design, as well as documented reliability, may be used in this evaluation, as well as other design and performance elements of the components that

comprise those systems. At a minimum, test results, safety and maintenance factors, and cost of normal operation for the bus design and system components proposed, may be considered in determining a final value for this factor.

2. **Proposer's reputation and performance (0–30 points):** The Evaluation Committee will consider the capability and reputation of the Proposer as presented in the Proposal or as is determined by review of information available from references or other resources. The Evaluation Committee 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.
1. **Delivery schedule (0–20 points):** The Evaluation Committee will review the proposed delivery schedule for the Agency's minimum purchase of coaches. Delivery schedules that fulfill the delivery requirements, with evidence that the schedule can be accomplished, may receive higher points for this category.

C. Cost Proposal Evaluation (maximum of 20 points)

As described below, the proposed cost as submitted by the Proposer on the Agency's form will be assigned a maximum of 20 points. The Contractor is *required* to use the Agency's form, without alteration, for submittal of its cost Proposal. *Please DO NOT use your own forms.*

The cost will be evaluated in the following manner:

1. **Cost Proposal Criteria (0–20 points)**

    a. The cost Proposal criteria will be based on the "Total of Both the Low-Floor and Standard Floor Bus," Line 3.C. of Appendix B as noted in Section 8.B.6, "Sum of Total Base Offer per Bus."
    b. The lowest average cost Proposal will receive 20 points. Every other Proposal previously found to be in the Competitive Range will be given points proportionately in relation to the lowest price. This point total will be calculated by dividing the lowest price by the total price of the Proposal being evaluated and the result multiplied by the maximum weight for price (20 points) to arrive at a cost Proposal score.

    Example: Lowest Proposed Price / Proposer's Proposed Price × 20 = Proposal Score

    The application of the above formula will result in a uniform assignment of points relative to the criterion of price.

IP 11.5 Evaluation Procedures

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

conditions, exceptions, reservations or understandings that do not result in the rejection of the Proposal are subject to evaluation under the criteria set forth in "Proposal Selection Process."

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

IP 11.6 Evaluations of Competitive Proposals

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

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

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

3. **Proposals not within the Competitive Range.** Proposers of any Proposals that have been determined by the Agency as not in the Competitive Range, and that cannot be reasonably made to be within the Competitive Range, will be notified in accordance with the Agency's policies.

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

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

   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.

5. **Factory and site visits.** The Agency reserves the right to conduct factory visits of the Proposer's facilities and/or the facilities of major sub-suppliers included in the Proposal.

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

   - Notice that discussions and negotiations are concluded.
   - A complete listing of the conditions, exceptions, reservations or understandings that have been approved.
   - A common date and time for submission of written BAFOs, allowing a reasonable opportunity for preparation of the written BAFOs.
   - Notice that if any modification to a BAFO is submitted, it must be received by the date and time specified for the receipt of BAFOs.
   - Notice to Proposers that do not submit a notice of withdrawal or a BAFO that their immediately previous Proposal will be construed as their BAFO.

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

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

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

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

IP 12. Response to Proposals

IP 12.1 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 12.2 Availability of Funds

Funds are not presently available for performance under this Contract beyond the current fiscal year. The Agency's obligation for performance of this Contract beyond the current fiscal year is contingent upon the availability of appropriated funds from which payment for Contract purposes can be made. No legal liability on the part of the Agency for any payment may arise for performance under this Contract beyond the current fiscal year, until the Proposer receives notice of availability of funds, in writing, from the Agency.

IP 12.3 Agency Contract Approval Process

(a) The Agency's Contracting Officer will appoint an Evaluation Committee to review the proposals and make a recommendation for contract award to PSTA's Board of Directors. The proposals will be evaluated by the Evaluation Committee applying the evaluation factor(s) above. The ultimate decision on the contract award shall be made by PSTA's Board of Directors in its sole and absolute discretion.

(b) Proposals may be determined to be "Acceptable", "Potentially Acceptable" (that is, susceptible of being made "Acceptable"), or "Unacceptable". Proposals evaluated as technically "Unacceptable" shall be rejected and will receive no further consideration for award.

(c) The Contracting Officer shall, also, evaluate prices for Proposals determined to be "Acceptable" or "Potentially Acceptable". After completing this evaluation, the Contracting Officer may:

(1) Proceed directly to the PSTA Board of Directors to consider awarding a contract based on the evaluation of initial offers; or

(2) Seek clarifications and/or request the remaining Proposers to make oral presentations concerning their technical Proposals. If oral presentations are required, the Contracting Officer will establish the specific criteria and parameters for oral presentations. Oral presentations shall be used to clarify written Proposals and may be evaluated; and/or

(3) Determine which of the remaining Proposals are within the competitive range and invite the Proposers in the competitive range to participate in discussions. The competitive range will consist of all Proposals that have a reasonable chance of being selected for award. Discussions may address either the technical or price Proposal, or both. At the conclusion of discussions, the Contracting Officer will set a time and date for the submission of "best and final offers." If a Proposer chooses not to submit a best and final offer, its initial Proposal (including price) will be considered its "best and final offer." After the date and time set for receipt of best and final offers the Contracting Officer will evaluate the best and final offers and may present his/her recommendation for award by PSTA's Board of Directors based upon the total points for both the technical and price components of each best and final offer. The ultimate decision on the contract award shall be made by PSTA's Board of Directors in its sole and absolute discretion.

IP 12.4 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 12.5 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 13. 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.

Proposer warrants that it has not offered or given gratuities (in the form of entertainment, gifts, or otherwise) to any official or employee of PSTA with a view toward securing favorable treatment in the awarding, amending, or evaluating Proposer's performance under this Contract.

No member of or delegate to the Congress of the United States shall be admitted to any share or part of this Contract or to receive any benefit there from. Contractor represents and warrants that no public officers or procurement employees have a material ownership interest in Contractor and this Contract is not otherwise prohibited by part III, chapter 112, Florida Statutes. Contractor further represents and warrants that its current business dealings will not conflict in any manner with Contractor's performance of the Services. Contractor shall promptly notify PSTA of any potential conflicts of interest which may arise throughout this Contract with respect to any prospective business association, interest or other circumstance with may influence, or appear to influence, the Contractor's judgment or quality of the Services. Such written notification shall identify the prospective business association, interest or circumstance, the nature of work that the Contractor may undertake and request an opinion of PSTA as to whether the association, interest or circumstance would, in the opinion of PSTA, constitute a conflict of interest if entered into by the Contractor. PSTA agrees to notify Contractor of its decision within thirty (30) days of receipt of notification by Contractor. If, in the opinion of PSTA, the prospective business association, interest or circumstance would not constitute a conflict of interest, PSTA shall so state in the notification and Contractor shall, at its option, enter into said association, interest or circumstance and it shall be deemed not in conflict of interest with respect to the Services.

IP 14. Ordering Instructions

Each Procuring Agency will forward to PSTA the executed purchase order for the buses being purchased. Each purchase order will contain the pricing for any and all optional equipment and or accessories listed in the Contractor's proposal. The Contractor will promptly assign each order a tracking and control number and forward a copy of the request and purchase order to the Florida Transit Association Finance Corporation

(FTAFC) for processing and invoicing of transaction fees ($500 per bus, not to exceed $10,000 per calendar year per Procuring Agency).

NOTE: Transaction Fee will be paid directly from Procuring Agency to FTAFC.

SECTION 3: GENERAL CONDITIONS

Definitions, Abbreviation, and Acronyms

GC 1.

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

Agency: Pinellas Suncoast Transit Authority (PSTA)

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.

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.

Contract Sum: The maximum amount approved by PSTA's Board of Directors for this Contract.

Contract Time: The maximum amount of time for all Services to be fully and finally, completed, delivered, inspected and accepted by PSTA.

Days: Calendar days, unless otherwise stated.

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

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

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

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

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.

Services: The manufacture and delivery of the Electric Transit Buses with charging stations and associated equipment procured by this Solicitation.

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

Solicitation: The Agency's request for proposals # 21-980369.

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 buses and charging and associated equipment 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.

A/C	air conditioning
ABS	antilock braking system
AC	alternating current
ACQ	alkaline copper quaternary
ADA	Americans with Disabilities Act
ADB	advanced design bus
Ah	amp hour
ALR	auto-locking retractor
APA	The Engineered Wood Association, formerly the American Plywood Association
APC	automatic passenger counter
APTA	American Public Transportation Association
ASTM	ASTM International, formerly the American Society for Testing and Materials
ATC	automatic traction control
AVL	automatic vehicle location
AWG	American Wire Gauge
BAFO	Best and Final Offer
BMS	Battery Management System
BRT	bus rapid transit
CARB	California Air Resources Board
CCS	climate control system
CCTV	closed-circuit television
cfm	cubic feet per minute

dB	decibel
DBE	disadvantaged business enterprise
DC	direct current
DDU	driver display unit
DOT	Department of Transportation
EDR	event data recorder
ECM	Electric Control Module
ELR	emergency locking retractor
EMI	electromagnetic interference
EPA	Environmental Protection Agency
EOL	end of life
ESS	energy storage system
EVSE	electric vehicle supply equipment
fc	foot-candle
FEA	Finite Element Analysis
FEMA	failure mode effects analysis
FMCSA	Federal Motor Carrier Safety Administration
FMVSS	Federal Motor Vehicle Safety Standards
FTA	Federal Transit Administration
GAWR	gross axle weight rated
GPS	global positioning system
GVW	gross vehicle weight
GVWR	gross vehicle weight rated
H-point	hip-point
HDS	hybrid drive system
HMI	human-machine interface
HSC	hybrid system controller
HV	high voltage
HVAC	heating, ventilation and air conditioning
I/O	input/output
IEEE	Institute of Electrical and Electronics Engineers
inHg	inches of mercury
ISO	International Standards Organization
kJ	kilojoule
LEL	LED emergency light
LV	low voltage
mA	milliampere
MDT	mobile data terminal
MPa	mega-Pascal
NC	normally closed
NFPA	National Fire Protection Association
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
psi	pounds per square inch
RF	radio frequency

RFI	radio frequency interference
RTC	real-time clock
SAE	SAE International, formerly the Society of Automotive Engineers
scf	standard cubic feet
SLW	seated load weight
SoC	state of charge
UL	Underwriters Laboratories
UNECE	United Nations Economic Commission for Europe
UPS	uninterruptable power supply
USC	United States Code
USCA	United States Code Annotated
V DC	volts of direct current
WEOL	warrantable end of life
Wh	watt-hours
VIN	vehicle information number
ZEV	zero-emission vehicle

GC 2. Materials and Workmanship

The Contractor shall be responsible for all materials and workmanship in the construction of the buses and all accessories used, and the charging and associated equipment, whether the same are manufactured by the Contractor or purchased from a Supplier. Contractor shall cause the Services to be completed in a workmanlike manner and shall provide services of first quality. All work and workmanship associated with the Services must be in accordance with customary standards of the various trades and industries involved in the Services. Contractor shall enforce strict discipline and good order among its employees, subcontractors, representatives, agents, and any others carrying out the Services. Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them. Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures, and for coordinating all portions of the work on the Services.

GC 3. Conformance with Specifications and Drawings

Materials furnished and Services 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 buses with charging and associated equipment 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.

The Services and all work associated therewith shall be of high-quality in all respects. No advantage will be taken by the Contractor in the omission of any part or detail of the Services. Contractor hereby assumes responsibility for all materials, equipment, and processes used in the Services, whether the same is manufactured by Contractor or purchased readymade from an outside source. Omissions from the Technical Specifications, or the inaccurate description of details of Work or Services that are manifestly necessary to carry out the intent of the Technical Specifications, or that are customarily performed, shall not relieve the Contractor from performing such omitted Services or Work or inaccurately described details of the Services or 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 Services and 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 Services and Work done shall be subject to the Agency Representative's inspection and approval in accordance with the approved Services and Work products developed as a result of the Contract Documents.

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

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

GC 4.2 Risk of Loss

The Contractor shall assume risk of loss of buses delivered under SP 2.1, Bus Delivery of this Contract. Prior to this delivery, the Contractor shall have risk of loss of all buses delivered under this Contract, including any damages sustained during the delivery regardless of the status of title or any payments related to the bus. Drivers shall keep a maintenance log enroute, and it shall be delivered to the Agency with the delivery of each bus. If the bus is released back to the Contractor for any reason, then the Contractor has the risk of loss upon such release. All other deliverables under this Contract not specified herein shall be free on board destination.

GC 5. Title and Warranty of Title

Adequate documents for registering title for each of the buses delivered under this Contract in Pinellas County Florida shall be provided to the Agency not fewer than ten (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 any and all encumbrances.

GC 6. Intellectual Property Warranty

The Contractor warrants that the Services, and all work, goods and services associated therewith do not infringe on any patent, trademark, copyright or trade secret of any third parties and agrees to defend, indemnify and hold harmless PSTA, its officers, agents, employees, trustees and its successors and assigns, from and against any and all liabilities, loss, damage or expense, including, without limitation, court costs and reasonable attorneys' fees, arising out of any infringement or claims of infringement of any patent, trade name, trademark, copyright or trade secret by reason of the sale or use of any goods or services purchased under the Contract. PSTA shall promptly notify the Contractor of any such claim. PSTA makes no warranty that the production, sale or use of goods or services under the Contract will not give rise to any such claim and PSTA shall not be liable to the Contractor for any such claim brought against the Contractor.

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

All subject data that constitutes a "trade secret" of the Contractor, as defined in section 812.081, Florida Statutes, shall be clearly marked by the Contractor at the time of delivery to PSTA. The Contractor shall grant a non-exclusive license to allow PSTA to utilize such information in order to maintain the buses and/or charging stations and associated equipment. If the Contractor fails to provide such license, PSTA shall have the right to reverse engineer the subject data, including but not limited to 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 Work or Services under this Contract. 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 agreed to 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 or Services 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 or Services ordered.

GC 8.3 No Stoppage of Work or Increase in Costs

Notwithstanding the foregoing, nothing in this section GC 8 shall excuse the Contractor from proceeding with the Work or Services as changed except for those changes which would increase the Contract Sum. No Work or Services for which an additional cost or fee will be charged by the Contractor shall be performed without the prior express written authorization of PSTA. Any increase in costs which would serve to increase the Contract Sum must be approved by PSTA's Board of Directors before such costs are incurred.

GC 9. Legal Clauses

GC 9.1 Indemnification

The following indemnification clause shall apply to all Work or Services related to the manufacture and delivery of Electric Transit Buses with charging and associated equipment.. To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless PSTA, its elected officials, officers and employees, from any and all liabilities, any and all claims including claims for equitable or injunctive relief, damages, losses and costs, including but not limited to reasonable attorney's fees, to the extent caused by the negligence, recklessness, or intentionally wrongful conduct of the Contractor, its employees, agents, officers, subcontractors, Suppliers, sub-suppliers and other persons employed or utilized by the Contractor in the performance of the Contract. This indemnification obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any part or person described in this section, including but not limited to any immunity from or limitation of liability to which PSTA is entitled to pursuant to the doctrine of sovereign immunity or section 768.28, Florida Statutes. This indemnification provision shall include claims made by an employee of the Contractor against PSTA and the Contractor waives any entitlement to immunity under section 440.11, Florida Statutes. This indemnification provision shall survive the termination of the Contract however terminated, and shall not be limited by the amount of any insurance required to be obtained or maintained under the Contract Documents.

The Parties recognize that Contractor is an independent contractor. Contractor agrees to assume liability for and indemnify, hold harmless, and defend PSTA, its board members, officers, employees, agents and attorneys of, from, and against all liability and expense, including reasonable attorneys' fees, in connection with any and all claims, demands, damages, actions, causes of action, and suits in equity of whatever kind or nature, including claims for personal injury, property damage, equitable relief, loss of use, or Contractor's violation or alleged violation of any third parties' trade secrets, proprietary information, trademark, copyright, patent rights or first amendment rights arising out of the execution, performance, nonperformance, or enforcement of this Contract, whether or not due to or caused by the negligence of PSTA, its board members, officers, employees, agents, and/or attorneys excluding only the sole negligence of PSTA, its officers, employees, agents, and attorneys. Contractor's liability hereunder shall include all attorneys' fees and costs incurred by PSTA in the enforcement of this indemnification provision. This includes claims made by the employees of Contractor against PSTA, and Contractor hereby waives its entitlement, if any, to immunity under Section 440.11, Florida Statutes. Notwithstanding anything contained herein to the contrary, this indemnification provision shall not be construed as a waiver of any immunity from or limitation of liability to which PSTA is entitled to pursuant to the doctrine of sovereign immunity or Section 768.28, Florida Statutes. All obligations contained in this Section 10 shall survive termination of this Contract, however terminated, and shall not be limited by the amount of any insurance required to be obtained or maintained under the Contract Documents.

Subject to the limitations set forth in this Section, Contractor shall assume control of the defense of any claim asserted by a third party against PSTA arising from or in any way related to this Contract and, in connection with such defenses, shall appoint lead counsel, in each case at Contractor's expense. Contractor shall have the right, at its option, to participate in the defense of any third party claim, without relieving Contractor of any of its obligations hereunder. If Contractor assumes control of the defense of any third party claim in accordance with this paragraph, Contractor shall obtain the prior written consent of PSTA before entering into any settlement of such claim. Notwithstanding anything to the contrary in this provision, Contractor shall not assume or maintain control of the defense of any third party claim, but shall pay the fees of counsel retained by PSTA and all expenses including experts' fees, if (i) an adverse determination with respect to the third party claim would, in the good faith judgment of PSTA, be detrimental in any material respect of PSTA's reputation; (ii) the third party claim seeks an injunction or equitable relief against PSTA; or (iii) Contractor has failed or is failing to prosecute or defend vigorously the third party claim. Each party shall cooperate, and cause its agents to cooperate, in the defense or prosecution of any third party claim and shall furnish or cause to be furnished records and information, and shall attend any conferences, discovery proceedings, hearings, trials, or appeals, as may be reasonably requested in connection therewith.

GC 9.2 Suspension of Work or Services

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 or Services for a specified period of time. If such suspension would cause any delay in performance, any increase in the Contract Sum, and/or increase in the Contract Time, the Contractor shall provide notice to PSTA.

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 or Services covered by the suspension during the period of work stoppage. Contractor shall continue the Work or Services 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 or Services 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) may 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 Services and/or any affected deliveries will be actually and necessarily delayed;
c. The Contractor has taken measures to avoid and/or mitigate the delay by the exercise of all reasonable precautions, efforts and measures, whether before or after the occurrence of the cause of delay; and
d. The Contractor makes written request and provides other information to the Agency as described in paragraph GC 9.3.4 below.

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

GC 9.3.2 None of the above shall relieve the Contractor of any liability for the payment of any liquidated damages owing from a failure to complete the Work and Services 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 or Services 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

This Contract may be terminated with or without cause in accordance with the provisions below.

GC 9.4.1 Termination for Convenience

Without Cause. For and in consideration of $10.00, if PSTA determines that it is in its best interest to do so, PSTA may terminate this Contract without cause, and without penalty or expense to PSTA, upon thirty (30) days' written notice to Contractor. If PSTA terminates this Contract pursuant to this subsection, Contractor shall promptly submit to PSTA its costs to be paid for Work or Services performed in accordance with the Contract Documents, up to the date of termination. If Contractor has any property belonging to PSTA in its

possession, Contractor shall account for the same and dispose of it or delivery it to PSTA, as directed by PSTA.

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

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

The Contractor shall be paid its costs, including Contract closeout costs, and profit on Work performed in accordance with the Contract Documents, up to the time of the notice 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.

Waiver of Incidental Damages. Notwithstanding anything contained herein, in no event shall the Contractor be entitled to receive termination expenses, unabsorbed overhead, lost profit, or any other consequential, special, or incidental damages, all of which are hereby expressly waived by the Contractor.

GC 9.4.2 Termination for Default

The Agency may terminate this Contract with cause at any time immediately upon written notice to the Contractor, if: (1) the Contractor fails to fulfill or abide by any of the terms or conditions specified in the Contract Documents; (2) the Contractor fails to perform in the manner called for in the Contract Documents; or (3) the Contractor does not provide the Services or the Work in accordance with the requirements of the specifications in the Contract Documents. In its sole discretion, PSTA may allow the Contractor an appropriately short period of time in which to cure a defect in performance or non-performance. In such case, PSTA's written notice of termination to the Contractor shall state the time period in which cure is permitted and other appropriate conditions, if applicable. The Contractor may terminate the Contract for cause if PSTA fails to fulfill or abide by any duties or conditions specified in the Contract Documents, provided that the Contractor must first provide notice of the alleged breach to PSTA and give PSTA ninety (90) days' written notice to cure the alleged breach. If PSTA cures the alleged breach or is making a good faith effort to cure said breach during the ninety (90) day cure period, the Contractor may not terminate the Contract. Should the Contract be terminated by PSTA for cause under this section, the Contractor shall be liable for all expenses incurred by PSTA in re-procuring elsewhere the same or similar items or services offered by the Contractor. If it is later determined by PSTA that Contractor's failure to perform was a result of a Force Majeure, PSTA may allow the Contractor to continue performance under a new time for performance under section 9.3.1 or treat the termination as if terminated without cause under section 9.4.1 of the Contract.

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

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

Payment for completed Services 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 Services such sum as the Contracting Officer determines to be necessary to protect the Agency against loss because of outstanding liens or claims of former lienholders.

GC 9.5 Compliance with Laws and Regulations

The Contractor shall at all times comply with all federal, state, county, and local laws, rules and/or regulations, and lawful orders of public authorities including those set forth in the Contract Documents and that, in any manner, could bear on the Services and the Contractor's Work under the Contract (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

The Contract Documents shall be governed by, construed and interpreted in accordance with the laws of the State of Florida. Contractor and PSTA consent to jurisdiction over them and agree that venue for any state action shall lie solely in the Sixth Judicial Circuit in and for Pinellas County, Florida, and for any federal actions shall lie solely in the U.S. District Court, Middle District of Florida, Tampa Division.

GC 9.8 Disputes and Claims

(a) Claims and Disputes Authority to Resolve. All claims or disputes by the Contractor against the Agency relating to the Contract shall be submitted in writing to the designated Contracting Officer for a determination in accordance with this Section.

(b) Definition. Claims and disputes include controversies raised by the Contractor arising under the Contract and those based upon breach of contract, mistake, misrepresentation or other cause of contract modification, termination or rescission.

(c) Notice of Claim or Dispute. The Contractor shall submit a Notice of Claim or Dispute to PSTA in writing within ten (10) days of issue giving rise to claim or dispute. The date of the issue shall include when the contractor knew of the issue or should have known of the issue that gave rise to the claim or dispute.

(d) Notice Requirements. The Notice of Claim or Dispute shall include at a minimum:

(1) the Notice of Claim or Dispute shall be titled "Notice of Contract Claim or Notice of Contract Dispute";

(2) name and address of the Contractor;

(3) name of the attorney and firm representing Contractor, if applicable;

(4) identification of the Contract; and

(5) reasons for the claim or dispute.

(e) Failure to timely submit Notice. Failure to submit the Notice of Claim or Dispute within ten (10) days of the issue that gave rise to the dispute or claim will result in the claim or dispute being rejected by the Agency without further consideration. The date of the issue shall include when the Contractor knew of the issue or should have known of the issue that gave rise to the claim or dispute.

(f) Delivery. A Notice of Claim or Dispute shall be sent via hand delivery or certified mail. **Electronic forms of delivery are not an acceptable means of delivery.** The Contractor is solely responsible for verifying that

the Notice of Claim or Dispute was received in a timely manner. Notice of Claim or Dispute should be addressed to:

Pinellas Suncoast Transit Authority
Attention: Chief Executive Officer
3201 Scherer Drive
St. Petersburg, Florida 33716

(g) Timeline for Formal Written Claim or Dispute. The Formal Written Claim or Dispute shall be filed within seven (7) days after the date the Notice of Claim or Dispute is timely filed. Failure to submit the Formal Written Claim or Dispute within seven (7) days will result in the Claim or Dispute being rejected by the Agency without further consideration.

(h) Written Claim or Dispute Requirements. The Formal Written Claim or Dispute shall include at a minimum:
(1) the Formal Written Claim or Dispute shall be titled "Formal Written Contract Claim or Dispute";

(2) name and address of the Contractor;

(3) name of the attorney and firm representing Contractor, if any;

(4) identification of the Solicitation;

(5) reason(s) for the claim or dispute;

(6) requested relief;

(7) the claim or dispute must demonstrate how the Contractor has been aggrieved as a result of the Agency's decision and shall include the facts, argument(s), and the law upon which the claim or dispute is made;

(8) documents to substantiate the basis or ground for the claim or dispute.

(i) No further consideration. Any documents, basis or ground(s) for the claim or dispute not set forth or provided in the formal written contract claim or dispute required under this provision shall be deemed waived.

(j) Written determination. The Contracting Officer shall issue a decision in writing within ten (10) days of the hearing of Claim or Dispute and shall mail to the Contractor. The decision shall state the reasons for the decision reached.

(k) Administrative Remedies. This process is considered to be an administrative remedy and all Contractors agree to exhaust their administrative remedies under the Agency policies prior to seeking judicial relief of any type in connection with any matter related to the suspension or debarment.

(l) Continue with Work and Services. Unless otherwise directed by PSTA, Contractor shall continue performance under the Contract while matters in dispute are being resolved, unless the continuation of performing will cause additional claims for additional compensation on the same grounds set forth in the claim provided to PSTA.

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 PSTA is the FTA recipient or a sub-grantee of the FTA recipient, the Contractor agrees to provide PSTA, FTA, the Comptroller General of the United States, the Secretary of the U.S. Department of Transportation, the State of Florida or any of their duly authorized representatives access to any books, documents, papers and records of the Contractor that are directly pertinent to or relate to this Contract (1) for the purpose of making audits, examinations, excerpts and transcriptions and (2) when conducting an audit and inspection.

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

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

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

   NOTE: FTA does not require Contractors to flow down these requirements to Subcontractors.

GC 9.10 Public Records

Pursuant to section 119.0701, Florida Statutes, for any tasks performed by the Contractor on behalf of PSTA, the Contractor shall: (a) keep and maintain all public records, as that term is defined in chapter 119, Florida Statutes (“Public Records”), required by PSTA to perform the Cork contemplated by the Contract; (b) upon request from PSTA’s custodian of public records, provide PSTA with a copy of the requested Public Records

or allow the Public Records to be inspected or copied within a reasonable time at a cost that does not exceed the costs provided in chapter 119, Florida Statutes, or as otherwise provided by law; (c) ensure that Public Records that are exempt or confidential and exempt from Public Records disclosure requirements are not disclosed except as authorized by law for the duration of the term of the Contract and following completion or termination of the Contract, if the Contractor does not transfer the records to PSTA in accordance with (d) below; and (d) upon completion or termination of the Contract, (i) if PSTA, in its sole and absolute discretion, requests that all Public Records in possession of the Contractor be transferred to PSTA, the Contractor shall transfer, at no cost, to PSTA, all Public Records in possession of the Contractor within thirty (30) days of such request or (ii) if no such request is made by PSTA, the Contractor shall keep and maintain the Public Records required by PSTA to perform the Work contemplated by the Contract. If the Contractor transfers all Public Records to PSTA pursuant to (d)(i) above, the Contractor shall destroy any duplicate Public Records that are exempt or confidential and exempt from Public Records disclosure requirements within thirty (30) days of transferring the Public Records to PSTA and provide PSTA with written confirmation that such records have been destroyed within thirty (30) days of transferring the Public Records. If the Contractor keeps and maintains Public Records pursuant to (d)(ii) above, the Contractor shall meet all applicable requirements for retaining Public Records. All Public Records stored electronically must be provided to PSTA, upon request from PSTA's custodian of public records, in a format that is compatible with the information technology of PSTA. If the Contractor does not comply with a Public Records request, or does not comply with a Public Records request within a reasonable amount of time, PSTA may pursue any and all remedies available in law or equity including, but not limited to, specific performance. The provisions of this section only apply to those tasks in which Contractor is acting on behalf of PSTA.

IF THE CONTRACTOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE CONTRACTOR'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THE CONTRACT, CONTACT THE CUSTODIAN OF PUBLIC RECORDS AT:

Telephone number: 727-540-1806 E-mail address: Records@psta.net Mailing address: Attn: Public Records Department 3201 Scherer Drive N., Saint Petersburg, Florida 33716

GC 9.11 General Nondiscrimination Clause

In connection with the performance of the Services 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 9.12 Amendment and Waiver

GC 9.12.1 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 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"
- "Parts Availability Guarantee"

- "Access to Records"
- "Training"

GC 9.21 Binding Affect; Assignment and Subcontracting

GC .20.1 Binding Affect.

The terms and provisions of this Contract shall be binding upon PSTA and the Contractor and each of their respective partners, successors, heirs, executors, administrators, assigns and legal representatives.

GC 9.20.3 Responsibility for Subcontractors.

If the Contractor's assignee, Supplier, sub-supplier or subcontractor fails to perform in accordance with the terms of this Contract, the Contractor shall complete or pay to have completed the work which the assignee or subcontractor failed to complete at no additional cost to PSTA. In the event of any noncompliance by any assignee or subcontractors, the Contractor shall be directly and wholly responsible for the noncompliance of its assignee or subcontractor and shall bear all attributable costs.

GC 9.20.5 E-Verify.

The Contractor shall utilize the U.S. Department of Homeland Security's E-Verify System to verify the employment eligibility of: (a) all persons employed by Contractor throughout the term of this Contract; and (b) all persons, including subcontractors, retained or hired by the Contractor, regardless of compensation, to perform the Services.

GC 9.22 Responsibility of Proposer

PSTA will only award a Contract to a firm which it has determined to be responsible. A responsible Contractor is one which meets the following standards:

A. Integrity and Ethics: Has a satisfactory record of integrity and business ethics, in compliance with 49 U.S.C. Section 5325(j)(2)(A).

B. Affirmative Action and DBE: Is in compliance with Common Grant Rules affirmative action and DOT's DBE requirements.

C. Public Policy: Is in compliance with the public policies of the Federal Government, as required by 49 U.S.C. Section 5325 (j)(2)(D).

D. Administrative and Technical Capacity: Has the necessary organization, experience, accounting, and operational controls and technical skills, or the ability to obtain them in compliance with 79 U.S.C. Section 5325(j)(2)(D).

E. Licensing and Taxes: Is in compliance with applicable licensing and tax laws and regulations.

GC 9.23 Advertisement

Contractor shall not advertise or publish news releases concerning this Contract without prior written consent of PSTA.

GC 9.24 Non-exclusive Contract.

PSTA specifically reserves the right to contract with other entities for the Services described in the Contract Documents or for similar Services if it deems, in its sole discretion, such action to be in PSTA's best interest.

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

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

SP 1.1.2 Repairs by the Agency

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

1. **Parts used.** If the Agency performs the repairs after non-acceptance of the bus, it shall correct or repair the Defect and any Related Defects using Contractor-specified parts available from its own stock or those supplied by the Contractor specifically for this repair. Reports of all repairs covered by this procedure shall be submitted by the Agency to the Contractor for reimbursement or replacement of parts monthly, or at a period to be mutually agreed upon. The Contractor shall provide forms for these reports.
2. **Contractor-supplied parts.** If the Contractor supplies parts for repairs being performed by the Agency after non-acceptance of the bus, then these parts shall be shipped prepaid to the Agency.
3. **Return of defective components.** The Contractor may request that parts covered by this provision be returned to the manufacturing plant. The total costs for this action shall be paid by the Contractor.
4. **Reimbursement for labor.** The Agency shall be reimbursed by the Contractor for labor. The amount shall be determined by the Agency for a qualified mechanic at a straight time wage rate of $65.00, which includes fringe benefits and overhead adjusted for the Agency's most recently published rate in effect at the time the Work is performed, plus the cost of towing in the bus, if such action was necessary. These wage and fringe benefits rates shall not exceed the rates in effect in the Agency's service garage at the time the Defect correction is made.
5. **Reimbursement for parts.** The Agency shall be reimbursed by the Contractor for defective parts that must be replaced to correct the Defect. The reimbursement shall include taxes where applicable and fifteen (15) percent handling costs.

SP 1.2 Pilot Bus

The Contractor shall produce one pilot vehicle for each type of vehicle with respect to the base order. This vehicle shall be one of the ultimate quantity of the base vehicle order. The pilot vehicle shall demonstrate that the vehicles fully meet all requirements of the Contract. The pilot vehicle shall be produced and delivered to the Agency for a minimum of thirty (30) days prior to initiation of any production activities for the remaining vehicles unless otherwise authorized in writing by the Agency. In the event that noncompliance is identified, the Agency shall to the extent practicable notify the Contractor of said noncompliance. No later than seven (7) days after the end of the 30-day test, the Agency shall issue a written report to the Contractor that advises the

Contractor of any noncompliance issues and/or any proposed modifications or changes required on the remaining vehicles.

In the event that the pilot vehicle does not initially comply with all performance criteria contained in the Technical Specifications, the Agency shall have the right to retain a portion of any progress payment that may have been established for the pilot vehicle. The amount to be withheld shall be based on the lack of compliance and may equal up to the entire progress payment amount for the pilot vehicle. This amount shall be withheld until compliance is demonstrated. In the event that the compliance is subsequently determined to be impossible to achieve, the Agency may require all or a portion of the progress payment for the pilot vehicle to be forfeited as a penalty for the noncompliance. The amount of the penalty shall be negotiated by the parties.

SP 1.3 Configuration and Performance Approval

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

SP 1.4 First Article Inspection – Production

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

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

SP 1.5 Post-Delivery Tests

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

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

SP 1.6 Repairs after Non-Acceptance

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

SP 2. Deliveries

SP 2.1 Bus Delivery

Delivery of buses shall be determined by signed receipt of PSTA's Director of Maintenance or designee, at the following point(s) of delivery: 3201 Scherer Dr. St. Petersburg, FL 33716.

SP 2.2 Delivery Schedule

The buses shall be delivered per PSTA's Purchase Order. Delivery shall be completed within the agreed upon timeframe by PSTA and Contractor after each bus order. Hours of delivery shall be between 8:00 a.m. and 5:00 p.m., Monday through Friday.

SP 2.3 FOB Point of Delivery

All pricing, labor, equipment, materials, products and services are to be FOB destination and delivered to PSTA at the address indicated.

SP 2.4 Contract Deliverables

Contract deliverables associated with this Contract are set forth in **Table 1**, along with other pertinent information. Contract deliverables shall be submitted in accordance with "Section 6: Technical Specifications." Due dates shown note the last acceptable date for receipt of Contract deliverables. The Agency will consider early receipt of Contract deliverables on a case-by-case basis. The reference section designates the appropriate specification section(s) where the requirement is referenced.

TABLE 1
Contract Deliverables

	Deliverable	Agency Action	Reference Section	Due Date	Format	Quantity Due
1.	Bus Testing— Altoona Test Report	Review		Prior to pilot bus delivery	Hardcopy **or** Electronic media	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 **or** Electronic media	1
4.	QA manufacturing certificate	Review		With each delivered bus	Hardcopy **or** Electronic media	1 per bus
5.	QA purchasing certifications acknowledging receipt of applicable specification	Review		30 days following first Pre-Production Meeting	Hardcopy **or** Electronic media	1 per major Supplier
6.	Pre-Delivery Bus Documentation Package	Review		With each delivered bus	Hardcopy **or** Electronic media	1 per bus

TABLE 1
Contract Deliverables

Deliverable		Agency Action	Reference Section	Due Date	Format	Quantity Due
9.	Pre-Production Meeting minutes	Approval		30 days after each meeting	Hardcopy **or** Electronic media	2 originals
10.	Driver's log and incident report	Review		With each bus delivery if drive-away service is used	Hardcopy **or** Electronic media	1 per bus
11.	Title documentation	Review		10 days prior to bus delivery	Hardcopy **or** Electronic media	1 per bus
12.	Performance bond	Review		30 days following execution of Contract	Hardcopy **or** Electronic media	1
13.	Insurance certificates	Approval		Before Work commences	Hardcopy **or** Electronic media	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 **or** Electronic media	1
18.	Professionally prepared mechanics' "Bus Orientation" training video	Review		30 days prior to first production bus	Electronic Media	20 each
19.	Final preventative maintenance manuals	Review		90 days after Agency written approval	Hardcopy Electronic media	10/100 buses 20
20.	Final diagnostic procedures manuals	Review		90 days after Agency written approval	Hardcopy Electronic media	10/100 buses 20
21.	Final parts manuals	Approval		90 days after Agency written approval	Hardcopy Electronic media	10/100 buses 20
22.	Component repair manuals (Agency approval/review period of 90 days from date of receipt)	Approval		90 days after Agency written approval of OEM component repair list	Hardcopy Electronic media	2 2

TABLE 1
Contract Deliverables

Deliverable		Agency Action	Reference Section	Due Date	Format	Quantity Due
23.	Draft preventative maintenance manuals (Agency approval/review period of 90 days from date of receipt)	Approval		With pilot bus	Hardcopy **or** Electronic media	10
24.	Draft diagnostic procedures manuals (Agency approval/review period of 90 days from date of receipt)	Approval		With pilot bus	Hardcopy **or** Electronic media	10
25.	Draft parts manuals (Agency approval/review period of 90 days from date of receipt)	Approval		With pilot bus	Hardcopy **or** Electronic media	10
26.	List of OEM component repair manuals	Approval		With pilot bus	Hardcopy **or** Electronic media	10
27.	Draft operators' manuals (Agency approval/review period of 90 days from date of receipt)	Approval		With pilot bus or maximum of 30 days prior to start of production	Hardcopy **or** Electronic media	10
28.	Final operators' manuals	Review		30 days following Agency approval of draft manual	Hardcopy **or** Electronic media	1 per bus
29.	Recommended spare parts list, including bill of materials	Review		60 days prior to shipment of first bus	Hardcopy **or** Electronic media	1
30.	Part number index	Approval		60 days prior to shipment of first bus	Hardcopy Spreadsheet	1 1
31.	Current price list	Review		90 days after Agency written approval of draft parts manual	Hardcopy	20
32.	In-process drawings	Review		30 days prior to production	Scale drawings	1
33.	Electrical and air schematics	Review		30 days prior to production	Hardcopy **or** Electronic media	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 **or** Electronic media	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

TABLE 1
Contract Deliverables

Deliverable		Agency Action	Reference Section	Due Date	Format	Quantity Due
40.	Technical review of electronic functionality	Approval		Prior to production	Hardcopy **or** Electronic media	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 **or** Electronic media	1 each
44.	Striping layout	Approval		Prior to production	Hardcopy **or** Electronic media	1
45.	Resolution of issues “subject to Agency approval”	Approval		Prior to production	Hardcopy **or** Electronic media	1

SP 3. Payment

Payment due date is calculated from time the Agency Accounts Payable Accountant has received and accepted the invoice pursuant to the Florida Prompt Payment Act. Payment due date for purchase of goods or services other than construction services is net forty-five (45) days from the accepted date. No advance payments are authorized. Payment will be made for only actual services or commodities that have been received and accepted by the Agency.

SP 3.1 Payment Terms

Option 1: Payment upon Delivery

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

The Agency shall make payments for buses at the unit prices itemized in the price schedule within 45 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 45 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 45 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 3.2 Payment of Taxes

PSTA is exempt from payment of all Federal, State, and local taxes in connection with this RFP. Said taxes shall not be included in the Proposal or Proposal prices. PSTA will provide necessary tax exemption certificates. This provision does not relieve the Contractor from the responsibility to pay all applicable taxes for goods, services, and labor acquired in the performance of the Services.

SP 4. Liquidated Damages

PSTA and the Contractor acknowledge and agree that, since time is of the essence for the Contract, PSTA will suffer damages if the Services, and all Work associated with the Services, is not completed within the time specified by the Delivery Schedule and final completion and acceptance within the Contract Time. In such event, the total amount of PSTA's damages will be difficult, if not impossible, to ascertain and quantify. It is therefore hereby agreed that it is appropriate and fair that PSTA receive liquidated damages from the Contractor if the Contractor fails to timely complete the Services within the Contract Time and all deliverables associated with the Services within the time set forth on the Delivery Schedule. PSTA shall be entitled to assess TWO HUNDRED U.S. DOLLARS and NO/100 ($200.00) per each calendar day until the Services is fully and finally completed and/or deliverable is received by PSTA with no cap on this assessment. The Contractor hereby expressly waives and relinquishes any right which it may have to seek to characterize the liquidated damages set forth herein as a penalty, which the parties agree represents a fair and reasonable estimate of PSTA's damages as of the Effective Date.

SP 5. Service and Parts

SP 5.1 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 5.2 Documentation

The Contractor shall provide an electronic copy and three (3) printed current maintenance manual(s) to include preventative maintenance procedures, diagnostic procedures or troubleshooting guides and major component service manuals, an electronic copy and three (3) printed current parts manual(s), and an electronic copy and three (3) 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 5.3 Parts Availability Guarantee

The Contractor hereby guarantees to provide, within reasonable periods of time, the spare parts, software and all equipment necessary to maintain and repair the buses supplied under this Contract for a period of at least twelve (12) years after the date of acceptance. Parts shall be interchangeable with the original equipment and

shall be manufactured in accordance with the quality assurance provisions of this Contract. Prices shall not exceed the Contractor's then-current published catalog prices.

Where the parts ordered by the Agency are not received within two (2) working days of the agreed-upon time and date and a bus procured under this Contract is out of service due to the lack of said ordered parts, then the Contractor shall provide the Agency, within eight (8) hours of the Agency's verbal or written request, the original Suppliers' and/or manufacturers' part numbers, company names, addresses, telephone numbers and contact persons' names for all the specific parts not received by the Agency.

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

SP 5.4 Agency-Furnished Property

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

1. The Agency shall furnish the equipment, goods or materials in a timely manner so as not to delay Contract delivery or performance dates. If Agency-furnished property is received in a condition not suitable for the intended use, then the Contractor shall promptly notify the Agency, detailing the facts, and at the Agency's expense repair, modify, return or take such other action as directed by the Agency. The parties may conduct a joint inspection of the property before the Contractor takes possession to document its condition.
2. The Agency retains title to all Agency-furnished property. Upon receipt of the Agency-furnished property, the Contractor assumes the charge and care of the property and bears the risk of loss or damage due to action of the elements or from any other cause. The Contractor shall provide appropriate protection for all such property during the progress of the Work. Should any Agency-furnished equipment or materials be damaged, such property shall be repaired or replaced at the Contractor's expense to the satisfaction of the Agency. No extension of time will be allowed for repair or replacement of such damaged items. Should the Contractor not repair or replace such damaged items, the Agency shall have the right to take corrective measures itself and deduct the cost from any sums owed to the Contractor.
3. Warranty administration and enforcement for Agency-furnished equipment are the responsibility of the Agency, unless the parties agree to transfer warranty responsibility to the Contractor.

SP 6. Federal Motor Vehicle Safety Standards (FMVSS)

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

SP 7. Insurance

Contractor must provide a certificate of insurance and endorsement in accordance with the insurance requirements listed below by the Effective Date. Failure to provide insurance by the Effective Date shall constitute a material breach of the Contract and may result in PSTA terminating this Contract, without any penalty or expense to PSTA.

Delays in commencement due to failure to provide satisfactory evidence of insurance shall not extend deadlines. Any penalties and failure to perform assessments shall be imposed as if the work commenced as scheduled. In the event Contractor has subcontractors perform any portion of the work in the Contract Documents; either Contractor shall name those subcontractors as "additional insured" or each Subcontractor shall be required to have the same insurance requirements as Contractor. Insurance must be maintained throughout the entire term of this Contract, insurance of the types and in the amounts set forth. Failure to do so may result in suspension of all work until insurance has been reinstated or replaced or termination of this Contract. For services with a "Completion Operation Exposure", Contractor shall maintain coverage and provide evidence of insurance for two (2) years beyond final acceptance. Any penalties and failure to perform assessments shall be imposed as if the work had not been suspended.

All insurance policies shall be from responsible companies duly authorized to do business in the State of Florida and have a minimum rating of "A-" as assigned by AM Best. Contractor shall provide PSTA with properly executed and approved Certificates of Insurance to evidence compliance with the insurance requirements to PSTA's Purchasing/Risk Management Division. A copy of the additional insured endorsement(s) for Commercial General Liability needs to be attached to the certificates. If Contractor has been approved by the Florida State Department of Labor, as an authorized self-insured for Workers' Compensation, PSTA's Purchasing/Risk Management Department shall recognize and honor such status. Contractor may be required to submit a Letter of Authorization issued by the Department of Labor and a Certificate of Insurance, providing details on Contractor's Excess Insurance Program. If Contractor participates in a self-insurance fund, updated financial statements may be required upon request, such self-insurance fund shall only be accepted, at the sole discretion of PSTA, and only if PSTA finds the financial statements to be acceptable. Contractor shall provide to PSTA's Purchasing/Risk Management Department, satisfactory evidence of the required insurance by, either:

- A Certificate of Insurance with the additional insured endorsement.
- A Certified copy of the actual insurance policy.
- The Most Recent Annual Report or Audited Financial Statement (Self-Insured Retention (SIR) or deductible exceeds $100,000).

PSTA, at its sole option, has the right to request a certified copy of policies required by this Contract. Notwithstanding the prior submission of a Certificate of Insurance, copies of endorsements, or other evidence initially acceptable to the PSTA, if requested by the PSTA, Contractor shall, within thirty (30) days after receipt of a written request from the PSTA, provide the PSTA with a certified copy or certified copies of the policy or policies providing the coverage required herein. Contractor may redact or omit, or cause to be redacted or omitted, those provisions of the policy or policies which are not relevant to the insurance required herein.

The acceptance and approval of Contractor's Insurance shall not be construed as relieving Contractor from liability or obligation assumed under this Contract or imposed by law. PSTA, Board Members, Officers and Employees will be included "Additional Insured" on all policies, except Workers' Compensation and Professional Liability coverage.

Should at any time Contractor not maintain the insurance coverage's required by this Contract, PSTA may either cancel or suspend delivery of goods or services as required by Contractor or, at its sole discretion, shall be authorized to purchase such coverage and charge Contractor for such coverage purchased. PSTA shall be under no obligation to purchase such insurance or be responsible for the coverage's purchased or the responsibility of the insurance company/companies used. The decision of PSTA to purchase such insurance coverages shall in no way be construed to be a waiver of its rights.

Any certificate of insurance evidencing coverage provided by a leasing company for either workers' compensation or commercial general liability shall have a list of employees certified by the leasing company attached to the certificate of insurance. PSTA shall have the right, but not the obligation to determine that Contractor is only using employees named on such a list to perform Work on the jobsite. Should employees not be named be utilized by Contractor, Contractor has the option to work without penalty until PSTA identify proof of coverage or removal of the employee by Contractor occurs, or alternately find Contractor to be in default and takes over the protective measures as needed.

The insurance provided by Contractor shall apply on a primary basis to any insurance or self-insurance maintained by any participating agency. Any insurance, or self-insurance, maintained by a participating agency shall be excess of, and shall not contribute with, the insurance provided by Contractor.

Except as otherwise specifically authorized in this Contract, or for which prior written approval has been obtained hereunder, the insurance maintained by Contractor shall apply on a first dollar basis without application of a deductible or self-insured retention. Under limited circumstances, PSTA may permit the application of a deductible or permit Contractor to self-insure, in whole or in part, one or more of the insurance coverages required by this Contract. In such instances, Contractor shall pay on behalf of PSTA and PSTA's board members, officers or employees, any deductible or self-insured retention applicable to a claim against PSTA and PSTA's board members, officer(s) or employee(s).

Waivers. All insurance policies, other than Professional Liability, shall include waivers of subrogation in favor of PSTA, from Contractor and Contractor will ensure the compliance with any subcontractors.

Project Specific Insurance Requirements - The Following policies and minimum coverage shall be maintained throughout the entire term of this Contract which shall remain in effect throughout its duration and for two (2) years beyond final acceptance for services with a Completed Operations exposure, are as follows:

Commercial General Liability Insurance: including, but limited to, Independent Contractors, Contractor Liability Premises/Operations, Completed Operations, and Personal Injury. Such insurance shall be no more restrictive than that provided by the most recent version of standard Commercial General Liability Form (ISO Form CG 00 01) as filed for use in the State of Florida without any restrictive endorsements. PSTA, its board members, officers, and employees shall be added as an "Additional Insured" on a form no more restrictive than ISO Form CG 20 10 (Additional Insured-Owners, Lessees, or Contractors).

Minimum required Commercial General Liability coverage will include:

(i) Premises Operations
(ii) Products and Completed Operations
(iii) Blanket Contractual Liability
(iv) Personal Injury Liability
(v) Expanded Definition of Property Damage
(vi) $1,000,000/Occurrence; $3,000,000 AggregatencuOccc

An Occurrence Form Policy is preferred. If coverage is a Claims Made Policy, provisions should include for claims filed on or after the effective date of this Contract. In addition, the period for which claims may be reported should extend for a minimum of two (2) years following the expiration of this Contract.

Vehicle Liability Insurance - Recognizing that the work governed by the Contract Documents requires the use of vehicles, Contractor, prior to the commencement of work, shall obtain Vehicle Liability Insurance. Coverage shall be maintained throughout the life of this Contract and include, as a minimum, liability coverage for:

- Owned, Non-owned, and Hired vehicles and with the minimum limits at $1,000,000 Combined Single Limit (CSL).

This policy should not be subject to any aggregate limit.

Workers' Compensation Insurance. Prior to beginning work, Contractor shall obtain Workers' Compensation Insurance with must have limits sufficient to meet the requirements of Florida Statutes Limits per Chapter 440. Contractor shall maintain throughout, and will remain in force during the term of this Contract for all employees engaged in work under this Contract.

The Employers' Liability Insurance with limits no less than:

- $500,000 Bodily Injury by Accident
- $1,000,000 Bodily Injury by Disease, policy limits
- $500,000 Bodily Injury by Disease, each employee.

The Workers' Compensation policy must be endorsed to waive the insurer's right to subrogate against the all participating agencies, and their respective officers and employees in the manner which would result from the attachment of the NCCI Waiver Of Our Right To Recover From Others Endorsement (Advisory Form WC 00 03 13) with all participating agencies, and their officers and employees scheduled thereon.

Professional Liability Insurance: Professional Liability Insurance recognizes that the work governed by this Contract involves the furnishing of advice or services of a professional nature, Contractor shall purchase and maintain throughout the life of this Contract, Professional Liability Insurance which will respond to damages resulting from any claim arising out of the performance of professional services or any error or omission of Contractor arising out of work governed by this Contract.
The minimum limits of liability shall be:

- $1,000,000 per Claims Made Bases/or per Occurrence
- $3,000,000 Aggregate

If coverage is provided on a claims made basis, Contractor agrees to maintain such Professional Liability Insurance, as described herein, for a period of at least two (2) years following the conclusion of this Contract, or purchase an extended claims reporting period of two (2) years following the expiration of this Contract.

Garagekeepers' Coverage (Legal Liability Form) - Garagekeepers' Liability Insurance is to be purchased to cover the Contractor/Vendor's liability for damage or loss, including comprehensive and collision risks, to PSTA's vehicles while in the care, custody, and control of the Contractor/Vendor.

Limits of Liability – Equal to full value of vehicles and equipment.

SP 8. 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 9. 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, using energy-efficient and non-polluting vehicles, equipment and processes, and ensuring employee awareness of sustainability initiatives.

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

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 Contract. The Contractor shall not perform any act, fail to perform any act or refuse to comply with any Pinellas Suncoast Transit Authority (PSTA) requests that would cause PSTA 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 this 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 Services. 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 these Services. 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 Pinellas Suncoast Transit Authority (PSTA). If it is later determined that the Bidder or Proposer knowingly rendered an erroneous certification, in addition to remedies available to Pinellas Suncoast Transit Authority (PSTA), the federal government may pursue available remedies, including but not limited to suspension and/or debarment. The Bidder or Proposer agrees to comply with the requirements of 49 CFR 29, Subpart C, while this Proposal is valid and throughout the period of any Contract that may arise from this Proposal. The Bidder or Proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

FR 8. Disadvantaged Business Enterprise (DBE)

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

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

The Contractor shall not discriminate on the basis of race, color, national origin or sex in the performance of this Contract. The Contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of this DOT-assisted Contract. Failure by the Contractor to carry out these requirements is a material breach of this Contract, which may result in the termination of this Contract or such other remedy as Pinellas Suncoast Transit Authority (PSTA) 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 more than 70 percent domestic content.

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

FR 13. Testing of New Bus Models

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

1. A manufacturer of a new bus model or a bus produced with a major change in components or configuration shall provide a copy of the final test report to the recipient at a point in the procurement process specified by the recipient, which will be prior to the recipient's final acceptance of the first vehicle.

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

FR 14. Pre-Award and Post-Delivery Audits

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

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

FR 15. Cargo Preference

The Contractor agrees to the following:

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

FR 16. Fly America

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

FR 17. Contract Work Hours and Safety Standards Act

1. **Overtime requirements:** No Contractor or Subcontractor contracting for any part of the Contract Work that may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such Work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.
2. **Violation; liability for unpaid wages; liquidated damages:** In the event of any violation of the clause set forth in paragraph 1 of this section, the Contractor and any Subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such Contractor and Subcontractor shall be liable to the United States for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph 1 of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by the clause set forth in paragraph 1 of this section.
3. **Withholding for unpaid wages and liquidated damages:** The Pinellas Suncoast Transit Authority (PSTA) shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any monies payable on account of work performed by the Contractor or Subcontractor under any such contract or any other federal contract with the same Prime Contractor, or any other federally assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same Prime Contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or Subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph 2 of this section.
4. **Subcontracts:** The Contractor or Subcontractor shall insert in any subcontracts the clauses set forth in paragraphs 1 through 4 of this section and also a clause requiring the Subcontractors to include these clauses in any lower-tier subcontracts. The Prime Contractor shall be responsible for compliance by any Subcontractor or lower-tier Subcontractor with the clauses set forth in paragraphs 1 through 4 of this section.

SECTION 6: TECHNICAL SPECIFICATIONS

GENERAL

TS 1. Scope

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

TS 2. Definitions

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

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

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

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.

Automated Charging Station: A Charging System that automates the charging process to allow for on-route Fast Charge of buses with little required input from the bus operator. The charging is accomplished through either an inductive or conductive connection to facilitate safe charging of the bus in a location out of reach of bus passengers and which can be operated during boarding and de-boarding of passengers. The operator input is limited to left/right steering, emergency braking and Charging System “on”, and where departure occurs before completion of the charging process, Charging System “off” controls.

Battery Compartment: Designated area for placement of high-or low-voltage energy storage, i.e. 12/24 VDC batteries. Battery Compartments shall be separately designated as High Voltage Compartment, and Backup Battery Compartment.

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

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

Charger: The equipment required to convert Alternating Current (AC) to Direct Current (DC), for the purpose of charging the battery and/or operating vehicle electrical systems while connected. The Charger may be on-board the vehicle or off-board the vehicle. Off-board Chargers may be built as part of the charging station.

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

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

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

Charging System: A system including the Charger, communication and control systems among the Charger, Energy Storage System and bus as well as the equipment required to perform the conductive connection between the Charger and the bus.

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.

Conductive Charging Interface: A charging interface that creates a physical connection between the EVSE and vehicle's Energy Storage System to recharge the vehicle.

Code: A legal requirement.

Curb Weight: Weight of vehicle, including maximum fuel, oil and coolant; and all equipment required for operation and required by this Specification, but without passengers or driver.

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

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

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

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.

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

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

Electric Drive System (EDS). The mechanical and/or electromechanical components, including the motor and energy storage system.

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

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

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

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

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

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

Energy System Controller (ESC): The ESC regulates energy flow throughout the electric system components in order to provide motive performance and accessory loads, as applicable, while maintaining critical system parameters (e.g., voltages, currents, temperatures, etc.) within specified operating ranges.

Fast Charge: A Charging System capable of charging the Energy Storage System during short in-route opportunity charging scenarios and simultaneously meeting the Operating Range requirements.

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

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.

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

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

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

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

GFD/GFI (Ground Fault Detector / Ground Fault Interrupt): A system capable of detecting and If necessary interrupting a measurable resistance below that required by SAE J1766 between Isolated High Voltage and Low Voltage systems.

Gross Battery Capacity: Gross capacity would be measured in kWh and would be the energy available from the entire battery pack.

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 Vehicle Weight): Curb weight plus gross load.

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

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

Hose: Flexible line.

Inductive Charging Interface: A charging interface that uses an electromagnetic field to transfer energy between the EVSE and the vehicle's Energy Storage System to recharge the vehicle

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

I/O: Input/Output for electrical systems

kVA: Kilovolt-Amps – A unit of power generally associated with electrical devices.

kWh: Kilowatt Hour—A derived unit of energy consumption.

kWh/mi: A method of computing average energy consumption on a per mile basis.

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.

Local Regulations: Regulations below the state level.

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

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

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

Maximum Standard Operating State of Charge: The maximum design operating state of charge as recommended by the propulsion system integrator and battery manufacturer.

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

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

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

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

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

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

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

Pipe: Nonflexible line.

Power: Work or energy divided by time

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

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

Propulsion Power Unit (PPU): System of components that provide tractive power, such as traction motor.

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

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

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

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

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

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

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

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

Special Tools: Tools not normally stocked by the Agency.

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

Specific Energy: The amount of energy per unit mass.

Specific Power: The amount of power per unit mass.

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.

Usable Battery Capacity: Usable battery capacity is measured in kWhr and would be the energy available for normal operations. Usable Battery Capacity would be the usable energy from the ESD as managed through the BMX, assumed to be less than the gross capacity. It is calculated based on a useful range of something above 0% SOC and something less than 100% SOC, i.e., as an example, if the range was between 10% and 90% SOC, then the usable battery capacity would be 80% of gross battery capacity.

Warrantable End of Life (WEOL): WEOL is a measure of battery degradation determined as the point at which the batteries can no longer provide the energy or power required to meet the design operating profile. It is expressed as a percentage of remaining battery capacity as compared to gross capacity at the beginning of useful life. For purposes of this specification, WEOL shall be a measure of the useful and intended life of the energy storage device. This measure shall be a percentage of remaining useful capacity based on degradation from the beginning capacity, i.e. kWhr and is used in the overall calculation of mileage range. WEOL shall be used as a condition for battery replacement and to potentially initiate warranty claims.

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

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

TS 3. Referenced Publications

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

All schedules, drawings, manufacturing documentation, manuals, parts lists and any other written material or other communication required in the performance of the Contract shall be prepared using the English language as used in the U.S. throughout, so that the documents will be readily understood when in use in the maintenance facilities and by the staff members of transit agencies in the State of Florida. Drawings and diagrams of electrical or electronic circuits shall use symbols and notation as used in the U.S. electronics industry. The English language as used in the U.S. shall be used for all oral, written or other communications.

TS 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 PSTA and 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.

TS 5. Overall Requirements

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

At a minimum, the following systems shall be subject to the provision of Contractor review and application approval:

- Energy Storage System
- Axles, suspension, foundation brakes
- Fire Suppression
- HVAC
- Charging System

The Contractor shall not make any substantive or material changes that would differentiate one bus from another bus. If the Contractor identifies a change during the manufacturing process that would materially improve the design, safety and/or performance of the bus, this change must (1) be discussed with PSTA and (2) be considered as a retrofit (if possible) to any previous buses manufactured or assembled. Any such changes must be approved by PSTA in accordance with the communication requirements of this RFP.

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

TS 5.1 Weight

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

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

TS 5.2 Capacity

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

TS 5.3 Service Life

The minimum useful design life of the bus in transit service shall be at least 12 years or 500,000 miles. It shall be capable of operating at least 50,000 miles per year, including the 12th year.

The buses must be able to integrate seamlessly into normal revenue service. The bus must be able to operate on PSTA bus routes, without any interruption in the normal service pattern. The bus must be designed for heavy-duty transit applications.

Normal transit service operation includes, but is not limited to, simultaneously powering all hotel power loads such as HVAC, smart card, destination sign, video surveillance, and multiplexor systems.

The minimum useful life of the charging infrastructure shall be presented in the Proposal.

TS 5.4 Maintenance and Inspection

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

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

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

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

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

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

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

TS 5.5 Maintenance Manuals & Parts Books

For each separately ordered group of buses, the Contractor shall supply detailed and well-organized maintenance manuals and illustrated parts books covering all items on the bus. Hard copies of maintenance and parts

manuals shall be delivered in three ring binders with the sections separated with sturdy plastic divider pages with tabs.

Electronic formats of all manuals will be accepted so long as the materials are organized in similar fashion to their hardcopy counterparts. All information contained in electronic format shall be able to be access through common computer software program in formats that are able to be read and printed.

TS 5.5.1 Operating Manual

The Contractor shall provide operating manuals for each separately ordered group and type of bus delivered. There shall be a separate manual for each type of bus.

The Contractor shall submit drafts of the operating manuals to the Agency for approval early enough to have a final draft on hand when the prototype bus is delivered, and all final copies when the first production bus is delivered.

The operating manual shall cover all operational requirements for the bus driver while in service, but exclude driving skills, rules of the road and interpretation of laws. Information and instructions for all phases of operation shall be provided, including but not limited to bus mechanical operation, response to safety alarm systems, driving operation, lighting system controls, emergency actions, maintenance checks and turning characteristics of the bus.

TS 5.5.2 Operator Training

For each separately ordered group of buses, the Contractor shall provide four (4) hours of training to the Agency's Operations' trainers on driving characteristics of the bus, use of all controls, gauges and warning lamps, driver's seat controls plus other operational items as requested. The Contractor will provide copies of all lesson plans, detailed instructor guides, videos, transparencies, and any other training aids. The Contractor shall identify the instructor and provide the qualifications of the instructor. Dates of the training and timing of deliverables will be determined by the PSTA training staff in coordination with the Contractor. Training and materials must be approved by the Agency.

TS 5.6 Maintenance Manuals

Maintenance manuals shall contain complete data required for preventive and corrective maintenance of all parts of the buses including but not limited to the following:

a) General information and specifications.

b) A complete, well-developed troubleshooting guide covering all the mechanical, electrical and electronic components.

c) All preventive maintenance, lubrication and adjustment requirements.

d) Complete wiring and schematic diagrams and schedules for wire and cable sizes and ratings including actual cable layout, plus locations in the bus of all electrical and electronic components.

e) Illustrative drawings, such as isometrics or exploded views, identifying components in relationship to each other as mounted in the buses.

f) Components shown in exploded views with all parts clearly identified.

g) Rebuilding procedures for all rebuildable components.

h) Detailed, well-illustrated procedures for component change-out plus servicing, adjusting, testing and run-in information as required.

i) A list of all components to be disconnected, plus the specific terminations to disconnect, when electric welding is performed on the bus.

j) Body and structural information and material specifications for major accident repairs. The Agency will accept vendor proprietary information on a timely, as needed basis.

k) Seating and stanchion layouts and window diagrams (may be included in parts manual).

l) Repair and calibration instructions and values.

m) List of special test equipment/tools required to maintain and repair systems down to the component level.

n) Software information, including source codes for any programmed module or component, information on programmed array logic (PAL) and any other programmed device.

o) Complete schematic drawings containing component identification and the location of components on the circuit board; circuit descriptions and theory of operation for all electronic components.

PSTA prefers that the Contractor's maintenance manual thoroughly describe the maintenance of all parts of the bus.

Realizing that some specialized OEM manuals will be provided, the Agency requires that the Contractor provide the following OEM vendor manuals and publications:

1) Bus electrical wiring diagrams.
2) Electrical system diagnostic and troubleshooting guides.
3) Electronic data control troubleshooting manuals.
4) Propulsion system service, troubleshooting, and overhaul manuals.
5) Transmission service, troubleshooting, and overhaul manuals.
6) HVAC system service, troubleshooting, and overhaul manuals.
7) Air system diagnostic and troubleshooting guides.
8) Comprehensive color-coded air system schematics.
9) Foundation brake system analysis and troubleshooting guides.
10) Anti-Lock Brake (ABS) and Automatic Traction Control (ATC) system service, troubleshooting, and overhaul manuals.
11) Differential and drive shaft service, troubleshooting, and overhaul manuals.

12) Steering column service, troubleshooting, and overhaul manuals.
13) Steering gear service, troubleshooting, and overhaul manuals.
14) Wheelchair ramp system service, troubleshooting, and overhaul manuals.
15) Fire suppression system service, troubleshooting, and overhaul manuals.

TS 5.7 Parts Manuals

Illustrated parts books shall contain exploded views that show all parts used on buses built under this Contract, and no other parts. The exploded views will show all fasteners and miscellaneous hardware. The books shall contain data arranged so that part numbers can be readily found and identified in the illustration for each system and subsystem component, assembly, sub-assembly or piece part from an orderly breakdown of the complete bus. It shall contain a ready reference part number index and part name index and be sufficiently well illustrated to identify items requiring repair, replacement and storage for use in the maintenance of the buses.

All sub-assemblies (such as wiper motor, starter motor, etc.) preferably shall have the original manufacturer's part number displayed at the beginning of the appropriate parts listing section.

Lists shall include at least the following information for all parts:

- Generic description and specifications.
- Contractor part number.
- Brand name, where applicable.
- Original manufacturer's part number (preferred).
- Indication if the part is custom manufactured only on request.
- Standard hardware described by size, type, material and grade.

It is preferred that the parts manual shall include all original manufacturer names and addresses. The parts manual shall include all special tools, test and diagnostic equipment supplied by the Contractor.

TS 5.8 Interchangeability

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

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

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

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

TS 5.9 Training

For each separately ordered group, or requirement, of buses, the Contractor shall provide a program of instruction, instructional materials, and training aids targeted for vehicle maintenance personnel. The timing of the maintenance training, constitution of the groups to be trained, delivery of the specified training aids, and specified equipment will be coordinated with the Agency.

The Contractor shall provide to the Agency copies of all lesson plans, detailed instructor guides for each training program, student workbooks, manuals, publications, videos, transparencies, and any other training aids used by an instructor when teaching a course 90 days prior to the delivery of the first production bus. The Contractor shall identify the instructors and provide the qualifications of the instructors. The Contractor shall inform the Agency of any training support equipment and/or supplies required of the Agency for the Contractor portion of the training.

The Contractor will designate a specific individual as the "Principal Training Contact" for the scheduling and accomplishment of the Contractor and vendor training. The Contractor will provide a name, complete mailing address, telephone number, and fax number for this person to the Agency not later than 90 days after Notice to Proceed.
If the Agency so requests the Contractor shall have at least one qualified instructor who shall be available at the Agency's property for no less than seven (7) calendar days, at hours convenient to the Agency, after delivery and acceptance of the first bus. Instructor(s) shall conduct schools and advise the personnel of the Agency on the proper operation and maintenance of the equipment. The Contractor also shall provide visual and other teaching aids (such as manuals, slide presentations and literature) for use by the Agency's own training staff, which become the property of the Agency.

TS 5.9.1 Technical/Service Representatives

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

The Contractor shall provide full-time, on-site technical support representative for the buses and charging and associated equipment for the first two (2) years after bus delivery, with annual renewal options for ten (10) more years.

TS 5.10 Operating Environment

The bus shall achieve normal operation in ambient temperature ranges of 30 ºF to 120 ºF, at relative humidity between 5 percent and 100 percent, and at altitudes up to 11 feet above sea level.
Degradation of performance due to atmospheric conditions shall be minimized at temperatures below 30 °F, above 120 °F or at altitudes above 11 feet.

TS 5.11 Noise

The Contractor is expected to meet interior and exterior noise requirements specified in Section 5.11.1 and Section 5.11.2, respectively. Furthermore, it shall be a design goal to minimize noise. Component layout and packaging, material selection and build quality shall reflect that goal.

TS 5.11.1 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 propulsion/drive system and accessories switched off.

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

TS 5.11.2 Exterior Noise

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

NOTE: Additional requirements appear in Section TS 63, "Pedestrian Safety."

TS 5.12 Fire Safety

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

TS 5.12.1 Materials

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.

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.

Provide a fully automatic fire detection system that shall detect fires in the propulsion system compartment and house batteries of the bus. The system shall detect conditions that lead to, or are the result of fire and/or smoke in the energy storage system compartment(s) and display appropriate warning lights to the driver. The system shall be capable of event logging, data monitoring, communication to multiplex vehicle networks via I/O or relay switching, and providing trouble indications for all inputs and outputs. Operator/fault messages shall be displayed via text messages on an operator display panel. Provide a supplemental manual actuator in the driver's station. Provide appropriate status and warning lights on the driver's dash and an audible fire detection warning. The system shall be unaffected by propulsion system compartment cleaning with high-pressure hot water ("steam cleaning"). System shall be as maintenance-free as possible. Access panel(s) shall be provided, as necessary, to allow reading the gauges on the fire suppression bottles and to easily remove and replace the bottles.

Materials entirely enclosed from the passenger compartment, such as insulation within the sidewalls and sub-floor, need not comply. In addition, smaller components and items, such as seat grab rails, switch knobs, small light lenses, door seals, window seals, steering wheel, steering column and escape hatches shall be exempt from this requirement.

TS 5.13 Fire Suppression

Fire Suppression/Gas Detection

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

TS 5.14 Respect for the Environment

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

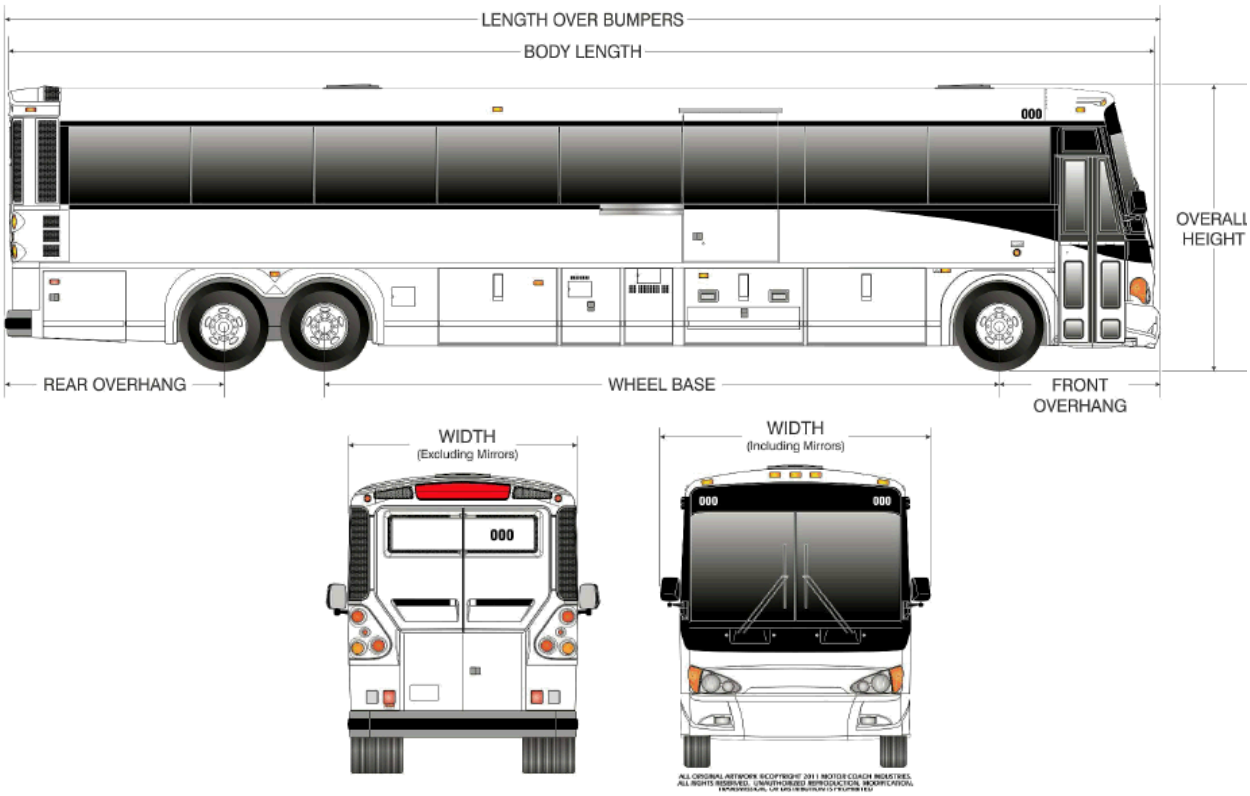
The Contractor shall provide a plan for reuse or recycling of replaced battery cells and/or battery packs.

DIMENSIONS

TS 6. Physical Size

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

FIGURE 1
Transit Bus Exterior Dimensions



TS 6.1 Bus Length

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

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

TS 6.2 Bus Width

TS 6.2.1 Transit Coach

DEFAULT

102 in. Width Bus

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

TS 6.2.2 Commuter Coach

DEFAULT

102 in. Width Bus

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

TS 6.3 Bus Height

DEFAULT

Maximum Overall Height

Maximum overall height shall be 144 in., including all rigid, roof-mounted items such as A/C, exhaust, fuel system and cover, etc.

TS 6.4 Step Height

TS 6.4.1 Transit Coach

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

TS 6.4.2 Commuter Coach

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

TS 6.4.3 Articulated Coach

The center door on an articulated bus shall have no steps.

TS 6.5 Underbody Clearance

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

TS 6.6 Ramp Clearances

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

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

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

DEFAULT

Refer to **Table 2a**.

TABLE 2a

Default Breakover Angle

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

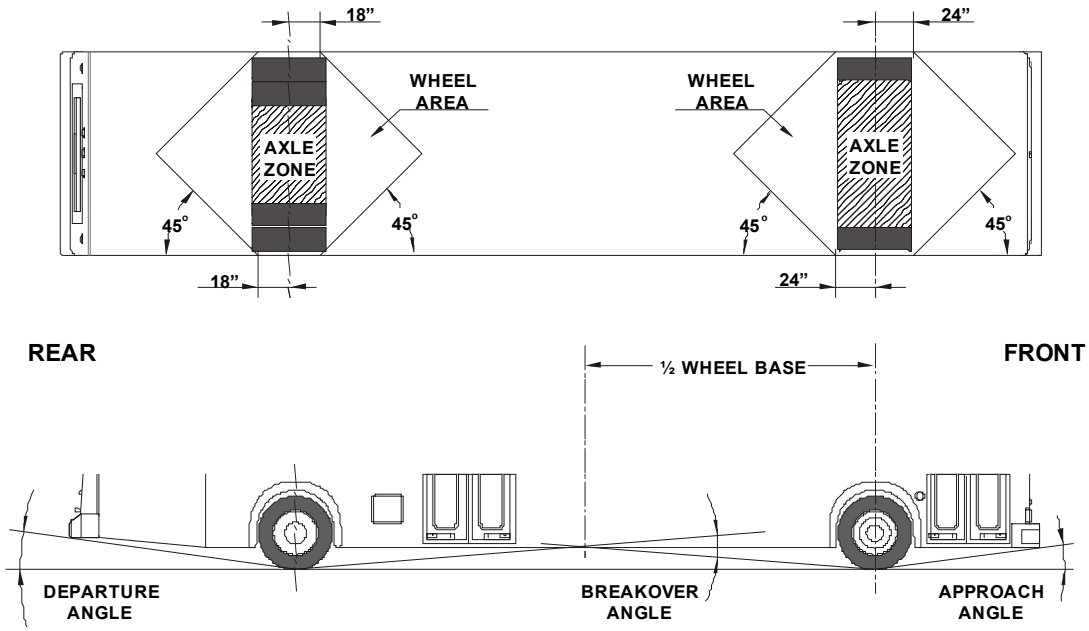
TS 6.7 Ground Clearance

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

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

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

FIGURE 2
Transit Bus Minimum Road Clearance



TS 6.8 Floor Height

TS 6.8.1 Transit Coach

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

TS 6.8.2 Commuter Coach

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

TS 6.9 Interior Headroom

Headroom above the aisle and at the centerline of the aisle seats shall be no less than 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.

VEHICLE PERFORMANCE

TS 7. Power Requirements

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

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

Performance Information/Graphs to be include with Proposal submittal shall include:

- Energy Consumption vs. Road Speed
- Torque vs. Road Speed
- Energy consumption vs. torque.
- Vehicle speed vs. time (both loaded and unloaded)
- Vehicle speed vs. grade (both loaded and unloaded)
- Acceleration vs. time
- Change of acceleration vs. time

TS 7.1 Top Speed

DEFAULT

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

TS 7.2 Gradeability

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

DEFAULT

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

> **NOTE:** Values are assumed to be sustained. Manufacturer shall supply Agency with data if there is a variance between peak performance and sustained vehicle performance.

TS 7.3 Acceleration

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

TABLE 3
Maximum Start Acceleration Times on a Level Surface[1]

Speed (mph)	Maximum time (seconds)
10	5
20	10
30	18
40	30
50	60
Top speed	Contractor to State

1. Vehicle weight = GVWR

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

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

Braking application and performance shall remain consistent regardless of system state of charge (SOC) or other variances related to regenerative braking.

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

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

TS 7.4 Operating Range

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

The operating range of the coach on a single battery charge shall be designed to meet the following targeted ranges per the operating profiles as stated in the "Design Operating Profile" section.

TS 8. Range (Design Operating Profile)

The bus must be able to achieve operational requirements under standard operating conditions and in agency-specific conditions. These conditions make up the Design Operating Profile. The standard operating conditions are defined by the Bus Research Testing Center at Altoona, Pennsylvania ("Altoona") and are used as a benchmark and as a means to compare the performance of various buses across a set standard. The

agency-specific conditions are established to ensure that the buses will be able to meet the unique operational requirements of the transit agency.

TS 8.1 Altoona Energy Consumption Tests

The Altoona On-Road Energy Consumption and Range Test for buses is based on a Transit Coach Operating Duty Cycle (ADB cycle) and includes a mix of central business district (CBD), arterial (ART) and commuter (COM) cycles. Test results from the ADB cycle economy tests or other applicable test procedures shall be provided to the Agency. Results shall include vehicle configuration and test environment information. Energy consumption data shall be provided for each duty cycle.

TS 8.1.1 29/30 FT Transit Coach

The OEM shall state the operating range of the coach when run under the following operating duty cycles:		
Duty Cycle	Energy Consumption (kWh/mi)	Nominal Range (miles)
Central Business District (CBD)		
Arterial (ART)		
Commuter (COM)		

TS 8.1.2 35 FT Transit Coach

The OEM shall state the operating range of the coach when run under the following operating duty cycles:		
Duty Cycle	Energy Consumption (kWh/mi)	Nominal Range (miles)
Central Business District (CBD)		
Arterial (ART)		
Commuter (COM)		

TS 8.1.3 40 FT Transit Coach

The OEM shall state the operating range of the coach when run under the following operating duty cycles:		
Duty Cycle	Energy Consumption (kWh/mi)	Nominal Range (miles)
Central Business District (CBD)		
Arterial (ART)		
Commuter (COM)		

TS 8.1.4 45 FT Commuter Coach

The OEM shall state the operating range of the coach when run under the following operating duty cycles:		
Duty Cycle	Energy Consumption (kWh/mi)	Nominal Range (miles)
Central Business District (CBD)		
Arterial (ART)		
Commuter (COM)		

TS 8.1.5 60 FT Articulated Bus

The OEM shall state the operating range of the coach when run under the following operating duty cycles:

Duty Cycle	Energy Consumption (kWh/mi)	Nominal Range (miles)
Central Business District (CBD)		
Arterial (ART)		
Commuter (COM)		

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TS 8.2 Design Operating Profile (Battery Electric Bus)

The Proposer must validate that the proposed bus will meet the design operating profile using sound mathematical modeling and simulation or empirical methods. Proposers must demonstrate the agreement of the mathematical models against Altoona results using ADB cycle data. The profile must be met under maximum auxiliary loads and at GVWR. It is assumed that buses will start daily duty cycle at maximum standard operating SoC. Batteries shall not be depleted below minimum standard operating SoC during operations. Minimum standard operating SoC shall allow for reserve battery capacity from which the bus can draw upon to return to the closest charging point in degraded mode. Charging of the batteries during normal operations shall not exceed maximum standard operating SoC at any time during charging.

The route model data provided may be used as an approximation of the actual route for modeling purposes only.

Supply a computer simulation of bus performance, utilizing the physical and mechanical characteristics of a specific bus, for each type of bus offered. Performance simulation data to be prepared with 130% passenger load and all accessories on. Supply a performance summary for the exact bus(es) to be built, utilizing a 130% passenger load. Data to show AT LEAST the following: time to speed on flat ground, 5%, 7%, 10% and maximum grade for speeds of 5, 10, 15, 25, 35 mph (or maximum for each grade). Describe to what extent and in what manner software controlled load shedding will be utilized to achieve the desired performance. Include a list of parameter set points that can be adjusted to suite operating environment and performance requirements of transit buses in the State of Florida.

Nominal conditions

- **Ambient temperature:** 90 °F
- **Bus weight:** SLW

Worst-case conditions

- **Ambient temperature:** Worst-case heating and cooling loads when operating in State of Florida environmental conditions as defined by NOAA.com, or other website.
- **Bus weight:** GVWR

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

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

POWERPLANT

TS 9. Electric Propulsion System

TS 9.1 Propulsion System - All Electric

TS 9.1.1 Propulsion System Description

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

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

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

Labels should be posted on high-voltage devices to identify them as components conducting high voltage potential.

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

TS 9.1.2 Propulsion System Service

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

TS 9.1.3 Primary Propulsion Unit and Traction Motor(s)

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

The propulsion and braking systems shall meet the performance requirement of the Duty Cycle. Braking application and performance shall remain consistent regardless of the System State of Charge (SOC) or other variances related to regenerative braking. The system shall be programmable to allow optimization of acceleration and deceleration rate. Performance may be affected when reprogramming. The manufacturer shall supply the new performance data. In addition to power required for propulsion, sufficient excess power shall be available to operate all accessories at their normal operating condition throughout the transit bus duty cycle.

The propulsion system shall be designed so that no component operates at more than 80% of its maximum designed load, speed,, voltage or amperage. A programmable system shall be provided to limit motor speed to a safe value. Propulsion system operation, including charging of the energy storage system, shall be electronically controlled. It shall have a programmable performance control system and the latest maintenance and diagnostic software system. PSTA will be granted access to full re-programming functionality to all components of the vehicle.

TS 9.1.4 Energy Storage System and Controller

Energy Storage System

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

The ESS shall comply with UN/DOT 38.3 and/or SAE J2464 requirements for lithium batteries or similar standards for non-lithium batteries.

The Contractor shall deliver the buses with an installed, fully charged, functioning ESS. The ESS shall be fully formed, installed and tested in accordance with the battery manufacturer’s recommended practices. The ESS design, including containers, module bracing systems, thermal-management systems, battery-management systems, watering/venting systems, interconnections, fusing and traction-controller and charger interfaces shall be adequately described in the Proposal. The Proposal shall include a description of all battery maintenance requirements including any periodic charge requirements necessary for cell balancing.

The Proposal shall include a detailed analysis of expected battery performance in the Design Operating Profile.

The Proposal shall also include a comprehensive statement of the warranty terms relating to the battery, including explanation of all disclaimers within the warranty. The charge cycle and cycle life shall be stated in the proposal, and a life-cycle cost analysis of the proposed battery system in the specified application shall be provided.

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

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

If the ESS running a low SOC will in any way damage the ESS and/or the propulsion system, the propulsion system manufacturer together with the Contractor shall provide sufficient warning to the operator. An approved system shutdown may be used. A phased automatic shutdown system shall be provided.

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

Proposers shall include certification of battery life-cycle testing by an independent testing agency.

Energy Storage System Capacity

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

Energy Storage System Safety

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

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

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

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

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

The HV and ESS shall include isolation protection between the HV and bus chassis system, to include automatic detection of isolation faults, alerts to the operator, diagnostic system and appropriate action to prevent personnel from HV exposure.

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

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

Battery Containers

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

Battery Management System

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

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

1. The BMS must be capable of monitoring the voltage of cells within each battery pack. The BMS must be able to read individual battery or block voltages at a frequency of one data point per block every 15 seconds.
2. The BMS must be capable of monitoring battery temperatures, mitigating damage to the battery and surroundings, and preventing thermal runaway.

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

Battery Thermal Management

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

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

Battery Charging

The bus shall support an SAE-approved charging standard (SAE J3068 AC and/or SAE J1772 DC). Manufacturer shall provide a detailed description of its charging system and specify its compliance with one of the above-listed standards. Proposers shall include a description of the charging infrastructure required to install and operate the charging equipment.

All charging systems provided for use with the bus and in conjunction with the battery management system must comply with the battery manufacturer's electrical and thermal limits.

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

The buses shall include a charging receptacle located either streetside front, streetside rear, or curbside rear. The charging receptacle shall be at the manufacturers standard mounting location. Proposer should indicate where their standard mounting is located. If the mounting location is customizable, meaning the Agency has a choice, the Proposer should so indicate in their Proposal response. If the Proposer allows more than one charging receptacle to be installed on the bus then the Proposer shall also indicate in their Proposal response.

Charging

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

TS 9.1.5 Propulsion System Controller (PSC)

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

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

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

TS 9.1.6 Hybrid System Controller (HSC)

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

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

Energy storage system SoC correction methods stated in SAE J2711 shall be used.

TS 10. Cooling Systems

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

The cooling systems shall be of sufficient size to maintain all continuous operating temperatures during the most severe operations possible and in accordance with 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.

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

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

In the event of a failure of the battery thermal management system while charging, the charge system shall be disabled and a visual alert shall be activated on the dashboard, the reset of which shall require the deliberate action of maintenance personnel. In the event of a failure of the battery thermal management system during bus operation, an audible and visual alert shall be activated on the dashboard, the reset of which shall require the deliberate action of maintenance personnel. In the event of a fire onboard a bus, thermal management fans shall be automatically turned off.

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

The cooling system shall meet the requirements stated in Operating Environment above.

The cooling system is assumed for all temperature control required for the propulsion system, heating and/or cooling, further assuming that heat from this system will also be used to provide thermal energy as required for vehicle functions, as HVAC and defroster.

TS 10.1 Component Thermal Management

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

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

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

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

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

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

TS 10.1.1 Radiator Screen

The radiator input shall be protected by an easily cleanable screen designed to collect large debris. The radiator cores shall be easily cleaned with standard pressure-washing equipment.

TS 10.1.2 Coolant

Coolant Filtration Without Supplemental Additives

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

TS 10.1.3 Drive Design

Standard Control and Drive Design

Control and drive of the radiator fan(s) shall be the Contractor’s standard design.

TS 10.1.4 Mounting

Standard Mounting Design

Mounting location of radiator shall be the Contractor's standard design.

TS 10.2 Drive Unit Cooling

If required, the drive unit shall be cooled by a dedicated heat exchanger which is sized to maintain operating fluid within the drive unit's recommended parameters of flow, pressure and temperature.

TS 10.3 Electric Drive System Cooling

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

The thermal management system shall maintain the electric drive system components within design operating temperature limits.

TS 11. Drive Unit

The drive unit shall be designed to operate for not less than 500,000 miles on the design operating profile without replacement or major service.

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

A nominal 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 electronically controlled drive unit 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 drive unit 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.

A nominal 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.

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.

TS 12. Regenerative Braking

The powertrain shall be equipped with regenerative braking designed to improve energy efficiency and extend brake lining service life. The application of regenerative braking shall cause a smooth blending of both regenerative and service brake function and shall activate the brake lights

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

Brake lights shall illuminate when regenerative braking is activated.

The regenerative braking system shall be adjustable within the limits of the powertrain and activated when the accelerator pedal is depressed.

Regenerative braking shall be provided in order to maximize the life of wearing components in the service brake system. A dynamic resistor grid, or approved equal, shall be provided to seamlessly compensate for the lack of regenerative braking when the ESS is fully charged. Electric braking shall be supplied by the traction motor, acting as a generator. Power generated shall be utilized in the following sequence: on-board energy storage; dynamic brake resistor. Deceleration should start at throttle off, be smooth and seamless throughout the full braking application until the bus comes to a complete stop.

PSTA will work with the OEM/drive system manufacturer to determine the performance settings.

TS 13. Mounting

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

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

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

All propulsion system 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 propulsion system so as not to affect performance or cause strain in piping and wiring connections to the propulsion system.

TS 13.1 Service

All systems requiring routine maintenance shall be arranged for ease of access and maintenance. The Contractor shall list all special tools, fixtures or facility requirements recommended for servicing.

All fluid fill locations shall be properly labeled to help ensure that correct fluid is added. All fillers shall be easily accessible with standard funnels, pour spouts, and automatic dispensing equipment. All lubricant sumps shall be fitted with magnetic-type drain plugs or magnets in pan.

TS 14. Hydraulic Systems

Hydraulic system service tasks shall be minimized and scheduled no more frequently than those of other major coach systems. All elements of the hydraulic system shall be easily accessible for service or unit replacement. Critical points in the hydraulic system shall be fitted with service ports so that portable diagnostic equipment may be connected or sensors for an off-board diagnostic system permanently attached to monitor system operation when applicable. A tamperproof priority system shall prevent the loss of power steering during operation of the bus if other devices are also powered by the hydraulic system.

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

Hydraulic System Sensors

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

TS 14.1 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 autoignition temperature of the fluid.

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

TS 14.2 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. Radiator

If liquid cooling is used, the radiator and/or heat exchanger shall be a heavy-duty metal unit. The radiator shall be accessible for cleaning. Any radiator shall be easily removable from the bus. Aluminum brazed/soldered radiator and/or heat exchanger may be used for low-temperature coolant systems only.

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

TS 16. Fluid Transfer Lines

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

All 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.

Hose and hose connections, where permitted, shall be made from materials resistant to corrosion and protected from fretting and high heat.

TS 17. Emissions and Exhaust

TS 17.1 Emissions (All-Electric)

The vehicle shall have no exhaust emissions resulting from the operation of the bus. The vehicle shall be rated and certified as a Zero Emission Vehicle (ZEV).

STRUCTURE

TS 18. General

TS 18.1 Design

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

TS 19. Altoona Testing

The vehicle must have completed any FTA-required Altoona testing. Any items that required repeated repairs or replacement must undergo the corrective action with supporting test and analysis. A report clearly describing and explaining the failures and corrective actions taken to ensure that any and all such failures will not occur shall be submitted to the Agency.

DEFAULT

An Altoona Test Report shall be provided to the Agency with the Proposal submittal. Buses which have not successfully completed an Altoona Test for the type and sizes requested under this RFP will not be considered.

TS 19.1 Structural Validation

DEFAULT

Baseline Structural Analysis

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

TS 20. Distortion

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

TS 21. Resonance and Vibration

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

TS 21.1 Propulsion Compartment Bulkheads

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

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

TS 21.2 Crashworthiness (Transit Coach)

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

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

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

TS 22. Corrosion

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

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

Corrosion Resistance Requirements

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

TS 23. Towing

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

DEFAULT

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

No Provision of Glad-Hand Type Connectors for Towing

No glad-hand type connector shall be provided.

Two rear recovery devices/tie-downs shall permit lifting and towing of the bus for a short distance, such as in cases of an emergency, to allow access to provisions for front towing of the bus. The method of attaching the tow bar or adapter shall require the specific approval of the Agency. Any tow bar or adapter exceeding 50 lb should have means to maneuver or allow for ease of use and application. Each towing device shall accommodate a crane hook with a 1 in. throat.

TS 24. Jacking

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

Decals

Apply decals to identify location of jacking pads.

TS 25. Hoisting

The bus axles or jacking plates shall accommodate the lifting pads of a two-post (or three-post if 60 ft. articulated bus) hoist system. Jacking plates, if used as hoisting pads, shall be designed to prevent the bus from falling off the hoist. Other pads or the bus structure shall support the bus on jack stands independent of the hoist.

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

TS 26. Floor

TS 26.1 Design (Transit Coach)

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

Bi-Level Floor Design

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 increased slope shall be allowed on the upper level, not to exceed 3.5 deg off the horizontal.

Sloped Floor Design

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 26.2 Design (Commuter Coach)

The floor shall be essentially a continuous plane, except at the wheel housings and platforms. Where the floor meets the walls of the bus, as well as other vertical surfaces such as platform risers, the surface edges shall be blended with a circular section of radius not less than ¼ in. or installed in a fully sealed butt joint. Similarly, a

molding or cover shall prevent debris accumulation between the floor and wheel housings. The vehicle floor in the area of the entrance and exit doors shall have a lateral slope not exceeding 2 deg to allow for drainage.

The aisle of the bus shall be a sloped floor design and shall not exceed 5.5 deg off the horizontal or include one step not to exceed entrance door step heights. The floor shall be a continuous plane over the wheel housings. Where the floor meets the walls of the bus, as well as other vertical surfaces such as platform risers, the surface edges shall be blended with a circular section of radius not less than ¼ in. or installed in a fully sealed butt joint.

TS 26.3 Design (Articulated Transit Coach)

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

Sloped Floor

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

TS 26.4 Strength

The floor deck may be integral with the basic structure or mounted on the structure securely to prevent chafing or horizontal movement and designed to last the life of the bus. Sheet metal screws shall not be used to retain the floor, and all floor fasteners shall be serviceable from one side only. Any adhesives, bolts or screws used to secure the floor to the structure shall last and remain effective throughout the life of the coach. Tapping plates, if used for the floor fasteners, shall be no less than the same thickness as a standard nut, and all floor fasteners shall be secured and protected from corrosion for the service life of the bus.

The floor deck shall be reinforced as needed to support passenger loads. At GVWR, the floor shall have an elastic deflection of no more than 0.60 in. from the normal plane. The floor shall withstand the application of 2.5 times gross load weight without permanent detrimental deformation. The floor, with coverings applied, shall withstand a static load of at least 150 lb applied through the flat end of a ½ in. diameter rod, with 1/32 in. radius, without permanent visible deformation.

TS 26.5 Construction

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

Pressure-Preserved Plywood Panel

Plywood shall be certified at the time of manufacturing by an industry-approved third-party inspection agency such as APA – The Engineered Wood Association (formerly the American Plywood Association). Plywood shall be of a thickness adequate to support design loads, shall be manufactured with exterior glue, shall satisfy the requirements of a Group I Western panel as defined in PS 1-95 (Voluntary Product Standard PS 1-95, "Construction and Industrial Plywood") and shall be of a grade manufactured with a solid face and back. Plywood shall be installed with the highest grade, veneer side up. Plywood shall be pressure-treated with a preservative chemical and process such as alkaline copper quaternary (ACQ) that prevents decay and damage by insects. Preservative treatments shall use no EPA-listed hazardous chemicals. The concentration of preservative chemicals shall be equal to or greater than required for an above-ground-level application. Treated plywood will be certified for preservative penetration and retention by a third-party inspection agency. Pressure-preservative treated plywood shall have a moisture content at or below 15 percent.

As an alternative the bus may also consist of composite flooring.

TS 26.6 Construction (Commuter Coach)

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

The floor deck may not be integral with the basic structure but shall be mounted on the structure securely to prevent chafing or horizontal movement. Sheet metal screws shall not be used to retain the floor. All floor fasteners shall be secured and protected from corrosion for the service life of the coach. The floor deck shall be reinforced as needed to support passenger loads. At GVWR, the floor shall have an elastic defection of no more than 0.375 in. (10 mm) from the normal plane. The floor shall withstand the application of 3.0 times gross load weight without permanent detrimental deformation.

TS 27. Platforms

TS 27.1 Driver's Area

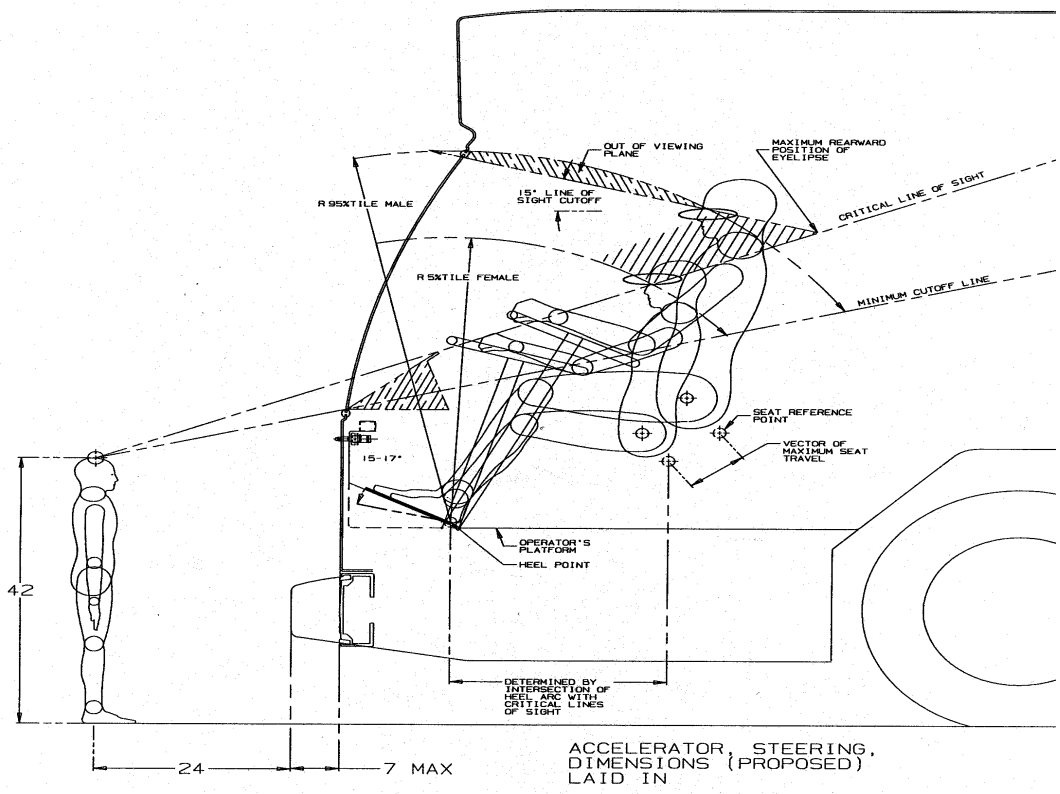
The covering of platform surfaces and risers, except where otherwise indicated, shall be the same material as specified for floor covering. Trim shall be provided along top edges of platforms unless integral nosing is provided.

No specific trim material is being specified.

TS 27.2 Driver's Platform

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

FIGURE 2
Determining Platform Height



TS 27.3 Farebox

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

DEFAULT

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

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

Stanchions

Stanchions shall be located around the farebox.

TS 27.4 Rear Step Area to Rear Area (Transit Coach)

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

TS 28. Wheel Housing

TS 28.1 Design and Construction

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

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

TS 28.2 Design and Construction (Transit Coach)

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

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

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

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

TS 28.3 Articulated Joint (Articulated Transit Coach)

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

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

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

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

In order to prevent damage to the structure and electrical, air, hydraulic and refrigerant lines when the vertical or horizontal bending capabilities of the hinge are exceeded, the bus shall be provided with appropriate warning devices, brake interlocks and positive mechanical stops. These devices shall operate when the maximum bend angle is being approached in either plane.

TS 28.4 Raceway (Articulated Transit Coach)

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

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

TS 28.5 Bellows

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

DEFAULT

No bellows liner required.

CHASSIS

TS 29. Suspension

TS 29.1 General Requirements

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

TS 29.2 Alignment

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

TS 29.3 Springs and Shock Absorbers

TS 29.3.1 Suspension Travel

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

TS 29.3.2 Damping

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

TS 29.3.3 Lubrication

Standard Grease Fittings

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

TS 29.3.4 Kneeling

DEFAULT

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

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

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

An indicator visible to the driver shall be illuminated until the bus is raised to a height adequate for safe street travel. An audible warning alarm will sound simultaneously with the operation of the kneeler to alert passengers and bystanders. A warning light mounted near the curbside of the front door, a minimum 2.5 in. diameter amber lens, shall be provided that will blink when the kneel feature is activated. Kneeling shall not be operational while the wheelchair ramp is deployed or in operation.

ALTERNATIVE

Full front kneeling capability.

ALTERNATIVE

Full right-side kneel capabilities.

ALTERNATIVE

Full four-wheel kneel capabilities.

TS 30. Wheels and Tires

TS 30.1 Wheels

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

Wheels and rims shall be hub-piloted, aluminum machine finished, with standard non-locking lug nuts.

TS 30.2 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.

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

ALTERNATIVE

The tires shall be supplied by the Contractor; if required by the Agency.

TS 31. Steering

Electrically assisted steering shall be provided to reduce steering effort.

TS 31.1 Steering Axle (Transit Coach)

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 31.2 Steering and Tag Axles (Commuter Coach)

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

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

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

TS 31.3 Steering Wheel

TS 31.3.1 Turning Effort

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

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

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

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

TS 31.3.2 Steering Wheel, General

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, Sections 4.2.2 and 4.2.3). Placement of steering column must be as far forward as possible, but either in line with or behind the instrument cluster.

TS 31.3.3 Steering Column Tilt

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

TS 31.3.4 Steering Wheel Telescopic Adjustment

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

TABLE 4

Steering Wheel Height[1] Relative to Angle of Slope

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

1. Measured from bottom portion closest to driver.

TS 32. Drive Axle

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

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

TS 32.1 Non-Drive Axle

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

TS 33. Tag Axles (Commuter Coach)

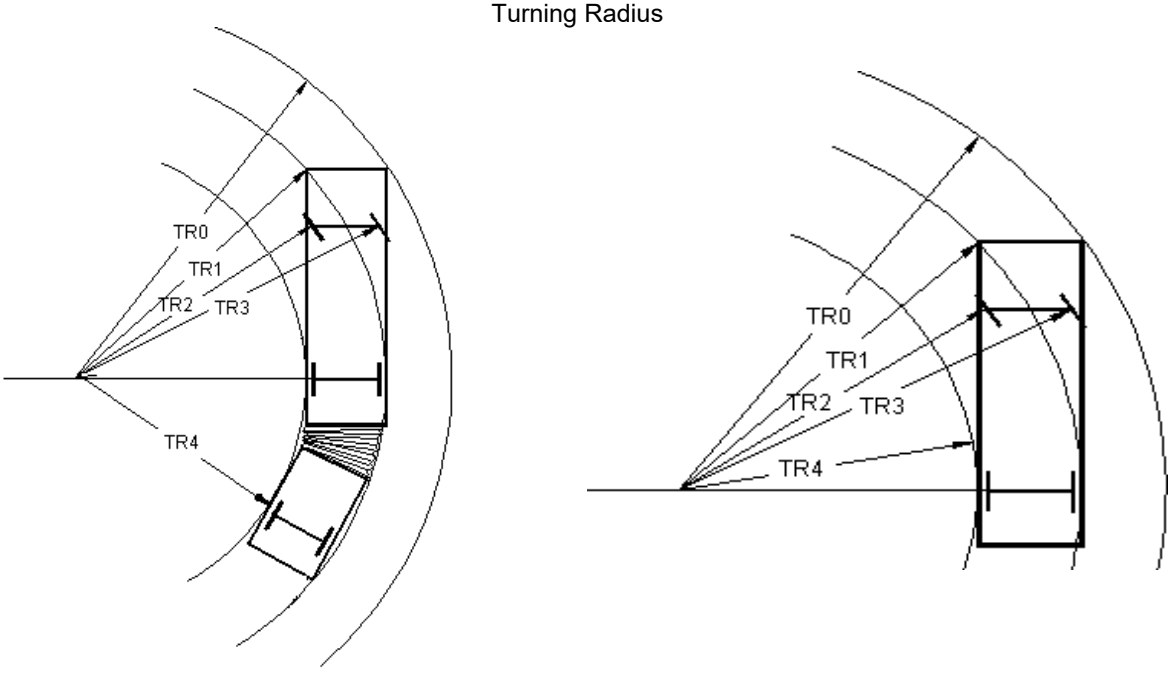
A tag axle shall be located behind the drive axle. The tag axle shall be a solid beam type with fixed steering. The tag axle shall have single tires the same size as the tires on the front and drive axles. Tag axle weight shall not exceed 14,000 lb. With full passenger seating capacity, load on any axle shall not exceed 22,400 lb. Combined load capacity weight on the drive and tag axles shall not exceed 36,500 lb. A tag axle unloading feature will allow full or partial unloading, or dumping of air from the tag axle air spring bellows. This feature enables weight to shift to the drive axle for more traction. Manual unloading valves are located inside the RH rear curbside service door.

TS 34. Turning Radius

TABLE 5
Maximum Turning Radius

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

FIGURE 3
Turning Radius



TS 35. Brakes

TS 35.1 Service Brake

DEFAULT

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

TS 35.1.1 Regenerative Braking

In addition to traditional mechanical friction service braking, the bus shall be equipped with regenerative braking designed to improve energy efficiency and extend brake lining service life. The application of regenerative braking shall cause a smooth blending of both regenerative and service brake function. Actuation of ABS and/or automatic traction control (ATC) shall override the operation of the regenerative brake.

TS 35.2 Actuation

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

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

Microprocessor-controlled ATC shall be provided.

TS 35.3 Friction Material

The brake linings shall be made of non-asbestos material. In order to aid maintenance personnel in determining extent of wear, a provision such as a scribe line or a chamfer indicating the thickness at which replacement becomes necessary shall be provided on each brake lining. The complete brake lining wear indicator shall be clearly visible from the hoist or pit without removing backing plates.

No remote brake wear indicator shall be required.

TS 35.4 Hubs and Drums/Discs

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

The vehicle may consist of either of the braking configurations stated below. Manufacturer shall state which configuration is being submitted as part of their proposal:

Drum Brakes

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

Disc Brakes on Front Axle

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

Disc Brakes on All Axles

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

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

TS 35.5 Hubs and Drums (Commuter Coach)

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

Drum Brakes

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

Disc Brakes on Front Axle

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

Disc Brakes on All Axles

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

TS 35.6 Parking/Emergency Brake

DEFAULT

Air Brakes

The parking brake shall be a spring-operated system, actuated by a valve that exhausts compressed air to apply the brakes. The parking brake may be manually enabled when the air pressure is at the operating level per FMVSS 121.

TS 36. Interlocks (Transit Coach)

TS 36.1 Passenger Door Interlocks

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

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

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

Non-adjustable brake interlock regulator.

DEFAULT

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

ALTERNATIVE

Requiring Accelerator Interlock Whenever Front Doors Are Open

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

TS 37. Pneumatic System

TS 37.1 General

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

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

TS 37.2 Air Compressor

ALTERNATIVE

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

TS 37.3 Air Lines and Fittings

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

DEFAULT

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

Line supports shall prevent movement, flexing, tension, strain and vibration. Copper lines shall be supported to prevent the lines from touching one another or any component of the bus. To the extent practicable and before installation, the lines shall be pre-bent on a fixture that prevents tube flattening or excessive local strain. Copper lines shall be bent only once at any point, including pre-bending and installation. Rigid lines shall be supported at no more than 5 ft intervals. Nylon lines may be grouped and shall be supported at 30 in. intervals or less.

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

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

TS 37.4 Air Reservoirs

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

TS 37.5 Air System Dryer

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

ELECTRICAL, ELECTRONIC AND DATA COMMUNICATION SYSTEMS

TS 38. Overview

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

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

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

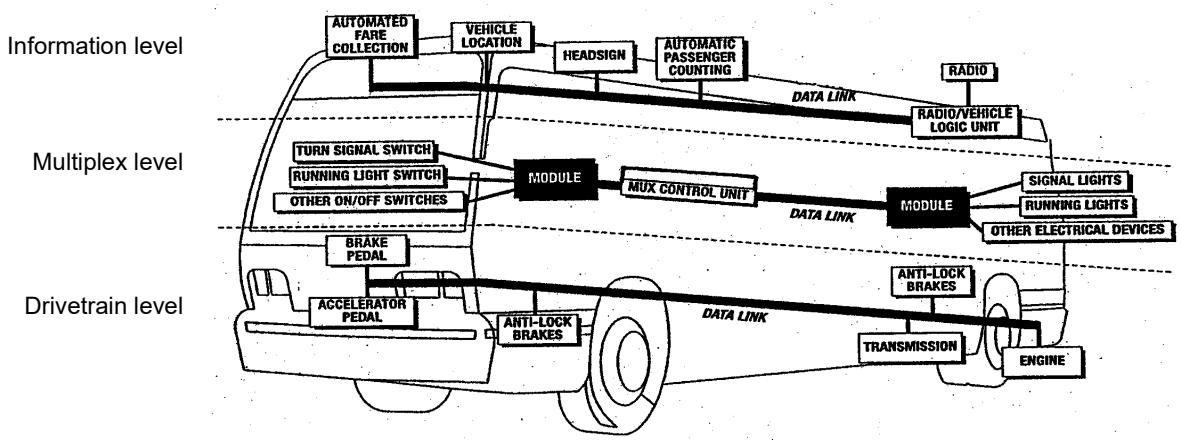
Information level systems that require vehicle information for their operations or provide information shall adhere to J1939 data standard.

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

- **Powertrain level:** Components related to the powertrain, including the propulsion system components (electric energy storage, energy storage controller, motors, inverters, converters, etc.)and anti-lock braking system (ABS),which may include traction control. At a minimum, propulsion system components consisting of the batteries, drive unit, regenerative braking system, and anti-lock braking systems shall be powered by a dedicated and isolated supply voltage to ensure data communication between components exists when the vehicle is switched to the “on” position.

- **Information level:** Components whose primary function is the collection, control or display of data that is not necessary to the safe drivability of the vehicle (i.e., the vehicle will continue to operate when those functions are inoperable). These components typically consist of those required for automatic vehicle location (AVL) systems, destination signs, fareboxes, passenger counters, radio systems, automated voice and signage systems, video surveillance and similar components.
- **Multiplex level:** Electrical or electronic devices controlled through input/output signals such as discrete, analog and serial data information (i.e., on/off switch inputs, relay or relay control outputs). Multiplexing is used to control components not typically found on the drivetrain or information levels, such as lights; wheelchair lifts; doors; heating, ventilation and air conditioning (HVAC) systems (if applicable); and gateway devices.

FIGURE 4
Data Communications Systems Levels



TS 38.1 Modular Design

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

TS 39. Environmental and Mounting Requirements

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

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

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

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

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

TS 40. General Electrical Requirements

TS 40.1 Low-Voltage (SLI) Batteries

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

TS 40.1.1 Low-Voltage Batteries (24 V)

ALTERNATIVE

Different Size Terminal Ends

Positive and negative terminal ends shall be different sizes.

ALTERNATIVE (BATTERY ELECTRIC VEHICLES)

Two Group 31 AGM Batteries

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

ALTERNATIVE (BATTERY ELECTRIC VEHICLES)

Two Appropriately Sized Batteries

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

TS 40.1.2 Low-Voltage Battery Cables

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

ALTERNATIVE

Color-code each voltage.

Jump-Start Connector

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

TS 40.1.3 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 vehicle. All components within the battery compartment, and the compartment itself, shall be protected from damage or corrosion from the electrolyte. The inside surface of the battery compartment's access door shall be electrically insulated, as required, to prevent the battery terminals from shorting on the door if the door is damaged in an accident or if a battery comes loose. The battery compartment temperature should not exceed manufacturer's specification.

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

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

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

Non-Locking Access Door

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 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.

The same fire-resistant properties must apply to the battery compartment. No sparking devices should be located within the battery box.

TS 40.1.4 Auxiliary Electronic Power Supply

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

TS 40.1.5 Master Battery Switch

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

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

Single Switch

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

TS 40.1.6 Low-Voltage Generation and Distribution

The low-voltage generating systems shall maintain the charge on fully charged batteries.Voltage monitoring and over-voltage output protection (recommended at 32 V) shall be provided. Charging profile shall be maintained within battery manufacturer’s guidelines or specifications.

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

TS 40.1.7 Circuit Protection

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

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

TS 40.2 Grounds

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

TS 40.3 Low Voltage and High Voltage Wiring and Terminals

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

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

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

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

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

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

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

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

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

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

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

TS 40.4 High-Voltage Generation and Distribution

All high voltage wiring shall be clearly marked, and isolated from low voltage wiring. High voltage wiring shall be loomed in a bright red or orange, watertight, anti-abrasive, flexible conduit. High voltage wiring shall utilize grommet less bulkhead fitting to pass through walls and bulkheads. The entire high voltage wiring circuit shall be watertight. Power cables shall be flexible multi-stranded copper with a hypalon or neoprene jacket. The jacket insulation shall be rated at a minimum of 900 volts. The conductors for the traction battery and motor cable shall be sized for continuous operation at maximum controller current without exceeding a 20 F degree rise above ambient temperature. The conductors for other power cables shall be sized for continuous operation at their maximum expected current without exceeding a 20 F degree rise above ambient temperature. Connections between battery blocks shall be fastened, providing a contact area at least as large as the circular area of the cell post. Other connectors shall be selected and sized to carry the maximum expected current.

TS 40.5 High Voltage Disconnect System

The high-voltage system shall be fitted with automatic disconnecting contactors located as closely as possible to the positive and negative battery output terminals so as to minimize the external circuitry that is not de-

energized when the devices open. These contractors shall be in addition to any such devices incorporated in the motor controller, and shall not require electrical power to operate (that is, they shall be normally open when unpowered). The contactors shall be rated as capable of interrupting the maximum normally encountered charging or operating current at the highest voltage likely to be encountered (maximum charger-output voltage, or charger-input voltage, whichever is greater). Contactors shall be controlled by the "High Voltage Disconnect" switch, and any safety-critical interlocks and interlock loops, motor-controller overcurrent- protection functions, and vehicle crash and/or fire sensors. Reset of the contactors shall require the deliberate action of the operator or maintenance personnel. Contactors should provide a visual or electrical indication of their status (open or closed) or of a failure to function.

Lids to high voltage enclosures must be interlocked, such that opening an enclosure automatically disconnects the high voltage system. Any high voltage cable of 5 amps or greater must also have an interlock such that disconnecting any cable of this type will disconnect the high voltage system.

This feature could be part of the emergency shutdown system, providing an organized / fail safe method for shutting the high voltage system down by manual activation of an emergency switch (red palm but ton), sensed isolation fault between high voltage and chassis, opening an interlocked panel, or disconnecting high voltage cables of 5 amps or greater.

TS 40.6 High Voltage Wiring

High-voltage wiring shall conform in all respects to SAE recommended practices J1654 (High- voltage Primary Cable), J1673 (High-Voltage Automotive Wiring), and J1742 (High Voltage On-Board Connectors). The outer layer of insulation on high-voltage wiring shall be bright orange or yellow in color.

High-voltage wiring shall be protected from road hazards and collision damage by major structural members. Wiring shall be continuous cables with connections secured using suitable vibration resistant fasteners such as nylocks or lock washers on bolted terminals. Terminals shall be rated for the expected current, corrosion-resistant, and crimped or secured with setscrews.

Wiring length shall allow replacement of end terminals without pulling, stretching, or replacing the wire. Double insulation shall be maintained as close to the terminals as practicable. Terminal shanks and cable ends shall be protected by shrink tubing or vulcanized covers. Shrink tubing or vulcanized covers shall be the color coded to indicate polarity; black to indicate terminals normally negative, red for terminals normally positive. Red or black shall not be used for protective covers of terminals on wiring normally carrying high-voltage alternating currents. All high-voltage wiring shall be durably labeled and numbered to be identical from one bus to the next.

All HV wiring that runs through areas where rotating or moving components might cause abrasion must be enclosed in orange or yellow non-conductive conduit. The conduit must be securely anchored at least at each end, and must be located out of the way of possible snagging or damage. Wiring inside of battery enclosures is not required to be covered, but must be adequately secured and protected from abrasion and mechanical stress.

All external heat sinks or metal housings for HV components (i.e. motors, inverters, etc.) must be securely grounded. Within an enclosure, exposed (un-insulated) HV terminals and conductors of opposing polarities must be spaced with an adequate air gap to prevent arcing due to dielectric breakdown. It is strongly recommended that the spacing is significantly larger than this to reduce the risk of accidental short circuit during service.

High-voltage wiring shall not be bundled with low-voltage wiring (except appropriately fused and distinctively marked high-voltage instrumentation-signal wires may be routed with other instrumentation-signal wires if the conduit or bundle is also distinctively marked as carrying high voltage). Grommets of elastomeric material shall be provided at points where wiring penetrates metal or rigid structures. Wiring supports shall be non-conductive. Precautions shall be taken to avoid damage from heat, water, solvents, commonly encountered automotive fluids, and chafing. Wire shall support no mechanical loads in the area of terminals and the wires shall be supported to prevent flexing. All wiring shall be numbered to be identical from one bus to the next.

TS 40.7 High Voltage Overcurrent Protection

All wiring and connected devices and equipment shall be protected against overcurrent by fuses or circuit breakers. Fuses and circuit breakers shall be rated to protect against prolonged overloads and short circuit conditions. The time-current characteristics of overcurrent protective devices and functions shall minimize hazard to personnel and equipment in the event of failure of any single protective device of function.

TS 40.8 High Voltage Grounding

The bus chassis and all conductive structural elements of the vehicle shall be electrically interconnected by means of low-resistance mechanical connections, ground straps, wires, or welded connections. Buses with a nonconductive chassis shall be provided with a low-impedance grounding system suitably sized for the level and duration of possible faults currents. Ground paths shall not exhibit an electrical potential in excess of 0.1-volt relative to each other while the bus is off or in normal operating or charging configurations. The high-voltage electrical system shall not, in any normally encountered operational or charging configuration, make use of the vehicle chassis or of the low voltage grounding system as a current path. The high-voltage electrical system shall not, in any normally encountered operation or charging configuration, induce any detectable electrical current in the vehicle chassis, in the low-voltage grounding system, or in the low-voltage electrical systems except as a design feature of instrumentation circuits.

HV and low-voltage (chassis-grounded) circuits must be physically segregated. If both HV and grounded circuits are present within an enclosure, they must be separated by insulating barriers or other moisture resistant, UL recognized insulating materials, or well separated so that there is no risk of arcing due to dielectric break-down or contact due to slight shifting of components during use.

If hazardous voltages are contained within a conductive exterior case or enclosed that may be exposed to human contact as installed in the vehicle, such case or enclosure shall be provided with a conductive connection to the vehicle chassis or grounding system.

Energy storage components (including batteries) and major power electronics components shall have their conductive external cases connected to the vehicle chassis or grounding system by a ground strap, wire, welded connection or other suitable low resistance mechanical connection. This grounding connection shall provide a low impedance path, sized appropriately for the level and duration of possible fault currents. Ground paths shall not be carried through hinges, bolted joints (except those specifically designed as electrical connectors), body or propulsion system mountings.

Other components that receive hazardous voltages from sources outside their enclosures may have their cases grounded either directly (as above) or indirectly through the wiring harness that carries the voltage(s) from the external source. Disconnecting the wiring harness used to provide indirect case grounding shall also disconnect the source of hazardous voltages.

Loss of isolation of the high-voltage electrical system from the chassis grounding system shall cause a dash-board-warming lamp to illuminate and automatic disconnect of the high-voltage system.

TS 40.9 DC-DC Converters and DC-AC Converters

The buses shall be fitted with a device or controller function to maintain the low-voltage batteries at a full state-of-charge using energy drawn from the traction battery.

The high-voltage inputs to individual DC-to-AC and DC-to-DC conversion devices shall be protected by circuit breakers or fuses. The output circuits of DC-to-AC and DC-to-DC conversion devices shall also be protected by appropriately rated circuit breakers or fuses.

Verify that the charger/charge function works throughout the acceptance testing. Verify that the fuses or circuit breakers are appropriately sized by consulting the conversion devices maker's literature in the contractors engineering files.

TS 40.10 Electrical Components

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

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

TS 40.11 Electrical Compartments

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

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

TS 41. General Electronic Requirements

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

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

TS 41.1 Wiring and Terminals

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

TS 41.1.1 Discrete I/O (Inputs/Outputs)

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

TS 41.1.2 Shielding

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

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

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

TS 41.1.3 Communications

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

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

TS 41.1.4 Radio Frequency (RF)

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

TS 41.1.5 Audio

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

TS 42. Multiplexing

TS 42.1 General

Versatility and future expansion shall be provided for by expandable system architecture. The multiplex system shall be capable of accepting new inputs and outputs though the addition of new modules and/or the utilization no 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 (0 V, 12 V, 24 V) at each module location shall be designated as spares. If not ten percent, manufacturer shall state amount of spares to be provided.

TS 42.2 System Configuration

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

TS 42.2.1 I/O Signals

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

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

TS 43. Data Communications

TS 43.1 General

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

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

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

TS 43.2 Propulsion System Level

Propulsion system components, consisting of the electric motors, energy storage, power electronics, ABS and ATC and all other related components, shall be integrated and communicate fully with respect to vehicle operation with data using SAE Recommended Communications Protocols such as J1939 and/or J1708/J1587 with forward and backward compatibilities or other open protocols. Data communication among components shall be ensured when the vehicle is on operation.

TS 43.2.1 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 43.2.2 Programmability (Software)

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

TS 43.3 Multiplex Level

TS 43.3.1 Data Access

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

TS 43.3.2 Diagnostics and Fault Detection

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

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

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

TS 43.3.3 Programmability (Software)

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

- Password protection
- Limited distribution of the configuration software

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

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

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

DEFAULT

Revision control labels shall be electronic.

TS 43.4 Electronic Noise Control

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

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

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

DRIVER PROVISIONS, CONTROLS AND INSTRUMENTATION

TS 44. Driver's Area Controls

TS 44.1 General

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

Switches and controls shall be divided into basic groups and assigned to specific areas, in conformance with SAE J680, revised 1988, "Location and Operation of Instruments and Controls in Motor Truck Cabs," and be essentially within the hand reach envelope described in SAE J287, "Driver Hand Control Reach."

TS 44.2 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 44.3 Visors/Sun Shades

Driver's Window Sunscreens

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

TS 44.4 Driver's Controls

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

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

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

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

The 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 44.5 Normal Bus Operation Instrumentation and Controls

The following list identifies bus controls used to operate the bus. These controls are either frequently used or critical to the operation of the bus. They shall be located within easy reach of the operator. The operator shall not be required to stand or turn to view or actuate these controls unless specified otherwise.

Systems or components monitored by onboard diagnostics system shall be displayed in clear view of the operator and provide visual and/or audible indicators. The intensity of indicators shall permit easy determination of on/off status in bright sunlight but shall not cause a distraction or visibility problem at night. All indicators shall be illuminated using backlighting.

The indicator panel shall be located in Area 1 or Area 5, within easy view of the operator instrument panel. All indicators shall have a method of momentarily testing their operation. The audible alarm shall be tamper-resistant and shall have an outlet level between 80 and 83 dBA when measured at the location of the operator's ear.

Onboard displays visible to the operator shall be limited to indicating the status of those functions described herein that are necessary for the operation of the bus. All other indicators needed for diagnostics and their related interface hardware shall be concealed and protected from unauthorized access. **Table 6** represents instruments and alarms. The intent of the overall physical layout of the indicators shall be in a logical grouping of systems and severity nature of the fault.

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

TABLE 6 (Transit Coach)
Transit Bus Instruments and Alarms

Device	Description	Location	Function	Visual/Audible
Master run switch	Rotary, four-position detent	Side console	Master control for bus, off, day run, night run and clearance ID lights	
System start, front	Approved momentary switch	Side console	Activates vehicle systems	
Drive selector	Touch panel switch	Side console	Provides selection of propulsion: forward, reverse and neutral	Gear selection
HVAC	Switch or switches to control HVAC	Side console	Permits selection of passenger ventilation: off, cool, heat, low fan, high fan or full auto with on/off only	
Driver's ventilation	Switch or switches to control driver ventilation	Side console or dash left wing	Permits supplemental ventilation: fan off, low or high	
Defroster fan	Switch or switches to control defroster fan	Side console or dash left wing	Permits defroster: fan off, low, medium or high	
Defroster temperature	Variable position	Side console or dash left wing	Adjusts defroster water flow and temperature	
Windshield wiper	One-variable position switch operating both wipers	Dash left wing	Variable speed control of left and right windshield wipers	
Windshield washer	Push button	Dash left wing	Activates windshield washers	
Dash panel lights	Rotary rheostat or stepping switch	Side console or dash left wing	Provides adjustment for light intensity in night run position	
Interior lights	Three-position switch	Side console	Selects mode of passenger compartment lighting: off, on or reduced lighting	
WC ramp/ kneel enable	Two-position switch[1]	Side console or dash right wing	Permits operation of ramp and kneel operations at each door remote panel	Amber light
Front door ramp/kneel enable	Two-position keyed switch[1]	Front door remote or dash right wing	Permits ramp and kneel activation from front door area, key required[1]	Amber light
Front door ramp	Three-position momentary switch	Right side of steering wheel	Permits deploy and stow of front ramp	Red light
Front kneel	Three-position momentary switch	Front door remote	Permits kneeling activation and raise and normal at front door remote location	Amber or red dash indicator exterior alarm and amber light
Silent alarm	Recessed momentary push button	Side console	Activates emergency radio alarm at dispatch and permits covert microphone and/or enables destination sign emergency message	

TABLE 6 (Transit Coach)

Transit Bus Instruments and Alarms

Device	Description	Location	Function	Visual/Audible
Video system event switch	Momentary on/off switch with plastic guard	Side console	Triggers event equipment and event light on dash	Amber light
Left remote mirror	Four-position toggle type	Side console	Permits two-axis adjustment of left exterior mirror	
Right remote mirror	Four-position toggle type	Side console	Permits two-axis adjustment of right exterior mirror	
Mirror heater	Switch or temperature activated	Side console	Permits heating of outside mirrors when required	
Passenger door control	Five-position handle type detent or two momentary push buttons	Side console, forward	Permits open/close control of front and rear passenger doors	Red light
Rear door override	Two-position switch in approved location	Side console, forward	Allows driver to override activation of rear door passenger tape switches	
System shutdown override	Momentary switch with operation protection	Side console	Permits driver to override auto system shutdown	
Hazard flashers	Two-position switch	Side console or dash right wing	Activates emergency flashers	Two green lights
Fire suppression	Red push button with protective cover	Dash left wing or dash center	Permits driver to override and manually discharge fire suppression system	Red light
Mobile data terminal	Mobile data terminal coach operator interface panel	Above right dash wing	Facilitates driver interaction with communication system and master log-on	LCD display with visual status and text messages
Farebox interface	Farebox coach operator interface panel	Near farebox	Facilitates driver interaction with farebox system	LCD display
Destination sign interface	Destination sign interface panel	In approved location	Facilitates driver interaction with destination sign system, manual entry	LCD display
Turn signals	Momentary push button (two required) raised from other switches	Left foot panel	Activates left and right turn signals	Two green lights and optional audible indicator
PA manual	Momentary push button	In approved location	Permits driver to manually activate public address microphone	
Low-profile microphone	Low-profile discrete mounting	Steering column	Permits driver to make announcements with both hands on the wheel and focusing on road conditions	
High beam	Push button	In approved location	Permits driver to toggle between low and high beam	Blue light
Parking brake	Pneumatic PPV	Side console or dash left wing	Permits driver to apply and release parking brake	Red light
Master door/ interlock	Multi-pole toggle, detented	Out of operator's reach	Permits driver override to disable door and brake/throttle interlock	Red light

TABLE 6 (Transit Coach)

Transit Bus Instruments and Alarms

Device	Description	Location	Function	Visual/Audible
Warning interlocks deactivated	Red indicator light	Dash panel center	Illuminates to warn driver that interlocks have been deactivated	Red light
Alarm acknowledge	Push button momentary	Approved location	Permits driver to acknowledge alarm condition	
Rear door passenger sensor disable	Two-position switch	In sign compartment or driver's barrier compartment	Permits driver to override rear door passenger sensing system	
Indicator/ alarm test button	Momentary switch or programming[1]	Dash center panel	Permits driver to activate test of sentry, indicators and audible alarms	All visuals and audibles
Speedometer	Speedometer, odometer, and diagnostic capability, 5-mile increments	Dash center panel	Visual indication of speed and distance traveled, accumulated vehicle mileage, fault condition display	Visual
Air pressure gauge	Primary and secondary, 5 psi increments	Dash center panel	Visual indication of primary and secondary air systems	Red light and buzzer
Fire detection	Coach operator display	Property specific or dash center	Indication of fire detection activation by zone/location	Buzzer and red light
Door obstruction	Sensing of door obstruction	Dash center	Indication of rear door sensitive edge activation	Red light and buzzer
Door ajar	Door not properly closed	Property specific or dash center	Indication of rear door not properly closed	Buzzer or alarm and red light
Low system air pressure	Monitors primary and secondary air tank pressure	Dash center	Indication of low air system pressure	Buzzer and red light
System coolant indicator	Low coolant indicator may be supplied as audible alert and visual and/or text message	Within driver's sight	Detects low coolant condition	Amber light
Hot system indicator	Temperature indicator may be supplied as audible alert and visual and/or text message	Within driver's sight	Detects system overheat condition and initiates time delay shutdown	Red light
ABS indicator	Detects system status	Dash center	Displays system failure	Amber light
HVAC indicator	Detects system status	Dash center	Displays system failure	Amber or red light
LV charging system indicator (12/24 V)	Detect charging system status	Dash center	Detects no-charge condition and optionally detects battery high, low, imbalance, no-charge condition, and initiates time-delayed shutdown	Red light flashing or solid based on condition
Bike rack deployed indicator	Detects bike rack position	Dash center	Indicates bike rack not being in fully stowed position	Amber or red light

TABLE 6 (Transit Coach)
Transit Bus Instruments and Alarms

Device	Description	Location	Function	Visual/Audible
HV charging system indicator (ESS)	Detects charging system status	Dash center	Indicates when bus is connected to off-board charger and ESS is accepting charge	Visual
State of charge indicator	Gauge, graduated based on SoC	Dash center	Indicates SoC of ESS	Visual
Regenerative braking indicator	Detects status	Dash center	Indicates when regenerative braking is being used	Visual
State of charge	Gauge, graduated based on SoC	Dash center	Indicates traction batteries SoC	
Turntable	Detects status	Dash center	Warning indication for hinge locking	Audible and amber warning and red light if locked
Turntable	Interlock momentary switch	Side console	Momentarily release interlock brakes due to overangled condition	

1. Indicate area by drawing. Break up switch control from indicator lights.

TS 44.6 Driver Foot Controls

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

TS 44.6.1 Pedal Angle

The vertical angle of the accelerator and brake pedals shall be determined from a horizontal plane regardless of the slope of the cab floor. The accelerator and brake pedals shall be positioned at an angle of 37 to 50 deg at the point of initiation of contact and extend downward to an angle of 10 to 18 deg at full throttle.

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

TS 44.6.2 Pedal Dimensions and Position

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

The accelerator and brake pedals shall be positioned such that the spacing between them, measured at the heel of the pedals, is between 1 and 2 in. Both pedals should be located approximately on the same plane coincident to the surface of the pedals.

TS 44.7 Brake and Accelerator Pedals

Brake Pedal

Non-adjustable brake pedal.

TS 44.8 Driver Foot Switches

Floor-Mounted Foot Control Platform

The angle of the turn signal platform shall be determined from a horizontal plane, regardless of the slope of the cab floor. The turn signal platform shall be angled at a minimum of 10 deg and a maximum of 37 deg. It shall be located no closer to the seat front than the heel point of the accelerator pedal.

Turn Signal Controls

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

Foot Switch Control

The control switches for the turn signals shall be mounted on an inclined, floor-mounted stainless steel enclosure or metal plate mounted to an incline integrated into the driver's platform, located to the left of the steering column. The location and design of this enclosure shall be such that foot room for the operator is not impeded. The inclined mounting surface shall be skid-resistant. All other signals, including high beam and public address system, shall be in approved locations.

The foot switches shall be UL-listed, heavy-duty type, of a rugged, corrosion-resistant metal construction. The foot switches for the directional signals shall be momentary type, while those for the PA system and the high beam shall be latching type. The spacing of the switches shall be such that inadvertent simultaneous deflection of switches is prevented.

Other Floor-Mounted Controls

The following may be floor mounted, momentary or latching, as identified by the Agency:

- hazard
- silent alarm
- PA system

TS 45. Driver's Amenities

TS 45.1 Coat Hanger

Coat Hook

A hook and loop shall be provided to secure the driver's coat.

TS 45.2 Drink Holder

No drink holder.

TS 45.3 Storage Box

Storage Box

An enclosed driver storage area shall be provided with a positive latching door and/or lock. The minimum size is 2750 cu in.

TS 46. Windshield Wipers and Washers

TS 46.1 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.

Intermittent Wiper with Variable Control

A variable-speed feature shall be provided to allow adjustment of wiper speed for each side of the windshield between approximately five and 25 cycles per minute.

Non-Synchronized Wipers

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

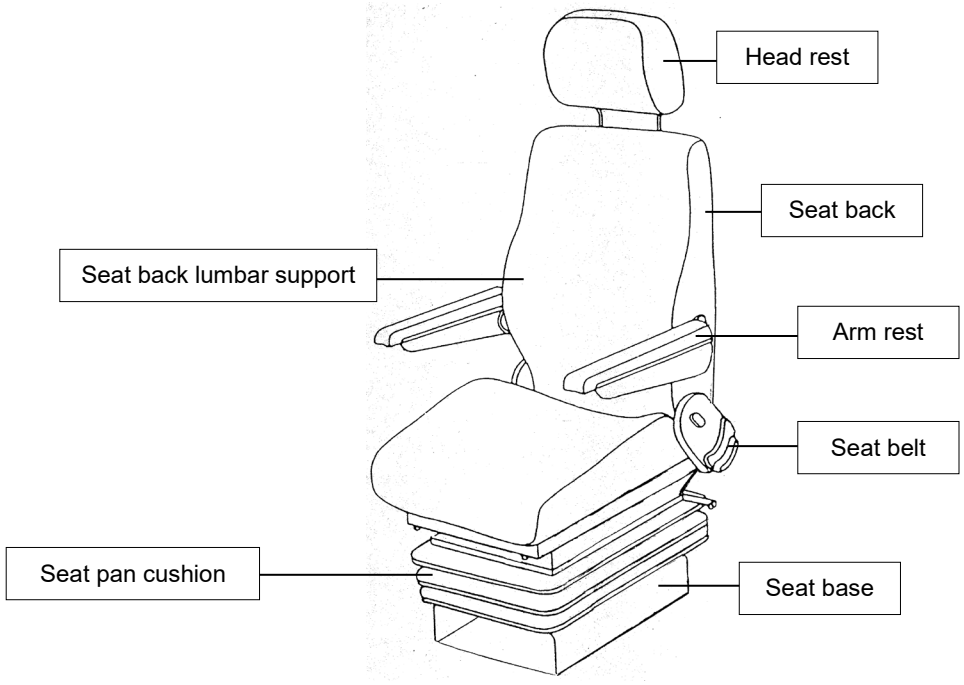
TS 46.2 Windshield Washers

The windshield washer system, when used with the wipers, shall deposit washing fluid evenly and completely wet the entire wiped area.

The windshield washer system shall have a minimum 3-gallon reservoir, located for easy refilling from outside the bus. Reservoir pumps, lines and fittings shall be corrosion-resistant and must include a means to determine fluid level.

TS 47. Driver's Seat

FIGURE 5
Driver's Seat



TS 47.1 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 47.1.1 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.

SP 9.1.1 Seat Pan Cushion Height

Dimensions

Measurement shall be from the cab floor to the top of the level seat at its center midpoint. The seat shall adjust in height from a minimum of 14 in., with a minimum 6 in. vertical range of adjustment.

TS 47.1.2 Seat Pan Cushion Slope

Measurement is the slope of the plane created by connecting the two high points of the seat, one at the rear of the seat at its intersection with the seat back and the other at the front of the seat just before it waterfalls downward at the edge. The slope can be measured using an inclinometer and shall be stated in degrees of incline relative to the horizontal plane (0 deg). The seat pan shall adjust in its slope from no less than plus 12 deg (rearward "bucket seat" incline) to no less than minus 5 deg (forward slope).

TS 47.1.3 Seat Base Fore/Aft Adjustment

Measurement is the horizontal distance from the heel point to the front edge of the seat. The minimum and maximum distances shall be measured from the front edge of the seat when it is adjusted to its minimum seat pan depth (approximately 15 in.). On all low-floor buses, the seat base shall travel horizontally a minimum of 9 in. It shall adjust no closer to the heel point than 6 in. On all high-floor buses, the seat base shall travel a minimum of 9 in. and adjust no closer to the heel point than 6 in.

TS 47.1.4 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 47.1.5 Seat Suspension

The driver's seat shall be appropriately dampened to support a minimum weight of 380 lb. The suspension shall be capable of dampening adjustment in both directions.

Rubber bumpers shall be provided to prevent metal-to-metal contact.

TS 47.1.6 Seat Back

Width

Measurement is the distance between the outermost points of the front of the seat back, at or near its midpoint in height. The seat back width shall be no less than 19 in. Seat back will include dual recliner gears on both sides of the seat.

Height

Standard height seat back.

TS 47.1.7 Headrests

Adjustable headrest.

TS 47.1.8 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 47.1.9 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 47.2 Seat Belt

The belt assembly should be an auto-locking retractor (ALR). All seat belts should be stored in automatic retractors. The belts shall be mounted to the seat frame so that the driver may adjust the seat without resetting the seat belt.

The seat and seatbelt assemblies as installed in the bus shall withstand static horizontal forces as required in FMVSS 207 and 210.

Lap and Shoulder (Three-Point) Seat Belt

Seat belts shall be provided across the driver's lap and diagonally across the driver's chest. The driver shall be able to use both belts by connecting a single buckle on the right side of the seat cushion. Three-point seatbelts must be emergency locking retractor (ELR) in design.

Adjustable-height D-ring.

Orange three-point seatbelt webbing.

Lap Belt Length

72 in.

The lap belt assembly shall be a minimum of 72 in. in length.

TS 47.3 Adjustable Armrest

No armrests.

TS 47.4 Seat Control Locations

While seated, the driver shall be able to make seat adjustments by hand without complexity, excessive effort or being pinched. Adjustment mechanisms shall hold the adjustments and shall not be subject to inadvertent changes.

TS 47.5 Seat Structure and Materials

Cushions

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

Cushion Materials

Open-cell polyurethane (FMVSS 302).

TS 47.6 Pedestal

Powder-coated steel.

TS 47.7 Mirrors

TS 47.7.1 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.

Exterior mirrors shall be installed with a breakaway mounting system.

Spring-loaded mirror heads auto return.

DEFAULT

Flat Mirrors on Both Sides

The bus shall be equipped with two flat outside mirrors, each with not less than 50 sq in. of reflective surface. The mirrors shall be located so as to provide the driver a view to the rear along both sides of the bus and shall be adjustable both in the horizontal and vertical directions to view the rearward scene. The roadside rearview mirror shall be positioned so that the driver's line of sight is not obstructed.

ALTERNATIVE

Combination of flat and convex mirrors referred to as transit-specific.

Curbside Mirrors

The curbside rearview mirror shall be mounted so that its lower edge is no less than 76 in. above the street surface. A lower mount may be required due to mirror configuration requests.

Remote Adjustment of Curbside Mirror

The driver shall be able to adjust the curbside mirror remotely while seated in the driving position. The control for remote positioning of the mirror shall be a single switch or device.

ALTERNATIVE

Heated and Remote Mirrors

The heaters shall be energized whenever the driver's heater and/or defroster is activated or activated independently.

Street-Side Mirrors

ALTERNATIVE

Remote Adjustment of Curbside Mirror

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

ALTERNATIVE

Heated Street-Side Mirrors

The street-side mirrors shall have heaters that energize whenever the driver's heater and/or defroster is activated, or can be activated independently.

ALTERNATIVE

Mirrors with external mounted turn signal, both sides.

TS 47.7.2 Interior Mirrors

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

WINDOWS

TS 48. General

Use with 29/30 ft length: A minimum of 6000 sq in. of window area, including operator and door windows, shall be required on each side of the standard configuration bus.

Use with 35 ft length: A minimum of 8000 sq in. of window area, including operator and door windows, shall be required on each side of the standard configuration bus.

Use with 40 ft length: A minimum of 10,000 sq in. of window area, including operator and door windows, shall be required on each side of the standard configuration bus.

Use with 45 ft length: A minimum of 12,000 sq in. of window area, including operator and door windows, shall be required on each side of the standard configuration bus.

Use with 60 ft length: A minimum of 16,000 sq in. of window area, including operator and door windows, shall be required on each side of the standard configuration bus.

TS 49. Windshield

The windshield shall permit an operator's field of view as referenced in SAE J1050. The vertically upward view shall be a minimum of 14 deg, measured above the horizontal and excluding any shaded band. The vertically downward view shall permit detection of an object 3½ ft high no more than 2 ft in front of the bus. The horizontal view shall be a minimum of 90 deg above the line of sight. Any binocular obscuration due to a center divider may be ignored when determining the 90 deg requirement, provided that the divider does not exceed a 3 deg angle in the operator's field of view. Windshield pillars shall not exceed 10 deg of binocular

obscuration. The windshield shall be designed and installed to minimize external glare as well as reflections from inside the bus.

The windshield shall be easily replaceable by removing zip-locks from the windshield retaining moldings. Bonded-in-place windshields shall not be used. Winglets may be bonded.

TS 49.1 Glazing

The windshield glazing material shall have a ¼ in. nominal thickness laminated safety glass conforming to the requirements of ANSI Z26.1 Test Grouping AS-1 and the recommended practices defined in SAE J673.

Shaded Band

The upper portion of the windshield above the driver's field of view shall have a dark, shaded band and marked AS-3, with a minimum luminous transmittance of 5 percent when tested in accordance to ASTM D1003.

DEFAULT

Two-piece windshield.

ALTERNATIVE

One-piece windshield.

TS 50. Driver's Side Window

The driver's side window shall be the sliding type, requiring only the rear half of the sash to latch upon closing, and shall open sufficiently to permit the seated operator to easily adjust the street-side outside rearview mirror. When in an open position, the window shall not rattle or close during braking. This window section shall slide in tracks or channels designed to last the service life of the bus. The operator's side window shall not be bonded in place and shall be easily replaceable. The glazing material shall have a single-density tint.

The driver's view, perpendicular through the operator's side window glazing, should extend a minimum of 33 in. (840 mm) to the rear of the heel point on the accelerator, and in any case must accommodate a 95th percentile male operator. The view through the glazing at the front of the assembly should begin not more than 26 in. (560 mm) above the operator's floor to ensure visibility of an under-mounted convex mirror. Driver's window construction shall maximize ability for full opening of the window.

The driver's side window glazing material shall have a ¼ in. nominal thickness tempered safety glass conforming to the requirements of ANSI Z26.1-1996 Test Grouping AS-2 and the recommended practices defined in SAE J673.

The design shall prevent sections from freezing closed in the winter. Light transmittance shall be 75 percent on the glass area below 53 in. from the operator platform floor. On the top-fixed-over-bottom-slider configuration, the top fixed area above 53 in. may have a maximum 5 percent light transmittance.

DEFAULT

Standard Driver's Side Window, Traditional Frame

Agency to choose from the following options:

- full slider
  - egress
  - non-egress
- top fixed over bottom slider
  - egress
  - non-egress

ALTERNATIVE

Hidden Frame (Flush "Euro-Look") Driver's Side Window

Agency to choose from the following options:

- full slider
  - egress
  - non-egress
- top fixed over bottom slider
  - egress
  - non-egress

ALTERNATIVE

Quick Change Operator's Side Window

Glazing in the window assembly shall be replaced without removing the window from its installed position on the bus or manipulation of the rubber molding surrounding the glazing. The glazing shall be held in place mechanically by a formed metal extruded ring constructed to last the life of the vehicle.

ALTERNATIVE

Standard Driver's Side Window, Traditional Frame

Agency to choose from the following options:

- full slider
  - egress
  - non-egress
- top fixed over bottom slider
  - egress
  - non-egress

TS 51. Side Windows

TS 51.1 Configuration

Side windows shall not be bonded in place, but shall be easily replaceable without disturbing adjacent windows and shall be mounted so that flexing or vibration from engine operation or normal road excitation is not apparent. All aluminum and steel material will be treated to prevent corrosion.

TS 51.2 Emergency Exit (Egress) Configuration

Minimum Egress

All side windows shall be fixed in position, except as necessary to meet the emergency escape requirements.

DEFAULT

Standard Passenger Side Window Configurations

Agency to choose from the following options:

- traditional frame
  - full fixed
  - openable windows with inward-opening transom panels
  - openable windows with sliding transom panels
  - openable windows with a fixed transom panel and sliding lower panels
  - openable windows with full-height sliding panels
- hidden frame (flush “Euro-look”)
  - full fixed
  - openable windows with inward-opening transom panels.

ALTERNATIVE

Quick Change Passenger Side Windows

Glazing in the window assembly shall be replaced without removing the window from its installed position on the bus or manipulation of the rubber molding surrounding the glazing. The glazing shall be held in place mechanically by a formed metal extruded ring constructed to last the life of the vehicle.

DEFAULT

Traditional Frame

Agency to choose from the following options:

- full fixed
- openable windows with inward-opening transom panels
- openable windows with sliding transom panels
- openable windows with a fixed transom panel and sliding lower panels
- openable windows with full-height sliding panels

ALTERNATIVE

Hidden Frame (Seamless)

Agency to choose from the following options:

- full fixed
- openable windows with inward-opening transom panels

TS 51.3 Configuration

Fixed Side Windows

All side windows shall be fixed in position, except as necessary to meet the emergency escape requirements.

TS 51.4 Materials

Safety Glass Glazing Panels

Side windows glazing material shall have a minimum of 3/16 in. nominal thickness tempered safety glass. The material shall conform to the requirements of ANSI Z26.1-1996 Test Grouping 2 and the recommended practices defined in SAE J673.

Windows on the bus sides and in the rear door shall be tinted. The maximum solar energy transmittance shall not exceed 37 percent, as measured by ASTM E-424. Luminous transmittance shall be measured by ASTM D-1003. Windows over the destination signs shall not be tinted.

Glazing color shall be gray. Transmissivity range shall be 8%-18%.

Safety Glass Glazing Panels

Side windows glazing material shall have a minimum of 3/16 in. nominal thickness tempered safety glass. The material shall conform to the requirements of ANSI Z26.1 Test Grouping 2 and the recommended practices defined in SAE J673.

> **NOTE:** All glass treatments must be permanent, within the glass and/or in the center membrane. Surface films are not permitted.

SHGC and light transmission performance shall be defined by the National Fenestration Rating Council.

TS 51.5 Rear Window

There is no requirement for rear window.

However if a rear window is inherent to the design of the vehicle then the manufacturer must conform to the rear window requirement specification below.

Rear Window Requirement

The rear window shall be glazed with the same material (including anti-vandalism provision if required) and tint as side windows. The glazing shall be set in rubber channels or be push-out type to meet FMVSS 217. If push-out type, it shall be one-piece, rugged sash design, meeting specifications for side windows.

HEATING, VENTILATING AND AIR CONDITIONING

TS 52. Capacity and Performance

The HVAC climate control system shall be capable of controlling the temperature and maintaining the humidity levels of the interior of the bus as defined in the following paragraphs.

DEFAULT

HVAC equipped. See below for configuration.

DEFAULT

Allow Either Roof- or Rear-Mounted HVAC Unit

The HVAC unit may either be roof or rear-mounted. Note that a rear-mounted unit will preclude a rear window and that the term “roof-mounted unit” includes units mounted on top of or beneath the roof surface.

ALTERNATIVE (ARTIC)

Require roof- and rear-mounted HVAC unit (articulated buses).

ALTERNATIVE (ARTIC)

Require roof- mounted HVAC units in both bus sections (articulated buses).

ALTERNATIVE

AC or DC electrically driven A/C system with hermetic compressor(s), condenser fan and evaporator blower motors.

With the bus running at the design operating profile with corresponding door opening cycle, and carrying a number of passengers equal to 150 percent of the seated load, the HVAC system shall control the average passenger compartment temperature within arrange between 65 and 80 °F, while maintaining the relative humidity to a value of 50 percent or less. The system shall maintain these conditions while subjected to any outside ambient temperatures within a range of 40 to 95 °F and at any ambient relative humidity levels between 5 and 50 percent. Demonstrate this requirement after first reaching a stabilized interior temperature of 70 ±3 °F with full passenger and solar load.

When the bus is operated in outside ambient temperatures of 95 to 115 °F, the interior temperature of the bus shall be permitted to rise 0.5 °F for each degree of exterior temperature in excess of 95 °F.

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

Capacity and Performance Requirements

The air conditioning portion of the HVAC system shall be capable of reducing the passenger compartment temperature from 110 to 90 °F in less than 20 minutes after system startup in a 100 °F ambient temperature. During the cooldown period, the refrigerant pressure shall not exceed safe high-side pressures, and the condenser discharge air temperature, measured 6 in. from the surface of the coil, shall be less than 45 °F above the condenser inlet air temperature. The appropriate solar load as recommended in the APTA “Recommended Instrumentation and Performance Testing for Transit Bus Air Conditioning System,” representing 4 p.m. on Aug. 21, shall be used. There shall be no passengers on board, and the doors, windows and fresh air opening shall be closed.

ALTERNATIVE

R134a

The air conditioning system shall meet these performance requirements using R134a.

ALTERNATIVE

R407C

The air conditioning system shall meet these performance requirements using R407C.

TS 53. Controls and Temperature Uniformity

The HVAC system excluding the driver's heater/defroster shall be centrally controlled with an advanced electronic/diagnostic control system with provisions for extracting/reading data. The system shall be compliant with J1939 Communication Protocol for receiving and broadcasting of data.

HVACs that use coolant pumps for driver's defroster/heat shall be sized for the required flow and be brushless, having a minimum maintenance-free service life for both the brushless motor and the pump of at least 40,000 hours at full power.

ALTERNATIVE

Fully Automatic Climate Control System

The climate control system shall be fully automatic and control the interior average temperature to within ±2 °F of specified temperature control setpoint.

ALTERNATIVE

Manually Adjustable Temperature Control Setpoint

The climate control system shall have the provision to allow the driver to adjust the temperature control setpoint at a minimum of between 68 and 72 °F. From then on, all interior climate control system requirements shall be attained automatically, unless readjusted by the driver.

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

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

TS 53.1 Auxiliary Heater

DEFAULT

No auxiliary heater.

TS 53.2 Load Shedding and Derating

Optional Multistage Load Shedding or Derating

HVAC control must include a method to provide multistage load shedding when required to conserve battery power. The HVAC system may be operated with reduced performance to allow the bus to operate when the high voltage batteries are below critical levels.

TS 54. Air Flow

TS 54.1 Passenger Area

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

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

The climate control blower motors and fan shall be designed such that their operation complies with the interior noise level requirements.

DEFAULT

No "Fresh Air" Requirements

To be used by agencies with an operating profile where the door opening cycle results in effectively providing an adequate "fresh air" mixture.

TS 54.2 Driver's Area

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

TS 54.3 Controls for the Climate Control System (CCS)

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

- The heat/defrost system fan shall be controlled by a separate switch that has an "off" position and at least two positions for speed control. All switches and controls shall preclude the possibility of clothing becoming entangled, and shields shall be provided, if required. If the fans are approved by the Agency, an "on/off" switch shall be located to the right of or near the main defroster switch.

- A manually operated control valve shall control the coolant flow through the heater core.
- If a cable-operated manual control valve is used, then the cable length shall be kept to a minimum to reduce cable seizing. Heater water control valves shall be “positive” type, closed or open. The method of operating remote valves shall require the concurrence of the Agency project manager.

TS 54.4 Driver’s Compartment Requirements

A separate heating, ventilation and defroster system for the driver’s area shall be provided and shall be controlled by the driver. The system shall meet the following requirements:

- The heater and defroster system shall provide heating for the driver and heated air to completely defrost and defog the windshield, driver’s side window and the front door glasses in all operating conditions. Fan(s) shall be able to draw air from the bus body interior and/or exterior through a control device and pass it through the heater core to the defroster system and over the driver’s feet. A minimum capacity of 100 cfm shall be provided. The driver shall have complete control of the heat and fresh airflow for the driver’s area.
- The defroster supply outlets shall be located at the lower edge of the windshield. These outlets shall be durable and shall be free of sharp edges that can catch clothes during normal daily cleaning. The system shall be such that foreign objects such as coins or tickets cannot fall into the defroster air outlets. Adjustable ball vents or louvers shall be provided at the left of the driver’s position to allow direction of air onto the side windows.

A ventilation system shall be provided to ensure driver comfort and shall be capable of providing fresh air in both the foot and head areas. Vents shall be controllable by the driver from the normal driving position. Decals shall be provided, indicating “operating instructions” and “open” and “closed” positions. When closed, vents shall be sealed to prevent the migration of water or air into the bus.

TS 54.5 Driver’s Cooling

A separate fan unit shall provide 100 cfm of air to the driver’s area through directionally adjustable nozzles and an infinitely variable fan control, both of which shall be located above and ahead of the driver.

Driver’s booster blower.

TS 55. 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.

Cleanable Filters

Air filters shall be cleanable.

TS 56. Roof Ventilators

Each ventilator shall be easily opened and closed manually. When open with the bus in motion, this ventilator shall provide fresh air inside the bus. The ventilator shall cover an opening area no less than 425 sq in. and shall be capable of being positioned as a scoop with either the leading or trailing edge open no less than 4 in.,

or with all four edges raised simultaneously to a height of no less than 3½ in. An escape hatch shall be incorporated into the roof ventilator. Roof ventilator(s) shall be sealed to prevent entry of water when closed.

DEFAULT

One Roof Ventilator

One ventilator shall be provided in the roof of the bus.

ALTERNATIVE

Two Roof Ventilators

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

ALTERNATIVE

Three Roof Ventilators

(Used in articulated buses.)

TS 57. Maintainability

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

DEFAULT

High and low refrigerant pressure electronic gauges to be located in the return air area.

TS 58. Entrance/Exit Area Heating

No requirements for entrance/exit area heating.

TS 59. Floor-Level Heating

TS 59.1 Transit Coach

No requirements for floor-level heating.

TS 59.2 Commuter Coach

There is no requirement for entrance/exit area heating and/or wall heating. The only requirement is to supply heated air through the existing HVAC system installed on the vehicle.

EXTERIOR PANELS, FINISHES AND EXTERIOR LIGHTING

TS 60. Design

The bus shall have a clean, smooth, simple design, primarily derived from bus performance requirements and passenger service criteria. The exterior and body features, including grilles and louvers, shall be shaped to facilitate cleaning by automatic bus washers without snagging washer brushes. Water and dirt shall not be retained in or on any body feature to freeze or bleed out onto the bus after leaving the washer. The body and

windows shall be sealed to prevent leaking of air, dust or water under normal operating conditions and during cleaning in automatic bus washers for the service life of the bus.

Exterior panels shall be sufficiently stiff to minimize vibration, drumming or flexing while the bus is in service. When panels are lapped, the upper and forward panels shall act as a watershed. However, if entry of moisture into the interior of the vehicle is prevented by other means, then rear cap panels may be lapped otherwise. The windows, hatches and doors shall be able to be sealed. Accumulation of spray and splash generated by the bus's wheels shall be minimized on windows and mirrors.

TS 60.1 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.

No requirement for protection against graffiti/vandalism for body material surfaces.

TS 60.2 Roof-Mounted Equipment (Transit Coach)

A nonskid, clearly marked walkway or steps shall be incorporated on the roof to provide access to equipment without damaging any system or bus paneling.

TS 61. Pedestrian Safety

Exterior protrusions along the side and front of the bus greater than ½ in. and within 80 in. of the ground shall have a radius no less than the amount of the protrusion. The exterior rearview mirrors, cameras and required lights and reflectors are exempt from the protrusion requirement. Advertising frames shall protrude no more than ⅞ in. from the body surface. Grilles, doors, bumpers and other features on the sides and rear of the bus shall be designed to minimize toeholds or handholds.

Exterior protrusions shall not cause a line-of-sight blockage for the driver.

TS 62. Repair and Replacement

TS 62.1 Side Body Panels (Transit Coach)

Structural elements supporting exterior body panels shall allow side body panels below the windows to be repaired in lengths not greater than 12.5 ft.

Standard attachment of side body panels.

TS 62.2 Side Body Panels (Commuter Coach)

Structural elements supporting exterior body panels shall allow side body panels below the windows to be repaired.

TS 63. Rain Gutters

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

TS 64. License Plate Provisions

Provisions shall be made to mount standard-size U.S./Canada license plates per SAE J686 on the rear of the bus. These provisions shall direct-mount or recess the license plates so that they can be cleaned by automatic bus-washing equipment without being caught by the brushes. The rear license plate provision shall be illuminated per SAE J587.

No front plate or holder provision is required.

TS 64.1 Rub rails

No requirement for rub rails.

TS 65. Fender Skirts

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

TS 66. Wheel Covers (Transit Coach)

Wheel covers not required.

TS 66.1 Splash Aprons

Standard Splash Aprons

Splash aprons, composed of ¼ in. minimum composition or rubberized fabric, shall be installed behind and/or in front of wheels as needed to reduce road splash and to protect underfloor components. The splash aprons shall extend downward to within 6 in. off the road surface at static conditions. Apron widths shall be no less than tire widths. Splash aprons shall be bolted to the bus understructure. Splash aprons and their attachments shall be inherently weaker than the structure to which they are attached. The flexible portions of the splash aprons shall not be included in the road clearance measurements. Splash apron shall be installed as necessary to protect the wheelchair loading device from road splash. Other splash aprons shall be installed where necessary to protect bus equipment.

TS 67. Service Compartments and Access Doors

TS 67.1 Access Doors (Transit Coach)

Access openings shall be sized for easy performance of tasks within the compartment, including tool operating space. Access doors shall be of rugged construction and shall maintain mechanical integrity and function under normal operations throughout the service life of the bus. They shall close flush with the body surface. All doors shall be hinged at the top or on the forward edge and shall be prevented from coming loose or opening during transit service or in bus washing operations. All access doors shall be retained in the open position by props or counterbalancing with overcenter or gas-filled springs with safety props and shall be easily operable by one person. Springs and hinges shall be corrosion resistant. Latch handles shall be flush with, or recessed behind, the body contour and shall be sized to provide an adequate grip for opening. Access doors, when opened, shall not restrict access for servicing other components or systems.

If precluded by design, the manufacturer shall provide door design information specifying how the requirements are met.

TS 67.2 Access Doors (Commuter Coach)

Conventional doors shall be used for the engine compartment area and for all auxiliary equipment compartments, including doors for checking the quantity and adding to the engine coolant, engine lubricant and transmission fluid. Access openings shall be sized for easy performance of tasks within the compartment, including tool operating space. Access doors shall be of rugged construction and shall maintain mechanical integrity and function under normal operations throughout the service life of the bus. They shall close flush with the body surface. All doors shall be hinged at the top or on the forward edge and shall be prevented from coming loose or opening during transit service or in bus washing operations. All access doors shall be retained in the open position. Latch handles shall be flush with, or recessed behind, the body contour and shall be sized to provide an adequate grip for opening. Access doors, when opened, shall not restrict access for servicing other components or systems.

If precluded by design, the manufacturer shall provide door design information specifying how the requirements are met.

TS 67.3 Access Door Latch/Locks

Requirement for Latches on Access Doors

Access doors larger than 100 sq in. in area shall be equipped with corrosion-resistant flush-mounted latches or locks except for coolant and fuel fill access doors. All such access doors that require a tool to open shall be standardized throughout the vehicle and will require a nominal 5/16 in. square male tool to open or lock.

Manufacturer shall provide a quantity of three access door latch/lock tools for each bus ordered.

TS 68. Bumpers

TS 68.1 Location

Bumpers shall provide impact protection for the front and rear of the bus with the top of the bumper being 27 in., ±2 in., above the ground. Bumper height shall be such that when one bus is parked behind another, a portion of the bumper faces will contact each other.

TS 68.2 Front Bumper

No part of the bus, including the bumper, shall be damaged as a result of a 5 mph impact of the bus at curb weight with a fixed, flat barrier perpendicular to the bus's longitudinal centerline. The bumper shall return to its pre-impact shape within 10 minutes of the impact. The bumper shall protect the bus from damage as a result of 6.5 mph impacts at any point by the common carriage with contoured impact surface defined in Figure 2 of FMVSS 301 loaded to 4000 lb parallel to the longitudinal centerline of the bus. It shall protect the bus from damage as a result of 5.5 mph impacts into the corners at a 30 deg angle to the longitudinal centerline of the bus. The energy absorption system of the bumper shall be independent of every power system of the bus and shall not require service or maintenance in normal operation during the service life of the bus. The bumper may increase the overall bus length specified by no more than 7 in.

The bumper shall be the manufacturers standard design and incorporate mounting provisions for an integrated bike rack.

TS 68.3 Rear Bumper

No part of the bus, including the bumper, shall be damaged as a result of a 2 mph impact with a fixed, flat barrier perpendicular to the longitudinal centerline of the bus. The bumper shall return to its pre-impact shape within 10 minutes of the impact. When using a yard tug with a smooth, flat plate bumper 2 ft wide contacting the horizontal centerline of the rear bumper, the bumper shall provide protection at speeds up to 5 mph, over pavement discontinuities up to 1 in. high, and at accelerations up to 2 mph per second. The rear bumper shall protect the bus when impacted anywhere along its width by the common carriage with contoured impact surface defined in Figure 2 of FMVSS 301 loaded to 4000 lb, at 4 mph parallel to or up to a 30 deg angle to the longitudinal centerline of the bus. The rear bumper shall be shaped to prevent unauthorized riders standing on the bumper. The bumper shall not require service or maintenance in normal operation during the service life of the bus. The bumper may increase the overall bus length specified by no more than 7 in.

TS 68.4 Bumper Material

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

TS 69. Finish and Color

TS 69.1 Appearance

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

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

- blisters or bubbles appearing in the topcoat film
- chips, scratches or gouges of the surface finish
- cracks in the paint film
- craters where paint failed to cover due to surface contamination
- overspray
- peeling
- runs or sags from excessive flow and failure to adhere uniformly to the surface
- chemical stains and water spots
- dry patches due to incorrect mixing of paint activators
- buffing swirls

All exterior finished surfaces shall be impervious to diesel fuel, gasoline and commercial cleaning agents. Finished surfaces shall resist damage by controlled applications of commonly used graffiti-removing chemicals.

Proper adhesion between the basic surface and successive coats of the original paint shall be measured using an Elcometer adhesion tester as outlined in ASTM D4541-85. Adhesion shall be a minimum 300 ft-lb. The bus manufacturer shall supply test samples of the exterior surface for each step of the painting process that

may be subject to adhesion testing per ASTM G4541-87 and ASTM D4145-85. ASTM D4541-93 may be used for inspection testing during assembly of the vehicle.

Standard Contractor exterior paint finish quality.

DEFAULT

Base coat/clear coat paint system.

TS 70. Decals, Numbering and Signing

Energy storage and delivery systems shall be identified in accordance with federal, state and local requirements, codes and standards.

Agency-Specified

Monograms, numbers and other special signing shall be applied to the inside and outside of the bus as required. Signs shall be durable and fade-, chip- and peel-resistant. They may be painted signs, decals or pressure-sensitive appliqués. All decals shall be installed per the decal Supplier recommendations. Signs shall be provided in compliance with the ADA requirements defined in 49 CFR Part 38, Subpart B, 38.27.

TS 70.1 Passenger Information

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

Requirements for a public information system in accordance with 49 CFR shall be provided.

TS 71. Exterior Lighting

All exterior lights shall be designed to prevent entry and accumulation of moisture or dust. Lamps, lenses and fixtures shall be interchangeable to the extent practicable. Two hazard lamps at the rear of the bus shall be visible from behind when the engine service doors are opened. Light lenses shall be designed and located to prevent damage when running the vehicle through an automatic bus washer.

Commercially available LED-type lamps shall be used at all exterior lamp locations.

Standard Lamps

All LED lamps shall be standard installation of the OEM. The entire assembly shall be specifically coated to protect the light from chemical and abrasion degradation.

Standard Size

Size of LED lamps used for tail, brake and turn signal lamps shall be standard installation of OEM.

Front marker (clearance) lights along with lights located on the roof and sides of the bus shall have protective shields or be of the flush mount type to protect the lens against minor impacts.

TS 71.1 Backup Light/Alarm

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

TS 71.2 Doorway Lighting

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

TS 71.3 Turn Signals

Standard Turn Signals

Turn-signal lights shall be provided on the front, rear, curb and street sides of the bus in accordance with federal regulations.

TS 71.4 Headlamps

Headlamps shall be designed for ease of replacement.

Standard Installation

Standard OEM headlamp installation shall be provided in accordance with federal regulations.

ALTERNATIVE

Daytime Running Lights

Headlamps shall incorporate a daytime running light feature.

LED

Headlamps shall be LED.

TS 71.5 Brake Lamps

TS 71.5.1 Transit Coach

Brake lamps shall be provided in accordance with federal regulations.

High and Center Mount Red Brake Lamp

Bus shall include red, high and center mount brake lamp(s) along the backside of the bus in addition to the lower brake lamps required under FMVSS. The high and center mount brake lamp(s) shall illuminate steadily with brake application. Agency to specify the size of the high and center mount brake lamp(s).

TS 71.5.2 Commuter Coach

Brake lamps shall be provided in accordance with federal regulations.

Bus shall include red, high and center mount brake lamp(s) along the back side of the bus in addition to the lower brake lamps required under FMVSS. The high and center mount brake lamp(s) shall illuminate steadily with brake application.

TS 71.6 Service Area Lighting (Interior and Exterior)

LED lamps shall be provided in the engine and all other compartments where service may be required to generally illuminate the area for night emergency repairs or adjustments. These service areas shall include, but not be limited to, the engine compartment, the communication box, junction/apparatus panels and passenger door operator compartments. Lighting shall be adequate to light the space of the service areas to levels needed to complete typical emergency repairs and adjustments. The service area lamps shall be suitable for the environment in which they are mounted.

Engine compartment lamps shall be controlled by a switch mounted near the rear start controls or in an approved location. All other service area lamps shall be controlled by switches mounted on or convenient to the lamp assemblies. Power to the service area lighting shall be programmable. Power shall latch on with activation of the switch and shall be automatically discontinued (timed out) after 30 minutes to prevent damage caused by inadvertently leaving the service area lighting switch in the “on” position after repairs are made.

INTERIOR PANELS AND FINISHES

TS 72. General Requirements

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

Interior surfaces more than 10 in. below the lower edge of the side windows or windshield shall be shaped so that objects placed on them fall to the floor when the coach is parked on a level surface. Any components and other electrical components within close proximity to these surfaces shall also be resistant to this cleaning method.

No requirement for anti-graffiti/vandalism surface treatments.

Internal surfaces, as possible, to be stainless steel or other resistant material.

TS 73. Interior Panels

Panels shall be easily replaceable and tamper-resistant. They shall be reinforced, as necessary, to resist vandalism and other rigors of transit bus service. Individual trim panels and parts shall be interchangeable to the extent practicable.

DEFAULT

Interior panel required to meet FMVSS 302.

ALTERNATIVE

Melamine-type material.

TS 73.1 Driver Area Barrier

TS 73.1.1 Transit Coach

A barrier or bulkhead between the driver and the street-side front passenger seat shall be provided. The barrier shall minimize glare and reflections in the windshield directly in front of the barrier from interior lighting during night operation. Location and shape must permit full seat travel and reclining possibilities that can accommodate the shoulders of a 95th-percentile male. The partition shall have a side return and stanchion to prevent passengers from reaching the driver by standing behind the driver's seat. The lower area between the seat and panel must be accessible to the driver. The partition must be strong enough in conjunction with the entire partition assembly for mounting of such equipment as flare kits, fire extinguishers (1.2 kg), microcomputer, public address amplifier, etc. The panel should be properly attached to minimize noise and rattles.

DEFAULT (TRANSIT COACH)

Wheel-Well-to-Ceiling Configuration of Driver's Barrier

The driver's barrier shall extend from the top of the wheel well to the ceiling the level of the seated driver and shall fit close to the bus-side windows and wall to prevent passengers from reaching the driver or the driver's personal effects.

ALTERNATIVE

Driver enclosure or door.

TS 73.1.2 Commuter Coach

A barrier or bulkhead between the driver and the street-side front passenger seat shall be provided. The barrier shall minimize glare and reflections in the windshield directly in front of the barrier from interior lighting during night operation. Location and shape must permit full seat travel and reclining possibilities that can accommodate the shoulders of a 95th-percentile male. The partition shall have a side return and stanchion to prevent passengers from reaching the driver by standing behind the driver's seat. The lower area between the seat and panel must be accessible to the driver. The partition must be strong enough in conjunction with the entire partition assembly for mounting of such equipment as flare kits, fire extinguishers (1.2 kg), microcomputer, public address amplifier, etc. The panel should be properly attached to minimize noise and rattles.

The driver's barrier shall extend from the floor area to the ceiling and from the bus wall to the first stanchion immediately behind the driver to provide security to the driver and to limit passenger conversation.

TS 73.2 Modesty Panels

Sturdy divider panels constructed of durable, unpainted, corrosion-resistant material complementing the interior shall be provided to act as both a physical and visual barrier for seated passengers.

Design and installation of modesty panels located in front of forward-facing seats shall include a handhold or grab handle along their top edge. These dividers shall be mounted on the sidewall and shall project toward the aisle no farther than passenger knee projection in longitudinal seats or the aisle side of the transverse seats. Modesty panels shall extend from at least the window opening of the side windows, and those forward of

transverse seats shall extend downward to 1 and 1½ in. above the floor. Panels forward of longitudinal seats shall extend to below the level of the seat cushion. Dividers positioned at the doorways, where applicable, shall provide no less than a 2½ in. clearance between the modesty panel and a fully open, inward opening door, or the path of a deploying flip-out ramp to protect passengers from being pinched. Modesty panels installed at doorways shall be equipped with grab rails if passenger assists are not provided by other means.

The modesty panel and its mounting shall withstand a static force of 250 lb applied to a 4 × 4 in. area in the center of the panel without permanent visible deformation.

TS 73.3 Front End

The entire front end of the bus shall be sealed to prevent debris accumulation behind the dash and to prevent the driver's feet from kicking or fouling wiring and other equipment. The front end shall be free of protrusions that are hazardous to passengers standing at the front of the standee line area of the bus during rapid decelerations. Paneling across the front of the bus and any trim around the driver's compartment shall be formed metal or composite material. Composite dash panels shall be reinforced as necessary, vandal-resistant and replaceable. All colored, painted and plated parts forward of the driver's barrier shall be finished with a surface that reduces glare. Any mounted equipment must have provision to support the weight of equipment.

TS 73.4 Rear Bulkhead

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

The rear bulkhead paneling shall be contoured to fit the ceiling, sidewalls and seat backs so that any litter or trash will tend to fall to the floor or seating surface when the bus is on a level surface. Any air vents in this area shall be louvered to reduce airflow noise and to reduce the probability of trash or liter being thrown or drawn through the grille. If it is necessary to remove the panel to service components located on the rear bulkhead, then the panel shall be hinged or shall be able to be easily removed and replaced. Grilles where access to or adjustment of equipment is required shall be heavy duty and designed to minimize damage and limit unauthorized access.

TS 73.5 Headlining

Ceiling panels shall be made of durable, corrosion resistant, easily cleanable material. Headlining shall be supported to prevent buckling, drumming or flexing and shall be secured without loose edges. Headlining materials shall be treated or insulated to prevent marks due to condensation where panels are in contact with metal members. Moldings and trim strips, as required to make the edges tamperproof, shall be stainless steel, aluminum or plastic, colored to complement the ceiling material. Headlining panels covering operational equipment that is mounted above the ceiling shall be on hinges for ease of service but retained to prevent inadvertent opening.

TS 73.6 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 73.7 Insulation

Any insulation material used between the inner and outer panels shall minimize the entry and/or retention of moisture. Insulation properties shall be unimpaired during the service life of the bus. Any insulation material used inside the engine compartment shall not absorb or retain oils or water and shall be designed to prevent casual damage that may occur during maintenance operations.

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

FMVSS 302

Insulation shall meet the requirements of FMVSS 302.

TS 73.8 Floor Covering

The floor covering shall have a nonskid walking surface that remains effective in all weather conditions. The floor covering, as well as transitions of flooring material to the main floor and to the entrance and exit area, shall be smooth and present no tripping hazards. Seams shall be sealed/welded per manufacturer's specifications. The color and pattern shall be consistent throughout the floor covering. The standee line shall be approximately 2 in. wide and shall extend across the bus aisle and contrast with the rest of the floor covering.

Any areas on the floor that are not intended for standees, such as areas "swept" during passenger door operation, shall be clearly and permanently marked.

The floor shall be easily cleaned and shall be arranged to minimize debris accumulation.

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

The floor under the seats shall be covered with smooth surface flooring material. The floor covering shall closely fit the sidewall in a fully sealed butt joint or extend to the top of the cove.

TS 73.9 Interior Lighting

The light source shall be located to minimize windshield glare, with distribution of the light focused primarily on the passengers' reading plane while casting sufficient light onto the advertising display. The lighting system may be designed to form part of or the entire air distribution duct.

The lens material shall be translucent polycarbonate. Lenses shall be designed to effectively "mask" the light source. Lenses shall be sealed to inhibit incursion of dust and insects yet be easily removable for service. Access panels shall be provided to allow servicing of components located behind light panels. If necessary, the entire light fixture shall be hinged.

TS 73.10 Passenger Area Lighting

First Row Lights

The first light on each side (behind the driver and the front door) is normally turned on only when the front door is opened, in “night run” and “night park.” As soon as the door closes, these lights shall go out. These lights shall be turned on at any time if the switch is in the “on” position.

Dimming Second Row Lights

To help eliminate windshield reflection on suburban roads where street lighting is at a low level, the second light on each side, when “night run” or “night park” is selected, shall be controlled by the switch; off in “off” and on in “normal.” These lights shall be turned on at any time if the switch is in the “on” position.

All interior lighting shall be turned off whenever the vehicle is in reverse and the run switch is in the “on” position.

The interior lighting design shall require the approval of the Agency.

LED lights.

First Light Modules Dim/Extinguish When Front Door Is Closed

When the master switch is in the “run” or “night/run” mode, the first light module on each side of the coach shall automatically extinguish or dim when the front door is in the closed position and illuminate when the door is opened.

TS 73.11 Driver’s Area Lighting

The driver’s area shall have a light to provide general illumination, and it shall illuminate the half of the steering wheel nearest the driver to a level of 5 to 10 fc.

TS 73.12 Seating Area Lighting (Transit Coach)

The interior lighting system shall provide a minimum 15 fc illumination on a 1 sq ft plane at an angle of 45 deg from horizontal, centered 33 in. above the floor and 24 in. in front of the seat back at each seat position. Allowable average light level for the rear bench seats shall be 7 fc.

TS 73.13 Seating Area Lighting (Commuter Coach)

A minimum 10-module parcel rack without dividers and compartment doors shall be furnished over all two-passenger seating positions except in the wheelchair door area. Retention cords shall run the length of the rack housing. The parcel rack edge, running along the full length of the aisle, shall incorporate a handhold for use by standees. Passenger headroom, measured from the rack end to the top of the seat headrest, shall be a minimum 17 in. (432 mm). Interior window post caps shall be ABS, thermo-formed plastic, off-white in color to provide a clean, finished appearance. The interior of the rack shall be vinyl covered aluminum to complement the interior. Parcel racks shall be supported by polycarbonate glass filled hangers spaced approximately 40 in. (1016 mm) apart. Total capacity shall be a minimum 109 cu ft (3 m^3) to allow for ample storage space for carry-on items.

Passenger service modules mounted on the underside of the parcel rack shall include individually controlled and adjustable LED passenger reading lights; an exit signal push button, red in color; and individual air distribution outlets. These outlets shall be adjustable from fully closed to fully open position. A minimum of

26 speakers shall also be provided in the cluster panels for the driver-controlled public address system. Speakers shall broadcast, in a clear tone, announcements that are clearly perceived from all seat positions at approximately the same volume level. Passengers using the securement systems shall be provided identical amenities as provided for all other passengers, except that the parcel rack shall be deleted in the area of the wheelchair lift door. Separate and independent notification will be provided on the dashboard indicator panel for stop request notification from securement positions.

TS 73.14 Vestibules/Doors Lighting (Transit Coach)

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

TS 73.15 Vestibules/Doors Lighting (Commuter Coach)

Floor surface in the aisles shall be a minimum of 2 fc, and the vestibule area in accordance with ADA requirements.

TS 73.16 Step Lighting

Step lighting for the intermediate steps between lower and upper floor levels shall be a minimum of 4 fc and shall illuminate in all vehicle run positions. The step lighting shall be low profile to minimize tripping and snagging hazards for passengers and shall be shielded as necessary to protect passengers’ eyes from glare.

TS 73.17 Ramp Lighting (Transit Coach)

Exterior and interior ramp lighting shall comply with federal regulations.

TS 73.18 Turntable Lighting (Articulated Coach)

Lighting in the turntable can be reduced to 7 fc.

TS 73.19 Farebox/Card Reader Lighting

TS 73.19.1 Transit Coach

Farebox Light

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

Card Reader Light

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

ALTERNATIVE (TRANSIT COACH)

Provide a farebox and card reader light.

TS 73.19.2 Commuter Coach

Farebox Light

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

TS 74. Fare Collection

Space and structural provisions shall be made for installation of currently available fare collection devices, which shall be as far forward as practicable. Location of the fare collection device shall not restrict traffic in the vestibule, including wheelchairs if a front door loading device is used, and shall allow the driver to easily reach the farebox controls and to view the fare register. The farebox shall not restrict access to the driver’s area, shall not restrict operation of driver controls, and shall not—either by itself or in combination with stanchions, transfer mounting, cutting and punching equipment, or route destination signs—restrict the driver’s field of view per SAE J1050. The location and mounting of the fare collection device shall allow use, without restriction, by passengers. The farebox location shall permit accessibility to the vault for easy manual removal or attachment of suction devices. Meters and counters on the farebox shall be readable on a daily basis. The floor under the farebox shall be reinforced as necessary to provide a sturdy mounting platform and to prevent shaking of the farebox.

Contractor shall provide fare collection installation layout to the Agency for approval.

Transfer mounting, cutting and punching equipment shall be located in a position convenient to the driver.

Agency will install its own farebox/card reader.

TS 75. Interior Access Panels and Doors (Transit Coach)

Access for maintenance and replacement of equipment shall be provided by panels and doors that appear to be an integral part of the interior. Access doors shall be hinged with gas props or overcenter springs, where practical, to hold the doors out of the mechanic’s way. Panels shall prevent entry of mechanism lubricant into the bus interior. All fasteners that retain access panels shall be captive in the cover.

Access Doors with Locks

Access doors shall be secured with locks. The locks shall be standardized so that only one tool is required to open access doors on the bus.

TS 75.1 Floor Panels

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

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

PASSENGER ACCOMMODATIONS

TS 76. Passenger Seating

TS 76.1 Arrangements and Seat Style (Transit Coach)

The passenger seating arrangement in the bus shall be such that seating capacity is maximized and in compliance to the following requirements.

Forward-Facing Seat Configuration

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

TS 76.2 Rearward Facing Seats (Transit Coach)

Rearward facing seats not allowed.

TS 76.3 Turntable Seating (Articulated Coach)

Seats.

TS 76.4 Padded Inserts/Cushioned Seats (Transit Coach)

DEFAULT

Non-Padded Inserts, Unupholstered

The passenger seats shall be equipped with un-upholstered inserts throughout the bus.

TS 76.5 Seat Back Fitness

Back Insert Seat Configuration

The seat back insert thickness shall not exceed 1 in. in the knee room area.

TS 76.6 Drain Hole in Seats

Requirement for Drain Hole Provision in Seat Inserts

Provision, such as a small grommeted hole, to allow drainage shall be incorporated into seat insert. (Drain through hole, ¼ in. through hole, bottom seat only, one per seat.)

TS 76.7 Arrangements and Seat Style (Commuter Coach)

DEFAULT

Forward-Facing Seat Configuration

Passenger seats shall be arranged in forward-facing configuration with a minimum of 55 reclining and cushioned passenger seats. Contractor to provide seat layout to the Agency once the Agency has provided the seat manufacturer and model number.

TS 76.8 Hip-to-Knee Room

Hip-to-knee room measured from the center of the seating position, from the front of one seat back horizontally across the highest part of the seat to a vertical surface immediately in front, shall be a minimum of 26 in. At all seating positions in paired transverse seats immediately behind other seating positions, hip-to-knee room shall be no less than 27 in.

TS 76.9 Foot Room

Foot room, measured at the floor forward from a point vertically below the front of the seat cushion, shall be no less than 14 in. Seats immediately behind the wheel housings and modesty panels may have foot room reduced (Agency will approve acceptable dimensions).

TS 76.10 Aisles (Transit Coach)

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).

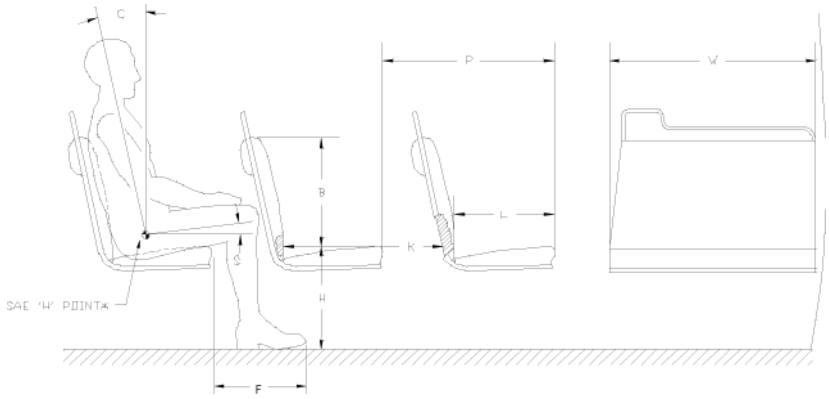
TS 76.11 Aisles (Commuter Coach)

The aisle between the seats shall be no less than 14 in. wide at seated passenger hip height.

TS 76.12 Dimensions (Transit Coach)

FIGURE 6

Seating Dimensions and Standard Configuration



Seat dimensions for the various seating arrangements shall have the dimensions as follows (refer to **Figure 6**):

- The width, W, of the two-passenger transverse seat shall be a minimum 35 in.
- The length, L, shall be 17 in., ±1 in.
- The seat back height, B, shall be a minimum of 15 in.
- The seat height, H, shall be 17 in., ±1 in. For the rear lounge (or settee) and longitudinal seats, and seats located above raised areas for storage of underfloor components, a cushion height of up to 18 in., ±2 in., will be allowed. This shall also be allowed for limited transverse seats, but only with the express approval of the Agency.
- Foot room = F.
- The seat cushion slope, S, shall be between 5 and 11 deg.
- The seat back slope, C, shall be between 8 and 17 deg.
- Hip to knee room = K.
- The pitch, P, is shown as reference only.

TS 76.13 Structure and Design (Transit Coach)

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

Seats, structures and restraints around the securement area should not infringe into the mobility device envelope or maneuverability.

The transverse seat structure shall be fully cantilevered from the sidewall with sufficient strength for the intended service. The lowest part of the seat assembly that is within 12 in. of the aisle shall be at least 10 in. above the floor.

In locations at which cantilevered installation is precluded by design and/or structure, other seat mounting may be allowed.

All transverse objects—including seat backs, modesty panels and longitudinal seats—in front of forward-facing seats shall not impart a compressive load in excess of 1000 lb onto the femur of passengers ranging in size from a 5th-percentile female to a 95th-percentile male during a 10g deceleration of the bus. This deceleration shall peak at 0.05 to 0.015 seconds from initiation. Permanent deformation of the seat resulting from two 95th-percentile males striking the seat back during this 10g deceleration shall not exceed 2 in., measured at the aisle side of the seat frame at height H. The seat back should not deflect more than 14 in., measured at the top of the seat back, in a controlled manner to minimize passenger injury. Structural failure of any part of the seat or sidewall shall not introduce a laceration hazard.

The seat assembly shall withstand static vertical forces of 500 lb applied to the top of the seat cushion in each seating position with less than ¼ in. permanent deformation in the seat or its mountings. The seat assembly shall withstand static horizontal forces of 500 lb evenly distributed along the top of the seat back with less than ¼ in. permanent deformation in the seat or its mountings. The seat backs at the aisle position and at the window position shall withstand repeated impacts of two 40 lb sandbags without visible deterioration. One sandbag shall strike the front 40,000 times and the other sandbag shall strike the rear 40,000 times. Each sandbag shall be suspended on a 36 in. pendulum and shall strike the seat back 10,000 times each from distances of 6, 8, 10 and 12 in. Seats at both seating positions shall withstand 4000 vertical drops of a 40 lb sandbag without visible deterioration. The sandbag shall be dropped 1000 times each from heights of 6, 8, 10 and 12 in. Seat cushions shall withstand 100,000 randomly positioned 3½ in. drops of a squirming, 150 lb, smooth-surfaced, buttocks-shaped striker with only minimal wear on the seat covering and no failures to seat structure or cushion suspension components.

The back of each transverse seat shall incorporate a handhold no less than ⅞ in. in diameter for standees and seat access/egress. The handhold shall not be a safety hazard during severe decelerations. The handhold shall extend above the seat back near the aisle so that standees shall have a convenient vertical assist, no less than 4 in. long, that may be grasped with the full hand. This handhold shall not cause a standee using this assist to interfere with a seated 50th-percentile male passenger. The handhold shall also be usable by a 5th-percentile female, as well as by larger passengers, to assist with seat access/egress for either transverse seating position. The upper rear portion of the seat back and the seat back handhold immediately forward of transverse seats shall be padded and/or constructed of energy-absorbing materials. During a 10g deceleration of the bus, the HIC number (as defined by SAE J211a) shall not exceed 400 for passengers ranging in size from a 5th percentile female through a 95th percentile male.

The seat back handhold may be deleted from seats that do not have another transverse seat directly behind and where a vertical assist is provided.

Longitudinal seats shall be the same general design as transverse seats but without seat back handholds. Longitudinal seats may be mounted on the wheelhouses. Armrests shall be included on the ends of each set of longitudinal seats except on the forward end of a seat set that is immediately to the rear of a transverse seat, the driver's barrier or a modesty panel, when these fixtures perform the function of restraining passengers from sliding forward off the seat. Armrests are not required on longitudinal seats located in the wheelchair parking area that fold up when the armrest on the adjacent fixed longitudinal seat is within 3½ in. of the end of the seat cushion. Armrests shall be located from 7 to 9 in. above the seat cushion surface. The area between the armrest and the seat cushion shall be closed by a barrier or panel. The top and sides of the armrests shall have a minimum width of 1 in. and shall be free from sharp protrusions that form a safety hazard.

Seat back handhold and armrests shall withstand static horizontal and vertical forces of 250 lb applied anywhere along their length with less than ¼ in. permanent deformation. Seat back handhold and armrests shall withstand 25,000 impacts in each direction of a horizontal force of 125 lb with less than ¼ in. permanent deformation and without visible deterioration.

TS 76.14 Structure and Design (Commuter Coach)

Passenger seats shall be arranged in a transverse, forward-facing configuration.

No more than 10 seated positions shall be lost on any bus configuration to accommodate two wheelchair passengers occupying the securement positions.

Each transverse, forward-facing seat, except the rear seats, shall accommodate two adult passengers. Floor seat tracks shall be stainless steel and shall be welded to the coach frame and be nearly flush with the finished floor. The wall tracks shall be stainless steel or aluminum and shall be bolted or riveted to the sidewall.

Seats shall be commuter coach reclining seats. Seat frames shall be constructed of high-strength, fatigue-resistant, welded steel with a durable powder-coated, corrosion-resistant colored finish that complements the coach interior. The seat frame shall be wall mounted with heavy gauge steel brackets and shall be attached to the coach floor with a heavy duty stainless steel T pedestal. The seat back shall recline a minimum of 1 in. to a maximum of 5 in. (127 mm) maximum with an infinite number of stops. The reclining seat backs shall be provided with a dress-up feature to facilitate coach cleaning. Seat width shall be a minimum of 36 in. and a maximum of 40.50 in. (1029 mm). Aisle shall not be less than 14 in. (356 mm) wide.

TS 76.15 Construction and Materials (Transit Coach)

Selected materials shall minimize damage from vandalism and shall reduce cleaning time. The seats shall be attached to the frame with tamper-resistant fasteners. Coloring shall be consistent throughout the seat

material, with no visually exposed portion painted. Any exposed metal touching the sides or the floor of the bus shall be stainless steel. The seat, pads and cushions shall be contoured for individuality, lateral support and maximum comfort and shall fit the framework to reduce exposed edges.

The minimum radius of any part of the seat back, handhold or modesty panel in the head or chest impact zone shall be a nominal ¼ in. The seat back and seat back handhold immediately forward of transverse seats shall be constructed of energy-absorbing materials to provide passenger protection and, in a severe crash, to allow the passenger to deform the seating materials in the impact areas. Complete seat assemblies shall be interchangeable to the extent practicable.

TS 76.16 Construction and Materials (Commuter Coach)

Seat cushions shall be supported by steel serpentine springs. Seat covering shall be high-quality wool fabric or vinyl. Wool fabric shall be tested to a minimum of 60,000 rubs per the Wyzendeek test method.

Seat foam padding shall be polyurethane. Seat upholstery shall be able to be removed with ease for cleaning/replacement purposes.

Agency to select seat fabric.

TS 77. Passenger Assists (Transit Coach)

Passenger assists in the form of full grip, vertical stanchions or handholds shall be provided for the safety of standees and for ingress/egress. Passenger assists shall be convenient in location, shape and size for both the 5th-percentile female standee and the 95th-percentile male standee. Starting from the entrance door and moving anywhere in the bus and out the exit door, a vertical assist shall be provided either as the vertical portion of the seat back assist or as a separate item so that a 5th-percentile female passenger may easily move from one assist to another using one hand and then the other without losing support. All handholds and stanchions at the front doorway, around the farebox, and at interior steps for bi-level designs shall be powder-coated in a high-contrast yellow color.

The forward-most vertical stanchions on either side of the aisle immediately behind the driver's area shall be a stainless steel finish.

TS 77.1 Assists (Transit Coach)

Excluding those mounted on the seats and doors, the assists shall have a cross-sectional diameter between 1¼ and 1½ in. or shall provide an equivalent gripping surface with no corner radii less than ¼ in. All passenger assists shall permit a full hand grip with no less than 1½ in. of knuckle clearance around the assist. Passenger assists shall be designed to minimize catching or snagging of clothes or personal items and shall be capable of passing the NHTSA Drawstring Test.

Any joints in the assist structure shall be underneath supporting brackets and securely clamped to prevent passengers from moving or twisting the assists. Seat handholds may be of the same construction and finish as the seat frame. Door-mounted passenger assists shall be of anodized aluminum, stainless steel or powder-coated metal. Connecting tees and angles may be powder-coated metal castings. Assists shall withstand a force of 300 lb applied over a 12 in. lineal dimension in any direction normal to the assist without permanent visible deformation. All passenger assist components, including brackets, clamps, screw heads and other

fasteners used on the passenger assists, shall be designed to eliminate pinching, snagging and cutting hazards and shall be free from burrs or rough edges.

TS 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, the vertical assist and the assists on the wheel housing or on the front modesty panel.

TS 77.3 Vestibule (Transit Coach)

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

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

TS 77.4 Rear Doorway(s) (Transit Coach)

Vertical assists that are functionally continuous with the overhead assist shall be provided at the aisle side of the transverse seat immediately forward of the rear door and on the aisle side of the rear door modesty panel(s). Passenger assists shall be provided on modesty panels that are functionally continuous with the rear door assists. Rear doors, or the exit area, shall be fitted with assists having a cross-sectional diameter between 1¼ and 1½ in. or providing an equivalent gripping surface with no corner radii less than ¼ in., and shall provide at least 1½ in. of knuckle clearance between the assists and their mounting. The assists shall be designed to permit a 5th-percentile female to easily move from one assist to another during the entire exiting process. The assists shall be located no farther inboard than 6 in. from the outside edge of the rear doorway step.

TS 77.5 Overhead (Transit Coach)

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

ALTERNATIVE

Grab straps or other extensions as necessary shall be provided for sections where vertical assists are not available and for use by passengers who cannot reach to 70 in.

ALTERNATIVE

Grab straps shall be fabric.

Overhead assists shall simultaneously support 150 lb on any 12 in. length. No more than 5 percent of the full grip feature shall be lost due to assist supports.

TS 77.6 Longitudinal Seat Assists (Transit Coach)

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

TS 77.7 Wheel Housing Barriers/Assists (Transit Coach)

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

TS 78. Passenger Doors

TS 78.1 Transit Coach

Doorways will be provided in locations and styles as follows. Passenger doors and doorways shall comply with ADA requirements.

TS 78.1.1 Front door

Door shall be forward of the front wheels and under direct observation of the driver.

TS 78.1.2 Rear Door(s)

Curbside doorway centerline located rearward of the point midway between the front door centerline and the rearmost seat back.

ALTERNATIVE (ARTICULATED BUS)

Curbside located forward of the rear axle of the trailer section.

ALTERNATIVE (ARTICULATED BUS)

Curbside, located forward of the center axle.

In cases where street-side and curbside doors are chosen, provisions shall be made for operating the front door, curbside rear door(s) and street-side rear door(s) independently or in the combinations shown in **Table 7** while providing positive tactile feedback to the operator identifying the door control selection.

TABLE 7
Door Operating Combinations

Front	Curbside Rear	Street-Side Rear
Closed	Closed	Closed
Open	Closed	Closed
Open	Open	Closed
Open	Closed	Open
Open	Open	Open
Closed	Open	Closed
Closed	Closed	Open
Closed	Open	Open

DEFAULT
If air-powered, the door system shall operate per specification at air pressures between 90 and 130 psi.

ALTERNATIVE
Electric-powered doors.

TS 78.2 Commuter Coach

TS 78.2.1 Front door

Forward of the front wheels and under direct observation of the driver.

TS 78.3 Materials and Construction

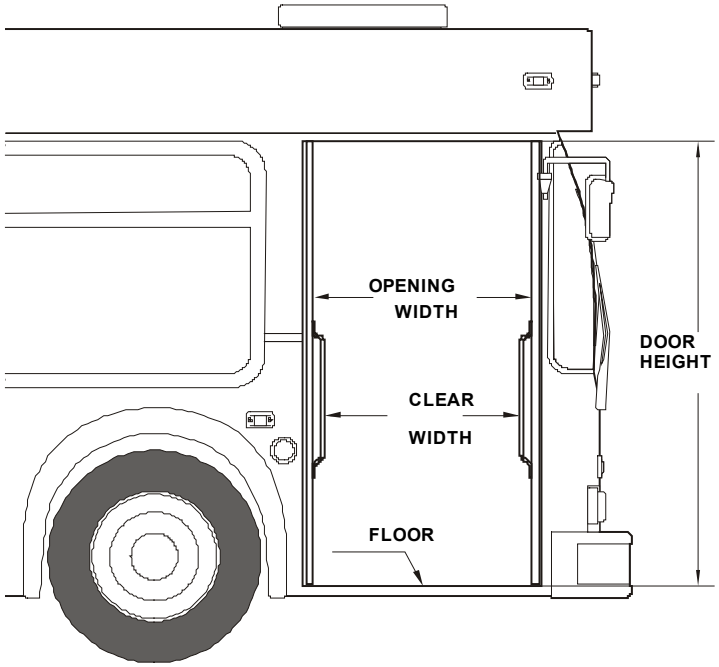
Structure of the doors, their attachments, inside and outside trim panels and any mechanism exposed to the elements shall be corrosion resistant. Door panel construction shall be of corrosion-resistant metal or reinforced non-metallic composite materials. When fully opened, the doors shall provide a firm support and shall not be damaged if used as an assist by passengers during ingress or egress. Door edges shall be sealed to prevent infiltration of exterior moisture, noise, dirt and air elements from entering the passenger compartment, to the maximum extent possible based on door types.

The closing edge of each door panel shall have no less than 2 in. of soft weather stripping. The doors, when closed, shall be effectively sealed, and the hard surfaces of the doors shall be at least 4 in. apart (not applicable to single doors). The combined weather seal and window glazing elements of the front door shall not exceed 10 deg of binocular obstruction of the driver's view through the closed door.

TS 78.4 Dimensions

TS 78.4.1 Transit Coach

FIGURE 7
Transit Bus Minimum Door Opening



When open, the doors shall leave an opening no less than 75 in. in height.

31¾ in. Minimum Doorway Clear Width

Front door clear width shall be a minimum of 31¾ in. with the doors fully opened. Rear door opening clear width shall be a minimum of 24 in. with the doors fully opened. If arear door ramp or lift is provided, then the clear door opening width shall be a minimum of 31¾ in. with door fully opened.

TS 78.4.2 Commuter Coach

Minimum doorway width per ADA requirements.

TS 78.5 Door Glazing

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

Door glazing shall be easily replaceable.

The front door panel glazing material shall have a nominal ¼ in. thick tempered glass conforming with the requirements of ANSI Z26.1 Test Grouping 2 and the recommended practices defined in SAE J673.

Glazing material in the rear doorway door panels shall be defined by the Agency.

TS 78.6 Door Projection (Transit Coach)

TS 78.6.1 Exterior

The exterior projection of the front doors beyond the side of the bus shall be minimized and shall not block the line of sight of the rear exit door via the curbside mirror when the doors are fully open. The exterior projection of both doors shall be minimized and shall not exceed 14 in. during the opening or closing cycles or when doors are fully opened.

TS 78.6.2 Interior

Projection inside the bus shall not cause an obstruction of the rear door mirror or cause a hazard for standees.

TS 78.7 Door Height Above Pavement

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

TS 78.8 Closing Force

Closing door edge speed shall not exceed 12 in. per second, and opening door speed shall not exceed 19 in. per second. Power doors shall not slam closed under any circumstance, even if the door is obstructed during the closing cycle. If a door is obstructed during the closing cycle, the pressure exerted on the obstruction shall not increase once initial contact has been made.

Doors closed by a return spring or counterweight-type device shall be equipped with an obstruction-sensing device that, at a minimum, alerts the driver if an obstruction is detected between the closing doors. Doors closed by a return spring or counterweight type device, when unlocked, shall be capable of being pushed to the point where the door starts to open with a force not to exceed 25 lb applied to the center edge of the forward door panel.

Whether or not the obstruction-sensing system is present or functional, it shall be possible to withdraw a 1½ in. diameter cylinder from between the center edges of a closed and locked door with an outward force not greater than 35 lb.

TS 78.8.1 Rear Door Closing Force (Transit Coach)

Power-close rear doors shall be equipped with an obstruction-sensing system such that if an obstruction is within the path of the closing doors, the doors will stop and/or reverse direction prior to imparting a 10 lb force on 1 sq in. of that obstruction. If a contactless obstruction sensing system is employed, then it shall be capable of discriminating between the normal doorway environment and passengers or other obstructions within the doorway, and of altering the zones of detection based upon the operating state of the door system.

TS 78.9 Actuators

Doors shall open or close completely in not more than 3.5 seconds from the time of control actuation and shall be subject to the closing force requirements.

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

Door actuators and associated linkages shall maximize door holding forces in the fully open and fully closed positions to provide firm, non-rattling, non-fluttering door panels while minimizing the force exerted by the doors on an obstruction midway between the fully open and closed positions.

The rear door actuator(s) shall be under the complete control of the vehicle operator and shall open and close in response to the position of the driver's door control.

The rear doors shall be passenger-controlled. The vehicle operator shall unlock and enable the opening mechanism, which shall be annunciated by illumination of a green light near the door. After enabling and unlocking, the doors shall be opened by either the passenger manually pushing the door open, or by a powered mechanism actuated by passenger activation of a touch bar or touch switch, or by passenger activation of a contactless sensing system. A switch located within reach of the seated operator shall, when actuated, restore rear door function to complete operator control, as described in the Default.

Doors that employ a "swing" or pantograph geometry and/or are closed by a return spring or counterweight-type device shall be equipped with a positive mechanical holding device that automatically engages and prevents the actuation mechanism from being back-driven from the fully closed position. The holding device shall be overcome only when the driver's door control is moved to an "Exit Door Enable" position and the vehicle is moving at a speed of less than 2 mph, or in the event of actuation of the emergency door release.

Locked doors shall require a force of more than 300 lb to open manually. When the locked doors are manually forced to open, damage shall be limited to the bending of minor door linkage with no resulting damage to the doors, actuators or complex mechanism.

TS 78.9.1 Actuator (Commuter Coach)

The nominal door opening and closing speed shall be in the 3 to 5 second range. The maximum door opening and closing speeds will be regulated using fixed, maintenance-free orifices and airline sizes. If required, door speeds can be decreased with the addition of a flow-restricting device. Actuators and the complete door mechanism shall be concealed from passengers but shall be easily accessible for servicing.

TS 78.9.2 Rear Door Interlocks (Transit Coach)

See TS 41.1, "Hardware Mounting," for door system interlock requirements.

TS 78.10 Emergency Operation

In the event of an emergency, it shall be possible to manually open doors designated as emergency exits from inside the bus using a force of no more than 25 lb after actuating an unlocking device. The unlocking device shall be clearly marked as an emergency-only device and shall require two distinct actions to actuate. The respective door emergency unlocking device shall be accessible from the doorway area. The unlocking device shall be easily reset by the operator without special tools or opening the door mechanism enclosure. Doors that are required to be classified as "emergency exits" shall meet the requirements of FMVSS 217.

TS 78.11 Door Control

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

DEFAULT

Door control located on street side.

The front door shall remain in commanded state position even if power is removed or lost.

TS 78.12 Door Controller

TS 78.12.1 Transit Coach

Five-Position Driver's Door Controller

The control device shall be protected from moisture. Mounting and location of the door control device handle shall be designed so that it is within comfortable, easy arm's reach of the seated driver. The door control device handle shall be free from interference by other equipment and have adequate clearance so as not to create a pinching hazard.

Position of the door control handle shall result in the following operation of the front and rear doors:

- **Center position:** Front door closed, rear door(s) closed or set to lock.
- **First position forward:** Front door open, rear door(s) closed or set to lock.
- **Second position forward:** Front door open, rear door(s) open or set to open.
- **First position back:** Front door closed, rear door(s) open or set to open.
- **Second position back:** Front door open, rear door(s) open or set to open.

TS 78.12.2 Commuter Coach

Doors shall be operated by push-button controls, conveniently located and operable within the driver's reach. The push buttons shall be labeled.

TS 78.13 Door Open/Close

Operator-Controlled Front and Passenger-Controlled Rear Doors with Provision for Driver Override

Operation of, and power to, the front passenger doors shall be completely controlled by the operator. Power to rear doors shall be controlled by the operator. After enabling, the rear doors shall be opened by the passenger. A switch shall be provided to enable the driver to obtain full control of the rear doors.

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.

TS 79. Accessibility Provisions

Space and body structural provisions shall be provided at the front or rear door of the bus to accommodate a wheelchair loading system.

TS 79.1 Loading Systems

There are three options:

- high-floor lift
- low-floor ramp
- platform (boarding bridge plate) level boarding

TS 79.2 Lift/ramp

The wheelchair lift control system must be capable of receiving multiplex commands from vehicle interlocks.

An automatically controlled, power-operated wheelchair lift system compliant to requirements defined in 49 CFR 571.403 (FMVSS 403) shall provide ingress and egress quickly, safely and comfortably, both in forward and rearward directions, for a passenger in a wheelchair from a level street or curb.

DEFAULT

Wheelchair lift mounted in front step well.

Folding Ramp

When the system is not in use, the passageway shall appear normal. In the stored position of the ramp, no tripping hazards shall be present, and any resulting gaps shall be minimized. The controls shall be simple to operate with no complex phasing operations required, and the loading system operation shall be under the surveillance and complete control of the driver. If the loading system and controls are at the rear doors, then a keyed switch shall be provided in the driver's area to disable the loading system. The bus shall be prevented from moving during the loading or unloading cycle by a throttle and brake interlock system. The loading system shall be inhibited from stowing/deploying when a passenger is on the ramp/platform. A passenger departing or boarding via the ramp shall be able to easily obtain support by grasping the passenger assist located on the doors or other assists provided for this purpose. The platform shall be designed to protect the ramp from damage and people on the sidewalk from injury during the extension/retraction or lowering/raising phases of operation.

The loading platform shall be covered with a replaceable or renewable nonskid material and shall be fitted with devices to prevent the wheelchair from rolling off the sides during loading or unloading.

Deployment or storage of the ramp shall require no more than 15 seconds. The device shall function without failure or adjustment for 500 cycles or 5000 miles in all weather conditions on the design operating profile when activated once during the idle phase. A manual override system shall permit unloading a wheelchair and storing the device in the event of a primary power failure. The manual operation of the ramp shall not require more than 35 lb of force.

TS 79.3 Loading System for 30 to 60 ft Low-Floor Bus

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

DEFAULT

Front Door Location of Loading System, Flip-Out Design Ramp with 6:1 Slope

The wheelchair loading system shall be located at the front door, with the ramp being of a simple hinged, flip-out type design being capable of deploying to the ground at a maximum 6:1 slope.

TS 79.4 Loading System for Level Boarding on a 45 to 60 ft Low-Floor BRT

For level-entry boarding in applications such as BRT, where the vertical transition from the vehicle floor and the boarding and alighting surface is no more than 3 in., a bridge plate shall be used. Bridge plates 30 in. or longer shall support a load of 600 lb, placed at the centroid of the ramp or bridge plate distributed over an area

of 26 × 26 in., with a safety factor of at least 3, based on the ultimate strength of the material. Bridge plates shorter than 30 in. shall support a load of 300 lb. When deployed to boarding and alighting surface, the slope of the bridge plate shall not exceed 6:1.

DEFAULT

Front Door Location of Bridge Plate Loading System

The bridge plate loading system shall be located at the front door.

ALTERNATIVE

Rear Door Location of Bridge Plate Loading System

The bridge plate loading system shall be located at the rear/center door.

TS 79.5 Wheelchair Accommodations

All passenger securement devices must be stowed off the floor and out of the way when not in use.

DEFAULT

Two Forward-Facing Wheelchair Securement Locations

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

TS 79.6 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. As a guide, no width dimension should be less than 34 in. Areas requiring 90 deg turns of wheelchairs should have a clearance arc dimension no less than 45 in., and in the parking area where 180 deg turns are expected, space should be clear in a full 60 in. diameter circle. A vertical clearance of 12 in. above the floor surface should be provided on the outside of turning areas for wheelchair footrests.

TS 80. Wheelchair Lifts (Commuter Coach)

TS 80.1 Lift

A travel lift and two forward-facing mobility device securement areas shall be provided. The lift assembly shall comply with all current ADA and FMVSS 403 and 404 requirements. The lift shall be installed below the floor line at the number 2 right-hand luggage bay on the curbside of the coach.

The lift shall be controlled by a dash-mounted toggle switch and a rear lift area toggle switch, and operated by up/down switches on a pendant mounted to the lift support bracket inside the number 2 baggage bay. The lift restraint belt must be buckled before the lift can be raised or lowered. The safety interlock circuit can be energized to operate the lift only if the transmission is in neutral, the park brake is applied, engine fast idle is on, the dash-mounted master switch is on, the lift secondary switch is on, and the lift restraint belt is buckled.

The wheelchair loading system shall provide safe, comfortable and rapid ingress and egress for applicable passengers from the street level or a curb When not in use, the lift shall stow in the luggage bay. The lift mechanism shall include a threshold warning device to provide “passenger on platform” information and to prevent stowing the lift platform when a passenger is sensed. The outer barrier shall be automatically controlled and shall be such that it cannot be overridden by the loading system operator. A dash-mounted

indicator light shall be provided and shall be illuminated when the loading system is activated. The interlock shall apply, the bus shall not move and the engine throttle/propulsion system shall be disabled whenever the wheelchair loading system is activated. If the lift door is open or ajar, the interlock shall remain engaged. Brackets, clamps, screw heads and other fasteners used on the passenger assists shall be anodized aluminum or stainless steel and shall be flush with the surface and free of rough edges.

The lift control mounted on the lift structure shall have push button up/down switches. The toggle electrical supply switch shall be located in close proximity to the controller. This toggle switch must be turned on prior to the lift operation. All lift control switches shall be permanently labeled. Decals shall not be permitted. The stow guard switch shall be red in color, and the stow/deploy switch shall be black in color. These switches shall be incorporated in a handheld pendant.

The lift shall include a hinged platform to bridge the coach floor to the lift platform. The bridge shall be hinged and locked in an upward position to act as a barrier when the lift is in use. The bridge shall also allow lift passenger ingress/egress easily from the platform. Lift travel speeds and lift operation shall be adjusted to the lift manufacturer's specifications upon completion of the lift installation into each coach and before coach delivery. The individual handrails shall incorporate a visual aid to ensure that they are folded in the proper order.

The lift shall include an emergency system in case of driver operation malfunction. Should an emergency situation occur, the lift operator shall release the push-button switch on the controller to immediately stop the lift cycle. The emergency hand pump handles and pump shall be located in an enclosed box at the rear wall of the number 1 right-hand luggage bay door. The handle shall be stored adjacent to the pump to allow immediate usage.

TS 80.2 Lift Door

The lift door shall be a single-leaf design that operates in a sliding track mounted both above and below the door leaf. The door shall open by sliding to the rear of the coach and shall remain on a horizontal plane throughout the opening and closing process. No pin-hinged doors shall be provided. The vehicle must be in neutral and the parking brake activated for the lift to operate. The accelerator shall be automatically disabled and the fast idle system activated when either the lift master switch is turned on or the lift door is open in order to provide maximum safety and security. These features shall be wired to the lift master switch to allow activation only when the vehicle is in neutral. The coach directional (hazard) lights will also flash on/off. After the lift operation is completed, the lift shall be properly stored and secured, with the access door closed and the lift master switch at the dash in the "off" position in order to move the coach.

The lift door shall have a window in line with the other passenger windows and shall not detract from the appearance of the coach. The door latch mechanism shall be located in the lower section of the door so that operators in the 5th percentile female range can operate the lift door.

The lift storage door shall not block the visual observation to the lift assembly while using the manual override mode of the lift. A lift door design consisting of a horizontally hinged lift platform egress door mounted within a vertical motion pantograph luggage door is a preferred design.

TS 80.3 Lift Width

The installation of the lift to the coach structure as well as the installation of the lift door into the sidewall of the coach shall not affect the structural integrity of the coach.

The parcel rack module above the wheelchair lift platform area shall be permanently removed to provide additional headroom. The modified rack shall be professionally finished at all ends.

A threshold warning module with a red warning light and an acoustic sensor shall be mounted in the ceiling structure above the wheelchair lift entrance doorway.

The heating and air ducts shall be rerouted around the lift area to ensure proper interior air conditioning/heating airflow and distribution.

A passenger chime tape switch shall be mounted on the sidewall at the two wheelchair securement positions.

Each coach shall have adequate information decals installed that detail the proper lift operation in both the normal and manual modes of operation.

TS 80.4 Lighting Requirements

Lighting for the lift areas shall be designed to meet Title 13 and ADA and FMVSS 404 standards. Lighting shall be provided to effectively illuminate the lift area. Light shall be wired through the lift master toggle switch on the driver's dash and shall automatically illuminate when this switch is in the "on" position. The lighting design shall minimize the effect of glare on passengers entering the bus through the wheelchair lift door. During lift operation, the street surface shall be illuminated to a minimum of 6 candlepower a distance of 3 ft beyond the external dimensions of the lift platform once deployed and lowered. Additional lighting shall be provided to ensure illumination of the instruction placard and the manual override pump when it is in use.

TS 80.5 Securement System

The vehicle interior shall permit the securement of two forward-facing wheelchair passengers in which the primary position shall be on the street side of the coach directly across from the lift. Securement areas shall be a minimum 30 × 48 in. as required by the ADA.

A separate three-point belt securement shall be provided to effectively secure wheelchair passengers. To further secure the passenger during the lift operation, a retractable seat belt strap shall be provided at the ingress/egress area of the lift platform. A minimum 10.5 in. high barrier shall also be provided at the rear of the lift area for additional passenger protection.

TS 80.6 Roof Ventilation/Escape Hatches

Two roof ventilators shall be provided and designed to perform as escape hatches. One ventilator/escape hatch shall be located in the roof at the front of the coach, another in the roof at the rear of the coach.

ALTERNATIVE

A rear egress window can replace a rooftop escape hatch.

ALTERNATIVE

A single roof-top escape hatch.

SIGNAGE AND COMMUNICATION

TS 81. Destination Signs

A destination sign system shall be furnished on the front, on the right side near the front door.

Route sign on the rear of the vehicle.

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.

Run number sign shall be installed.

TS 82. Passenger Information and Advertising (Transit Coach)

TS 82.1 Interior Displays

Provisions shall be made on the rear of the driver's barrier or equipment box located on the wheel well for a frame to retain information such as routes and schedules.

Advertising media 11 in. high and 0.09 in. thick shall be retained near the juncture of the bus ceiling and sidewall. The retainers may be concave and shall support the media without adhesives. The media shall be illuminated by the interior light system.

TS 83. Passenger Stop Request/Exit Signal

TS 83.1 Transit Coach

Pull Cord Passenger Signal

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

An auxiliary passenger "stop requested" signal shall be installed at the rear door to provide passengers standing in the rear door/exit area a convenient means of activating the signal system. The signal shall be a heavy-duty push button type located in the rear door vicinity. Button shall be clearly identified as "passenger signal."

TS 83.2 Commuter Coach

A heavy-duty “stop request” signal button shall be installed at every seat location except the rear cross seat.

TS 83.3 Signal Chime

A single “stop requested” chime shall sound when the system is first activated. A double chime shall sound anytime the system is activated from wheelchair passenger areas.

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

DEFAULT (COMMUTER COACH)

A single “stop requested” chime shall sound when the system is first activated. A double chime shall sound anytime the system is activated from wheelchair passenger areas.

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

TS 84. Communications

TS 84.1 Camera Surveillance System

Provide all wiring and mounting locations for a multi-camera surveillance system, including the installation of cameras, recorder, microphone, etc.

ALTERNATIVE

TS 84.2 A camera system shall be installed. Agency to provide details of camera system, including installation locations and number of buses to be equipped.Public Address System

A public address system shall be provided on each bus for facilitating radio system and driver-originated announcements to passengers.

TS 84.2.1 Speakers

DEFAULT

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.

TS 84.3 Automatic Passenger Counter (APC)

ALTERNATIVE

An infrared APC system shall be installed. Agency to provide details of APC system, including installation locations and number of buses to be equipped.

TS 84.4 Radio Handset and Control System

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

TS 84.4.1 Driver's Speaker

Each bus shall have a recessed speaker in the ceiling panel above the driver. This speaker shall be the same component used for the speakers in the passenger compartment. It shall have 8 ohms of impedance.

TS 84.4.2 Handset

Contractor will install a handset for driver use.

TS 84.4.3 Emergency Alarm

Contractor shall install an emergency alarm that is accessible to the driver but hidden from view.

TS 85. Electronics/Equipment Compartment

Each bus shall be equipped a fully sealed compartment located on the left front wheelhouse to provide a mounting location for radio equipment, video recording equipment, APC equipment and other electronic equipment. The compartment shall be lockable, completely water resistant and of steel construction. It shall be accessible from inside the bus, shall have 3 slide trays that automatically lock into place for easy maintenance of the equipment. The compartment shall be water resistant when the service door is secured. The compartment shall be supplied with power and ground circuit requirements.

A location convenient to the driver shall be provided for the radio control head, speaker and handset. The antenna mounting and lead termination shall be accessible from the bus interior. Conduit shall lead to the radio compartment and shall have a minimum bend radius adequate for easy pulling of coaxial cable. An access plate shall be provided in the ceiling. The compartment door shall have a lock. A sealing provision (gasket) shall be incorporated in the door of this compartment. The radio compartment finish shall be powder coated Black, standard black, or PSTA designated color.

Radio Mounting

A suitable area shall be provided for the mounting of communication Radio. This mounting could range from a simple plate to a box to contain the radio. A factor governing the mounting of the radio is what space is available. Another provision is that the cable that connects the radio and control head switch must be routed to an area immediately accessible to the driver.

Antenna

A single antenna will be mounted on the roof of each bus that will accommodate RF/GPS/Cellular. This antenna shall be located as close to midpoint between the two sides as practical, but not on a seam, and as close to the area of the radio, as to preclude a long run of coaxial cable that connects the radio and the antenna, so as to provide access below, should the antenna ever need to be changed. A 1" inside diameter flexible conduit with pull cord shall be incorporated into the roof and sidewall of the bus from the immediate area of the antenna so that the coaxial cable can be easily repaired as needed.

Antenna and Access Panel

An antenna access panel shall be installed in the ceiling of each bus at a point from the centerline of the bus, four (4) feet from the front of the bus. The access panel shall be located as close to a structural member as practical in order to provide a mounting base for the radio antenna.

An option to supply and mount a low profile 800 MHz antenna (Antenna Specialist ASP-930T) with RG58 coax cable and TNC connector to the radio will be provided and priced separately.

An option to supply and mount a GPS antenna w/gasket (Trimble 502 Model 18334) with RG58 coax cable and F Type male connector to the VLU will be provided and priced separately. The Contractor shall mount the GPS antenna (P/N 801-3200-000) and cable supplied with the Stop Announcement System.

All antenna cables shall be run in 1 inch diameter conduit to the radio box. Removable access covers shall be provided in the ceiling of the bus in order to allow access to the antenna and conduit. Three antennas shall be installed on every bus. Antenna locations shall be as close as possible to the center line of the bus and have a separation of approximately 3 feet. All mounting locations shall be approved by the appropriate municipality prior to bus manufacture.

TS 86. Computer Assisted Dispatching System (CAD/AVL)

There will be a requirement to furnish and install a complete automatic vehicle locating (AVL), computer assisted dispatching system as part of this proposal. The equipment provided and installed shall be manufactured and provided by Clever Devices.

Each PSTA bus is equipped with various components provided by Clever Devices to include all necessary wiring and software installation. The on board computing processer unit- IVN4 is the central processing unit for each revenue service vehicle in the PSTA fleet. Along with the IVN4 each bus has an interactive Mobile Data Terminal (MDT) which Clever Devices references as a Transit Control Head (TCH). This equipment is interfaced with the bus radio, destination signs, and fare boxes to provide a central "Single Point Logon." All data is transmitted through a cellular network.

Clever Devices also provides to PSTA an Automatic Vehicle Monitoring System (AVM-3) for each individual bus controlled by a central networking system. This interface monitors the major vehicle components and generates automatic reports through our Wireless Access Points (file dumping) and real-time monitoring via a cellular network.

TS 87. Charging System Specifications

The Contractor shall supply battery chargers to recharge the propulsion batteries of the electric buses provided under the terms of this Contract.

For the intent of this proposal, the chargers being requested shall be the following type:

- "In-Shop" and/or "Depot" Charger—a charger to be installed at the Agency's Maintenance Facility.
- "In-Field" and/or "On-Route Charger—a charger to be installed on the routes where the Agency intends to use the electric buses in normal revenue service.

These general requirements apply to all charging stations that may be delivered under the Contract. The Contractor shall provide charging equipment and the control and data system needed to recharge the bus propulsion system batteries.

The Contractor shall provide all charging equipment design requirements and specifications to the Agencyand it's designated architectural, civil, electrical, and mechanical engineering contractors to enable charging station site design, permitting, and construction.

The Contractor shall provide close coordination with the Agency and its engineering contractors during site design and construction of the charging stations. The Contractor shall be responsible for equipment start-up and testing to ensure that the charging equipment meets all stated specifications and functionality prior to site acceptance.

The chargers shall be rated for the intended purpose and location environment. The charging systems shall be capable of delivering the optimal battery charge profile as specified by the battery manufacturer and charging the installed traction battery to a fully charged state from the minimum recommended state-of-charge including necessary cool-down time as specified by the battery manufacturer. The chargers shall be capable of connection to a 480-volt, 3-phase, 60- Hz electrical supply.

The chargers shall be equipped with an submeter that:

Measures and displays kWh consumed and real time load in KW within 1% accuracy;

Is capable of RS-485 communications; and

Records kWh and kVARh delivered, kWh and kVARh received.

Battery chargers shall be configured to automatically apply a charging protocol appropriate to the battery's state-of-charge (SOC), in accordance with the battery manufacturer's recommended practices. The battery charger shall be configured to automatically initiate and sustain charging at any battery state-of-charge if properly connected when so signaled by an external timing circuit or control input. The battery charger shall be configured to automatically terminate the charge on attainment of a full state-of-charge or in the event of hazardous or anomalous conditions. Battery chargers shall be able to apply commissioning, equalization or conditioning charges according to the battery manufacturer's recommended practices when so configured by operation of keyboard or switch panel inputs. The battery charger shall be configured to automatically restart after unintended interruption of a charging episode due to interruption or temporary degradation of electrical service. The battery chargers shall be configured to interface with on-board battery management and interlock systems.

The actual charge profiles that the subject chargers deliver while charging, commissioning, equalizing, and conditioning the battery systems of the subject buses shall be recorded by the Contractor and shall be submitted to the battery manufacturer for review and approval. Written confirmation from the battery manufacturer attesting to the appropriateness of the delivered charge profile shall be submitted to PSTA concurrent with or prior to delivery of the first bus.

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

Any charging system installed under this contract shall be metered separately to enable PSTA to generate energy consumption reports and costs.

TS 87.1 "In-Shop" and/or "Depot Charger"

The chargers shall be capable of charging a minimum of two (2) buses simultaneously.

Installed chargers shall meet all applicable codes and manufacturer recommendations. Documentation showing that the chargers meet such applicable codes shall be included with each Proposal.

The bus shall be equipped with a single charge socket connection, accessible on the outside of the vehicle under a maintenance door, allowing a supplied charging cable to be attached to the bus.

Inside the vehicle, power shall be distributed through a main distribution panel with individual circuit breakers and RCD/GFCI protection on the input to the charging module or modules. Each charger circuit shall also be protected on the output stage to the battery pack or packs.

The installed chargers shall be designed and installed in such way that a single PSTA maintenance employee can safely connect (and disconnect) the charger(s) to the bus(es) without the need for a ladder or any special tools.

Installed chargers shall be specifically designed for charging the propulsion batteries installed on the buses provided un-der this contract.

Chargers or vehicles shall have indicating lights or a display that very clearly display the state of operation the charger is in (e.g., charging, not charging, etc.) and also display the percentage of charge the batteries are in (e.g., 65% charged).

Chargers shall have an emergency shut off switch that is clearly marked, easily accessible and easily operable.

The chargers shall be UL listed.

The chargers shall be equipped with suitably rated (electrically) cables to properly charge a nearby parked bus. Cables and connectors shall be resistant to oil, diesel fuel and other corrosives found in the Agency's Maintenance Facility.

The connectors shall be industry standard and of simple design and heavy-duty construction and shall not be energized except when mated with the bus mounted receptacle. A single bus mounted receptacle shall serve both the depot charging station and the opportunity charging station. The bus mounted receptacle shall be of simple and ergonomic design, of not more than 25 pounds (plug and cord), not more than two plugs, and heavy-duty construction, and shall not be energized except when mated with the charger connectors.

The connector to the bus shall have a locking mechanism, ensuring the connector will not come loose or fall by incidental contact.

There shall be a means of storing the cable, neatly, while the charger is not in use.

The chargers shall be mounted in such a way that three (3) inches of standing water will not adversely affect the operation of the charger.

Contractor shall submit power requirements with proposal documents.

All modifications to the facility shall be in accordance of applicable codes, ordinances and manufacturer's recommendations and shall meet the Agency's approval.

Contractor shall provide detailed wiring diagrams for the charger including controls.

Immediately upon charging circuit activation and until the recharging period is complete, the connected bus shall be automatically rendered inoperable. The bus shall remain inoperable until disconnected from the charger. Recharging of the bus must be dependent on the bus being completely stationary with the parking brake of the bus engaged. The charger shall be a completely self-contained package, designed for 24-hour operation and suitable for outdoor use. Connection of the charger to any electric bus provided under the terms of this contract shall be made without climbing on the roof of the bus.

The charger shall be capable of operating continuously without performance or safety degradation in environmental conditions common to the State of Florida.

Common environmental conditions include an ambient temperature range of 50ºF to 115ºF, at relative humidity between 60-percent and 100-percent. Chargers shall be mounted in such a way so as to prevent water, from floor washers or bus run off, entering the base of the units. If chargers are vehicle mounted, they shall be installed in such a way to prevent debris, water, salt, etc. from entering the unit.

Chargers shall not produce harmonic distortion in excess of 5% THD. Charging circuits shall be isolated from the vehicle chassis such that ground current from the grounded chassis does not exceed 5 mA.

The bid package shall contain a complete description of the charging systems (including anticipated AC energy consumption for buses operating on the specified operating profile, power factors, harmonic distortion, and accuracy of charge parameters).

TS 87.2 "In-Field" and/or "On-Route" Charger

The charger shall charge one (1) bus at a time but, however, have the capacity to charge several buses throughout the course of a day if multiple electric buses are used on a designated fixed route service.

Installed chargers shall meet all applicable codes and manufacturer recommendations. Documentation showing that the chargers meet such applicable codes shall be included with each Proposal.

The charging stations shall be equipped with a communication system to transmit information on each charge event, including, but not limited to bus ID, charger status, faults, beginning SOC, charge amount, ending

SOC, charge duration, energy consumption at the mains supply, energy consumption at the charge interface, max power, ambient temperature, etc.

The charging interface may be conductive or inductive. The bus may be equipped with a mechanism which connects to an external charging mechanism i.e. overhead charge interface, charge head, pantograph, or an interface which is under the vehicle, etc.

The charging sequence shall include the entire docking of the vehicle, instructions to the bus operator, disengagement of the vehicle prior to charging of the vehicle, charging of the vehicle, and release of the vehicle from the charger.

Immediately upon charging circuit activation and until the recharging period is complete, the connected bus shall be automatically rendered inoperable. The bus shall remain inoperable until disconnected from the charger. Recharging of the bus must be dependent on the bus being completely stationary with the parking brake of the bus engaged.

The charger shall automatically stop if faults or errors are detected. Emergency situations detected by either the equipment or the bus operator shall automatically terminate charging and release the bus from the equipment.

The charger shall automatically stop if the batteries reach fully rated state of charge or command by the bus operator such when layover time or stop over time has expired.

In all of the mention cases above when charging is terminated all mechanisms from either the charger or the bus mounted equipment shall disconnect and be completely free from themselves so that the vehicle may safety depart.

Inside the vehicle, power shall be distributed through a main distribution panel with individual circuit breakers and RCD/GFCI protection on the input to the charging module or modules. Each charger circuit shall also be protected on the output stage to the battery pack or packs.

Installed chargers shall be specifically designed for charging the propulsion batteries installed on the buses provide under this contract.

Chargers or vehicles shall have indicating lights or a display that very clearly display the state of operation the charger is in (e.g., charging, not charging, etc.) and also display the percentage of charge the batteries are in (e.g., 65% charged).

Chargers shall have an emergency shut off switch that is clearly marked, easily accessible and easily operable.

The chargers shall be UL listed.

All installation of chargers shall be in accordance of applicable codes, ordinances and manufacturer's recommendations and shall meet the Agency's approval.

Contractor shall provide detailed wiring diagrams for the charger including controls.

The charger shall be a completely self-contained package, designed for 24-hour operation and suitable for outdoor use. Connection of the charger to any electric bus provided under the terms of this contract shall be made without climbing on the roof of the bus.

The charger shall be capable of operating continuously without performance or safety degradation in environmental conditions common to the State of Florida.

Common environmental conditions include an ambient temperature range of 50ºF to 115ºF, at relative humidity between 60-percent and 100-percent.

TS 88. Bus Maintenance Procedures

TS 88.1 Preventative and Scheduled Maintenance

The Contractor shall work with the Agency to collaboratively ensure that a maintenance program is created that includes all sub-component manufacturer requirements to include both preventative and predictive maintenance tasks. This task is specifically called out as the Agencyunderstands with new technology there is a need to constantly monitor and change the maintenance program based on its performance. These tasks shall be identified to help reduce operation costs and extending the useful life of the vehicles, while improving safety for employees and the riding public.

Maintenance tasks shall include scheduled instructions that:

- aim at the failure process of individual sub-components,
- are specific on time and detailed,
- and should include specifications or tolerances

TS 88.2 Maintenance and Inspection

Scheduled maintenance tasks shall be related and shall be, in accordance with the Contractor's recommended preventative maintenance schedule (along with routine daily service performed during the servicing and overnight charging operations). The overall PMI (Preventative Maintenance Inspection) schedule for rolling stock shall be based upon a 6,000 mile interval and/or multiples of same.

The Contractor is responsible for providing a written comprehensive 52-week and long term rehab/replacement maintenance plan encompassing buses and charging infrastructure for its entire useful life.

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

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

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

The Proposer shall provide a list of all special tools and pricing for maintaining this equipment.

TS 88.3 Conditional Assessment

The Contractor shall be responsible for conducting a conditional assessment of the buses at the end of one year and three years of service life. A condition assessment is the process of inspecting, analyzing or testing the assets to collect data that is used to measure condition and performance. The condition assessment process involves a general inspection of all buses delivered, review of past performance/repair records, testing or analysis that evaluate an asset's visual and physical conditions (for example, structural issues, faulty components). Additionally, the Agency looks toward the Contractor to assess our internal procedures, training, inventory etc.

This process addresses risk, ensures that the asset can meet its level-of-service requirements, and provides information from which assets can be managed across their lifecycles. The condition assessment will measure the anticipated condition of the asset, relative to its useful life. Condition assessment and performance monitoring may lead to the following activities:

- Address immediate issues by completing reactive maintenance activities.
- Proactively identify any predictive and preventive maintenance or rehabilitation necessary, including modifying existing practices.
- Collect condition and performance data for scenario evaluation and performance modeling.
- Consider any engineering changes to retrofit existing equipment or improve future models of said equipment.

TS 88.4 Cost of Ownership

The Agency is interested in the long term cost of ownership, particularly the maintenance requirements that are routine, scheduled and/or reasonably predictable. In addition to the Proposers submittals describing and defining the service and maintenance requirements for the equipment, a "Cost of Ownership" template has been developed and included in the forms to be filled out by the Proposer as an element of the submittal package. This form itemizes tasks in three areas, PMI, scheduled maintenance and major component replacement.

TS 89. Charger Maintenance Procedures

TS 89.1 Preventative and Scheduled Maintenance

The Contractor shall provide a three (3) years of maintenance technical support of the charging equipment (both on-route and depot charges). This three year period shall correspond to the warranty period in start and end date as outlined in the Warranty Section.

- A written maintenance plan and training must be provided to the Agency prior to acceptance. The plan shall include at a minimum a 52 week preventative and scheduled maintenance and Long-term capital rehab / replacement plan for the life of the system.
- PSTA will use its own staff (or through the use of outside subcontractors) to provide weekly inspections as required to check fluids, drain filters and perform other similar light inspection and service as documented in the maintenance plan.

- Contractor shall visit the site not less frequently than once per month to perform inspections and maintenance as required. These visits must be coordinated with the Agency to ensure that there are buses that can be charged to allow operational testing.
- Contractor shall maintain detailed records of all inspections, calibrations, tests, maintenance and repairs. Information shall be provided to the Agency on a timely basis for storage.

TS 89.2 Maintenance Materials and Licenses

The Contractor shall supply all parts and consumables included within the cost of the contract.

- The Contractor shall maintain an inventory of all required parts including consumables and major repair parts during the terms of this contract.
- The Agency will pay the cost of all electric power and communications to the station.
- The Agency will provide insurance on the property.
- Contractor will provide other insurance as indicated elsewhere in this document.
- Contractor shall keep all operating permits current.
- Contractor shall at their own expense provide any documentation and/or testing required and pay any fees required for these permits.
- Contractor shall pay any upgrade or annual license fees as required to keep all copies of software current.

TS 89.3 Performance Reporting

The Contractor shall be responsible for monitoring the performance of the charging equipment and re-porting the condition to the Agency on a monthly basis. The report should include any recommendations for improvements that improve the charging of the buses or reduce the overall operational costs during the duration of the contract.

TS 89.4 Conditional Assessment

The Contractor shall be responsible for conducting a conditional assessment of the charging equipment at the end of one year and three years of service life. A condition assessment is the process of inspecting, analyzing or testing the assets to collect data that is used to measure condition and performance. The condition assessment process involves a review of past performance/repair records, inspections, testing or analysis that evaluate an asset's visual and physical conditions (for example, structural issues, faulty components).

This process addresses risk, ensures that the asset can meet its level-of-service requirements, and provides information from which assets can be managed across their lifecycles. The condition assessment will measure the anticipated condition of the asset, relative to its useful life. Condition assessment and performance monitoring may lead to the following activities:

- Address immediate issues by completing reactive maintenance activities.
- Proactively identify any predictive and preventive maintenance or rehabilitation necessary, including modifying existing practices.
- Collect condition and performance data for scenario evaluation and performance modeling.
- Consider and engineering changes to retrofit existing equipment or improve future models of said equipment.

TS 89.5 Cost of Ownership

The Agency is interested in the long term cost of ownership, particularly the maintenance requirements that are routine, scheduled and/or reasonably predictable. In addition to the Proposers submittals describing and defining the service and maintenance requirements for the equipment, a "Cost of Ownership" template has been developed and included in the forms to be filled out by the Proposer as an element of the submittal package. This form itemizes tasks in three areas, PMI, scheduled maintenance and major component replacement.

TS 90. Exportable Power Supply

Please describe the capabilities of the vehicle to provide power to auxiliary systems outside of the bus when stationary. Examples of auxiliary systems are standard 120 VAC accessory loads (lights and power tools), 240 VAC accessory loads, the local electrical grid, other vehicles, and/or buildings and facilities. The description shall include operation instructions and a list of resources (e.g. tools and personnel) needed to safely and properly connect the bus and provide power to off-board auxiliary systems. Proposers shall provide specifications of the power supply including but not limited to:

- available power, current and voltage,
- number, type, and location of receptacles,
- type of connector required,
- available energy at full charge,
- shutoff features and conditions,
- traction battery SOC and estimated remaining bus range at automatic shutoff,
- environmental condition requirements,
- compliance with applicable standards and UL Classification,
- maintenance requirements,
- warranty terms for related power electronics and inverters.

Describe whether exportable power features are provided as a standard offering or as an option to the proposal submission. If all or certain features are provided as an option clearly describe costs.
Requirements defined in the Access Doors (Transit Coach) section apply to all power supply access doors. Power supply access doors shall require a nominal 5/16 in. square male tool to open or lock.
The buses must be immobilized during all exportable power supply operations. Upon successful engagement of the power interface, the bus shall be interlocked such that propulsion is rendered non-tractive and the brakes applied.

SECTION 7: WARRANTY REQUIREMENTS

WR 1. Basic Provisions

WR 1.1 Warranty Requirements

WR 1.1.1 Contractor Warranty

Warranties in this document are in addition to any statutory remedies or warranties imposed on the Contractor. Consistent with this requirement, the Contractor warrants and guarantees to the original Agency each complete bus and specific subsystems and components as follows. Performance requirements based on design criteria shall not be deemed a warranty item.

WR 1.1.2 Complete Bus

The complete bus, propulsion system, components, major subsystems and body and chassis structure are warranted to be free from Defects and Related Defects for one year or 50,000 miles, whichever comes first, beginning on the date of revenue service but not longer than 15 days after acceptance under "Inspection, Testing and Acceptance." The warranty is based on regular operation of the bus under the operating conditions prevailing in the Agency's locale.

WR 1.1.3 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 twelve (12) years or 500,000 miles, whichever comes first.

Primary load-carrying members of the bus structure, including structural elements of the suspension, are warranted against corrosion failure and/or Fatigue Failure sufficient to cause a Class 1 or Class 2 Failure for a period of 12 years or 500,000 miles, whichever comes first.

WR 1.1.4 Propulsion System

Propulsion system components, including the engine, transmission or drive motors, and generators (for hybrid technology) and drive and non-drive axles shall be warranted to be free from Defects and Related Defects for the standard two years or 100,000 miles, whichever comes first. An Extended Warranty to a maximum of five years or 300,000 miles, whichever comes first, may be purchased at an additional cost. The propulsion system manufacturer's standard warranty, delineating items excluded from the Extended Warranty, should be submitted in accordance with the Request for Pre-Offer Change or Approved Equal or with the Form for Proposal Deviation.

WR 1.1.5 Subsystems

Other subsystems shall be warranted to be free from Defects and Related Defects for two years or 100,000 miles, whichever comes first. Other subsystems are listed below:

- **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.**
- **Fire suppression:** Fire suppression system including tank and extinguishing agent dispensing system.
- **Hydraulic systems:** Including radiator fan drive and power steering as applicable.
- **Cooling systems:** Radiator including core, tanks and related framework, including surge tank.
- **Passenger seating excluding upholstery.**
- **Surveillance system including cameras and video recorders.**

WR 1.1.6 Extended Warranty

PSTA requires the following additional subsystems to be warranted to be free from Defects and Related Defects for six (6) years.

- Batteries
- Traction Motor
- Inverters
- Battery Charger
- On-Route Battery Charger

WR 1.1.7 Serial Numbers

Upon delivery of each bus, the Contractor shall provide a complete electronic list of serialized units installed on each bus to facilitate warranty tracking. The list shall include, but is not limited to the following:

- Electric Drive Motor (s)
- Energy Storage Module (s)
- Propulsion System Controller / Inverter (s)
- HVAC System, major components
- Steering Axle
- Drive Axle
- Power Steering Unit
- Air Compressor
- Wheelchair Ramp
- Charger/Controller
- Charger Interface
-

The Contractor shall provide updated serial numbers resulting from warranty campaigns. The format of the list shall be approved by the Agency prior to delivery of the first production bus.

WR 1.1.8 Extension of Warranty

If, during the warranty period, repairs or modifications on any bus are made necessary by defective design, materials or workmanship but are not completed due to lack of material or inability to provide the proper repair for thirty (30) calendar days, then the applicable warranty period shall be extended by the number of days equal to the delay period.

WR 1.2 Voiding of Warranty

The warranty shall not apply to the failure of any part or component of the bus that directly results from misuse, negligence, accident or repairs not conducted in accordance with the Contractor-provided maintenance manuals and with workmanship performed by adequately trained personnel in accordance with recognized standards of the industry. The warranty also shall be void if the Agency fails to conduct normal inspections and scheduled preventive maintenance procedures as recommended in the Contractor's maintenance manuals and if that omission caused the part or component failure. The Agency shall maintain documentation, auditable by the Contractor, verifying service activities in conformance with the Contractor's maintenance manuals.

WR 1.3 Exceptions and Additions to Warranty

The warranty shall not apply to the following items:

- scheduled maintenance items
- normal wear-out items
- items furnished by the Agency

Should the Agency require the use of a specific product and has rejected the Contractor's request for an alternate product, then the standard Supplier warranty for that product shall be the only warranty provided to the Agency. This product will not be eligible under "Fleet Defects," below.

The Contractor shall not be required to provide warranty information for any warranty that is less than or equal to the warranty periods listed.

WR 1.3.1 Pass-Through Warranty

Should the Contractor elect to not administer warranty claims on certain components and wish to transfer this responsibility to the sub-suppliers, or to others, the Contractor shall request this waiver.

Contractor shall state in writing that the Agency's warranty reimbursements will not be impacted. The Contractor also shall state in writing any exceptions and reimbursement including all costs incurred in transport of vehicles and/or components. At any time during the warranty period, the Contractor may request approval from the Agency to assign its warranty obligations to others, but only on a case-by-case basis approved in writing by the Agency. Otherwise, the Contractor shall be solely responsible for the administration of the warranty as specified. Warranty administration by others does not eliminate the warranty liability and responsibility of the Contractor.

WR 1.3.2 Superior Warranty

The Contractor shall pass on to the Agency any warranty offered by a component Supplier that is superior to that required herein. The Contractor shall provide a list to the Agency noting the conditions and limitations of the Superior Warranty not later than the start of production. The Superior Warranty shall not be administered by the Contractor.

WR 1.4 Fleet Defects

WR 1.4.1 Occurrence and Remedy

A Fleet Defect is defined as cumulative failures of twenty-five (25) percent of the same components in the same or similar application. A Fleet Defect shall apply only to the base warranty period in sections entitled "Complete Bus," "Propulsion System" and "Major Subsystems." When a Fleet Defect is declared, the remaining warranty on that item/component stops. The warranty period does not restart until the Fleet Defect is corrected.

For the purpose of Fleet Defects, each option order shall be treated as a separate bus fleet. In addition, should there be a change in a major component within either the base order or an option order, the buses containing the new major component shall become a separate bus fleet for the purposes of Fleet Defects.

The Contractor shall correct a Fleet Defect under the warranty provisions defined in "Repair Procedures." After correcting the Defect, the Agency and the Contractor shall mutually agree to and the Contractor shall promptly undertake and complete a work program reasonably designed to prevent the occurrence of the same Defect in all other buses and spare parts purchased under this Contract. Where the specific Defect can be solely attributed to particular identifiable part(s), the work program shall include redesign and/or replacement

of only the defectively designed and/or manufactured part(s). In all other cases, the work program shall include inspection and/or correction of all the buses in the fleet via a mutually agreed-to arrangement. The Contractor shall update, as necessary, technical support information (parts, service and operator's manuals) due to changes resulting from warranty repairs. The Agency may immediately declare a Defect in design resulting in a safety hazard to be a Fleet Defect. The Contractor shall be responsible to furnish, install and replace all defective units.

WR 1.4.2 Exceptions to Fleet Defect Provisions

The Fleet Defect warranty provisions shall not apply to Agency-supplied items, such as radios, fare collection equipment, communication systems and tires. In addition, Fleet Defects shall not apply to interior and exterior finishes, hoses, fittings and fabric.

WR 2. Repair Procedures

WR 2.1 Repair Performance

The Contractor is responsible for all warranty-covered repair Work. To the extent practicable, the Agency will allow the Contractor or its designated representative to perform such Work. At its discretion, the Agency may perform such Work if it determines it needs to do so based on transit service or other requirements. Such Work shall be reimbursed by the Contractor.

WR 2.2 Repairs by the Contractor

If the Agency detects a Defect within the warranty periods defined in this section, it shall, within thirty (30) days, notify the Contractor's designated representative. The Contractor or its designated representative shall, if requested, begin Work on warranty-covered repairs within five calendar days after receiving notification of a Defect from the Agency. The Agency shall make the bus available to complete repairs timely with the Contractor's repair schedule.

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

WR 2.3 Repairs by the Agency

WR 2.3.1 Parts Used

If the Agency performs the warranty-covered repairs, then it shall correct or repair the Defect and any Related Defects utilizing parts supplied by the Contractor specifically for this repair. At its discretion, the Agency may use Contractor-specified parts available from its own stock if deemed in its best interests.

WR 2.3.2 Contractor-Supplied Parts

The Agency may require that the Contractor supply parts for warranty-covered repairs being performed by the Agency. Those parts may be remanufactured but shall have the same form, fit and function, and warranty. The parts shall be shipped prepaid to the Agency from any source selected by the Contractor within fourteen (14) days of receipt of the request for said parts and shall not be subject to an Agency handling charge.

WR 2.3.3 Defective Component Return

The Contractor may request that parts covered by the warranty be returned to the manufacturing plant. The freight costs for this action shall be paid by the Contractor. Materials should be returned in accordance with the procedures outlined in "Warranty Processing Procedures."

WR 2.3.4 Failure Analysis

The Contractor shall, upon specific request of the Agency, provide a failure analysis of Fleet Defect or safety-related parts, or major components, removed from buses under the terms of the warranty that could affect fleet operation. Such reports shall be delivered within 60 days of the receipt of failed parts.

WR 2.3.5 Reimbursement for Labor and Other Related Costs

The Agency shall be reimbursed by the Contractor for labor. The amount shall be determined by the Agency for a qualified mechanic at a straight time wage rate of $65.00 per hour, which includes fringe benefits and overhead adjusted for the Agency's most recently published rate in effect at the time the Work is performed, plus the cost of towing the bus if such action was necessary and if the bus was in the normal service area. These wage and fringe benefit rates shall not exceed the rates in effect in the Agency's service garage at the time the Defect correction is made.

WR 2.3.6 Reimbursement for Parts

The Agency shall be reimbursed by the Contractor for defective parts and for parts that must be replaced to correct the Defect. The reimbursement shall be at the current price at the time of repair and shall include taxes where applicable, plus 15 percent handling costs. Handling costs shall not be paid if parts are supplied by the Contractor and shipped to the Agency.

WR 2.3.7 Reimbursement Requirements

The Contractor shall respond to the warranty claim with an accept/reject decision including necessary failure analysis no later than sixty (60) days after the Agency submits the claim and defective part(s), when requested. Reimbursement for all accepted claims shall occur no later than sixty (60) days from the date of acceptance of a valid claim. The Agency may dispute rejected claims or claims for which the Contractor did not reimburse the full amount. The parties agree to review disputed warranty claims during the following quarter to reach an equitable decision to permit the disputed claim to be resolved and closed. The parties also agree to review all claims at least once per quarter throughout the entire warranty period to ensure that open claims are being tracked and properly dispositioned.

WR 2.4 Warranty after Replacement/Repairs

If any component, unit or subsystem is repaired, rebuilt or replaced by the Contractor or by the Agency with the concurrence of the Contractor, then the component, unit or subsystem shall have the unexpired warranty period of the original. Repairs shall not be warranted if Contractor-provided or authorized parts are not used for the repair, unless the Contractor has failed to respond within five days, in accordance with "Repairs by the Contractor."

If an item is declared to be a Fleet Defect, then the warranty stops with the declaration of the Fleet Defect. Once the Fleet Defect is corrected, the item(s) shall have three (3) months or remaining time and/or miles of the original warranty, whichever is greater. This remaining warranty period shall begin on the repair/replacement date for corrected items on each bus if the repairs are completed by the Contractor or on the date the Contractor provides all parts to the Agency.

WR 2.4.1 Warranty Processing Procedures

The following list represents requirements by the Contractor to the Agency for processing warranty claims. One failure per bus per claim is allowed.

- bus number and VIN
- total vehicle life mileage at time of repair
- date of failure/repair
- acceptance/in-service date
- Contractor part number and description
- component serial number
- description of failure
- all costs associated with each failure/repair (invoices may be required for third-party costs):
    - towing
    - road calls
    - labor
    - materials
    - parts
    - handling
    - troubleshooting time

WR 2.5 Forms

The Agency's forms will be accepted by the Contractor if all of the above information is included. Electronic submittal may be used if available between the Contractor and the Agency.

WR 2.6 Return of Parts

When returning defective parts to the Contractor, the Agency shall tag each part with the following:

- bus number and VIN
- claim number
- part number
- serial number (if available)

WR 2.7 Consumables

The following list of consumable items shall be available in the U.S., preferably from U.S. suppliers:

- Ventilating air filters
- Belts
- Lamps
- Fuses, relays, circuit breakers
- Brake lining material
- Hoses and lines - air, coolant and hydraulic
- Wire terminations and connectors
- Shock absorbers
- Air bags
- Brake drums

- Suspension bushings

WR 2.8 Timeframe

Each claim must be submitted no more than thirty (30) days from the date of failure and/or repair, whichever is later. All defective parts must be returned to the Contractor, when requested, no more than forty-five (45) days from the date of repair.

WR 2.9 Reimbursements

Reimbursements are to be transmitted to the following address:

Pinellas Suncoast Transit Authority (PSTA)
3201 Scherer Drive
Saint Petersburg, Florida 33716
Attention—Accounts Receivable

WR 2.10 Battery Warranty

The high voltage battery will be delivered with a warranty of no less than six (6) years from the time the bus is put into service by the Agency. Contractors offering warranty periods greater than the minimum of six (6) years should notate their warranty period in detail as part of their Proposal.

WR 2.10.1 Battery Definitions

Capacity (electrical energy storage device): Two levels of capacity shall be defined, gross and useable. Gross capacity shall be the capacity energy (kwh) of the entire battery pack and shall include usable, unusable, and/or reserve capacity energy. Useable capacity shall be the capacity energy between the design operating range within the battery management system for normal operation.

Maximum Standard Operating State of Charge: The maximum design operating state of charge as recommended by the propulsion system integrator and battery manufacturer.

Minimum Standard Operating State of Charge: The minimum design operating state of charge as specified by the propulsion system integrator and battery manufacturer.

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 percent. This is a dynamic measurement used for the energy storage system. An absolute SOC is based on total battery capacity at the beginning of useful life. A relative SOC is based on total degraded capacity at the time of measurement. The actual relationship between the SOC and energy stored expressed as a percentage shall be linear.

Usable Battery Capacity: Usable battery capacity is measured in kwhr and would be the energy available for normal operations. Usable battery capacity would be the usable energy from the ESC as managed through the BMS, assumed to be less than the gross capacity. It is calculated based on a useful range of something above 0% SOC and something less than 100% SOC, i.e., as an example, if the range was between 10% and 90% SOC, then the usable battery capacity would be 80% of gross battery capacity.

WR 2.10.2 Battery Degradation

The contractor shall provide a plan for replacing or reconditioning batteries if it has been determined that the batteries have degraded beyond their warrantable end of life (WEOL). The contractor must clearly define WEOL and the method by which battery capacity is measured to determine WEOL. The contractor must define the capacity to which the entire battery pack is restored such that it will remain above the WEOL for the remainder of the warranty.

WR 2.10.3 Battery End of Life

The Contractor shall provide a plan for battery packs and/or cells that are removed from service over the 12 year life of the bus. The plan may include, but is not limited to, recycling, repurposing, etc.

WR 2.10.4 Battery Cycle and Safety Training

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

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

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).

Build Schedule

The bus manufacturer's contract administrator shall supply a fleet build production schedule based on the dates in the Notice to Proceed, and a description of the manufacturer's schedule for plant operations.

The production schedule should contain specific milestone dates, such as the following:

- First vehicle on production line (date on which any work will begin)
- First vehicle off production line
- First vehicle through manufacturer's quality assurance inspections
- First vehicle shipped to the Agency
- Last vehicle on production line
- Last vehicle off production line
- Last vehicle shipped to the Agency

Plant Tour (if Meeting at OEM's Location)

The Agency will review the entire process from start to finish and review the work completed at each line station, including quality control measures.

Prototype/Pilot Vehicle Production

The Contractor shall conduct acceptance tests at its plant on each bus following completion of manufacture and before delivery to the Agency. These pre-delivery tests shall include visual and measured inspections, as well as testing the total bus operation. The tests shall be conducted and documented in accordance with written test plans approved by the Agency. The underfloor equipment shall be available for inspection by the resident inspectors, using a pit or bus hoist provided by the Contractor. A hoist, scaffold or elevated platform shall be provided by the Contractor to easily and safely inspect bus roofs. Delivery of each bus shall require written authorization of the primary resident inspector. Authorization forms for the release of each bus for delivery shall be provided by the Contractor. An executed copy of the authorization shall accompany the delivery of each bus.

Additional tests may be conducted at the Agency's discretion to ensure that the completed buses have attained the required quality and have met the requirements in "Section 6: Technical Specifications." The Agency may, prior to commencement of production, demand that the Contractor demonstrate compliance with any requirement in that section if there is evidence that prior tests have been invalidated by the Contractor's change of Supplier or change in manufacturing process. Such demonstration shall be by actual test, or by supplying a report of a previously performed test on similar or like components and configuration. Any additional testing shall be recorded on appropriate test forms provided by the Contractor and shall be conducted before acceptance of the bus.

The pre-delivery tests shall be scheduled and conducted with 30 days' notice so that they may be witnessed by the resident inspectors, who may accept or reject the results of the tests. The results of pre-delivery tests, and any other tests, shall be filed with the assembly inspection records for each bus.

Visual and Measured Inspections

Visual and measured inspections shall be conducted with the bus in a static condition. The purpose of the inspection testing includes verification of overall dimension and weight requirements, that required components are included and are ready for operation, and that components and subsystems designed to operate with the bus in a static condition do function as designed.

Total Bus Operation

Total bus operation shall be evaluated during road tests. The purpose of the road tests is to observe and verify the operation of the bus as a system and to verify the functional operation of the subsystems that can be operated only while the bus is in motion.

Each bus shall be driven for a minimum of 15 miles during the road tests. If requested, computerized diagnostic printouts showing the performance of each bus shall be produced and provided to the Agency. Observed defects shall be recorded on the test forms. The bus shall be retested when defects are corrected and adjustments are made. This process shall continue until defects or required adjustments are no longer detected.

Post-Delivery Tests

The Agency shall conduct acceptance tests on each delivered bus. These tests shall be completed within 15 days after bus delivery and shall be conducted in accordance with the Agency's written test plans. The purpose of these tests is to identify defects that have become apparent between the time of bus release and delivery to the Agency. The post-delivery tests shall include visual inspection and bus operations. No post-delivery test shall apply new criteria that are different from criteria applied in a pre-delivery test.

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

Prototype/Pilot Vehicle Acceptance

In order to assess the Contractor's compliance with the Technical Specifications, the Agency and the Contractor shall, at the Pre-Production Meeting, jointly develop a Configuration and Performance Review document for review of the pilot vehicle. This document shall become part of the official record of the Pre-Production Meeting.

Potential dimensional/performance tests included in the Configuration and Performance Review are the following:

- Complete electrical system audit
- Dimensional requirements audit
- Seating capacity
- Water test
- Water runoff test
- Function test of systems/subsystems and components
- Sound/noise level tests
- Vehicle top speed
- Acceleration tests
- Brake stop tests
- Airflow tests
- PA function tests
- Air/brake system audit
- Individual axle weight
- Standee capacity
- Body deflection tests
- Silent alarm function test
- Interior lighting
- Exterior lighting
- Gradeability test
- Kneeling system function
- HVAC pull down/heat
- Speedometer

- Outside air infiltration (smoke)
- Wheelchair ramps
- Propulsion system performance verification
- ESS charging verification
  -

Buy America Audit

A post-delivery Buy America audit is required for federally funded bus procurements (see 49 CFR Part 663 for additional information). The on-site resident inspectors will 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.

Resident Inspection Process for Serial Production

At the discretion of the Agency, a decision may be 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.

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 shall 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.

The inspections performed on each bus by the resident inspectors will include the following:

- Water test inspection
- Road test inspection
- Interior inspection (including functionality)
- Hoist/undercarriage inspection
- Exterior inspection (including roof)
- Electrical inspection
- Wheelchair ramp/lift inspection

Water Test Inspection

The water test inspection checks the integrity of the vehicle's body seams, window frame seals and other exterior component closeouts for their ability to keep rainwater, road splash, melting snow and slush, and other exterior water from entering the inside of the vehicle. The vehicle's interior is inspected for signs of moisture and water leaks. To perform the leak inspection, interior ceiling and side panels are removed, and access doors are opened. If any moisture or water is detected, then the source of the leak will be located and repaired by the manufacturer, and the vehicle will be tested again.

Road Test Inspection

The road test inspection checks all the vehicle's systems and subsystems while the vehicle is in operation. Typically, the road test inspection is performed immediately following the water test inspection to reveal any standing water that may be present due to a leak, but was not noticed during the "static" water test. Objectionable vibrations, air leakage and other factors that affect ride quality are recorded and reported to the vehicle manufacturer for resolution. Vehicle stability, performance, braking and interlock systems, HVAC, and other critical areas are checked to ensure that the vehicle is complete and ready to provide safe and reliable service.

The following tests may be performed and recorded during the road test:

- Acceleration test
- Top speed test
- Gradeability test
- Service brake test
- Parking brake test
- Turning effort test
- Turning radius test
- Shift quality
- Quality of retarder or regenerative braking action

During the road test, a vehicle may be taken to a weigh station to record the vehicle's front axle weight, rear axle weight and total vehicle (curb) weight.

Interior Inspection

The interior inspection checks the fit and finish of the interior installations.

In addition, the inspection also verifies the installation and function of systems and subsystems according to the Build Specification. All systems and functions accessed from the interior are inspected for functionality, appearance and safety.

Examples of systems/functions inspected include the following:

- Interior and exterior lighting controls
- Front and rear door systems
- Flooring installation
- Passenger and operator's seat systems
- Wheelchair securement and ramp systems
- Fire suppression system
- Electrical installations (multiplex, tell-tale wiring, panels, etc.)
- Window systems and emergency escape portals
- Operator dash/side panel controls/indicators

Hoist/Undercarriage Inspection

The hoist/undercarriage inspection checks the installation of components, wiring, air lines, presence of fluid leaks, etc., located under the vehicle. Typically, this inspection is performed following the road test. The vehicle is lifted onto a hoist or pulled over a pit for the inspection. Areas inspected are the front suspension, air bags, airline routings, electrical connections and routings, drivetrain components, linkages and any other system or component that may be prone to early failure due to inadequate installation techniques. All lines, cables, hoses, etc., are inspected for proper securement and protection to prevent rubbing, chafing or any other condition that could result in a failure. The 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 generated during the bus build process:

- Vehicle build specification
- Sales order

- Pre-Production Meeting notes
- Prototype and production correspondence (vehicle build file)
- Manufacturer's vehicle record (Warranty file)
    - Vehicle line documents
    - Serialization documents (Warranty file)
    - Alignment verification
    - Brake testing
    - HVAC testing and checkout
    - Manufacturer's QA checklist and signoff
    - Weight slip (prototype and Warranty file)
    - Prototype performance tests document (vehicle build file)
        - Acceleration Test
        - Top Speed Test
        - Gradeability Test
        - Interior Noise Test A – Stationary
        - Interior Noise Test B – Dynamic
        - Exterior Noise Test A – Pull Away
        - Exterior Noise Test B – Pass-By
        - Exterior Noise Test C – Curb Idle
        - Turning Radius Test
        - Turning Effort Test
        - Parking Brake Test
        - Service Brake Test
    - Vehicle acceptance inspections—production (Warranty file)
        - Water Test Inspection Report
        - Road Test Inspection Report
        - Interior Inspection Report
        - Hoist/Undercarriage Inspection Report
        - Exterior Inspection Report
        - Electrical Inspection Report
        - Wheelchair Inspection Report
    - Speed Memos (Warranty file)
    - Agency Vehicle Inspection record(Warranty file)
    - Release for delivery documentation (Warranty file)
    - Post-Production Acceptance – Certificate of Acceptance(Accounting)
    - Post-Delivery Inspection Report – (Fleet Management & Warranty files)

Vehicle Release for Delivery

Upon satisfactory completion of all inspection, audit and test criteria, and resolution of any outstanding issues affecting the purchase of any or all buses, proper documentation (the Release for Delivery) is signed by the designated resident inspector authorizing the bus manufacturer to deliver the vehicle to the Agency's facility, where it will undergo a post-delivery inspection process and final acceptance. The satisfactory sign-off of the Release for Delivery should complete the resident inspector's duties for each bus. In final preparation for delivery, the bus manufacturer may request the resident inspector to do a final walk-through of the bus after it has been cleaned and prepped for shipping.

Post-Delivery and Final Acceptance

The Agency shall conduct acceptance tests on each delivered bus. These tests shall be completed within 15 days after bus delivery and shall be conducted in accordance with the Agency's written test plans. The purpose of these tests is to identify defects that have become apparent between the time of bus release and

delivery to the Agency. The post-delivery tests shall include visual inspection, along with a verification of system(s) functionality and overall bus operations. No post-delivery test shall apply new criteria that are different from criteria applied in a pre-delivery test.

Buses that fail to pass the post-delivery tests are subject to non-acceptance. The Agency shall record details of all defects on the appropriate test forms and shall notify the Contractor of acceptance or non-acceptance of each bus within five days after completion of the tests. The defects detected during these tests shall be repaired according to procedures defined in the contract after non-acceptance.

Certificate of Acceptance

- **Accepted**

- **Not accepted:** In the event that the bus does not meet all requirements for acceptance. The Agency must identify reasons for non-acceptance and work with the OEM to develop a timeline of addressing the problem for a satisfactory resolution and redelivery.

- **Conditional acceptance:** In the event that the bus does not meet all requirements for acceptance, the Agency may conditionally accept the bus and place it into revenue service pending receipt of Contractor furnished materials and/or labor necessary to address the identified issue(s).

SECTION 9: FORMS AND CERTIFICATIONS

CER 1. Proposer's Checklist

RFP [21-980369 **Electric Transit Buses with Charging and Associated Equipment**

Package 1: Technical Proposal

- ☐ 1. Letter of Transmittal
- ☐ 2. Technical Proposal
- ☐ 3. Acknowledgement of Addenda
- ☐ 4. Form for Proposal Deviation
- ☐ 5. Vehicle Questionnaire
- ☐ 6. References and non-priced information (if provided by Proposer)
- ☐ 7. Engineering organization chart, engineering change control procedure, field modification process
- ☐ 8. Manufacturing facility plant layout, other contracts, staffing
- ☐ 9. Production schedule and other Contract commitments for the duration of this Contract.
- ☐ 10. Quality Assurance Program

Package 2: Price Proposal

- ☐ 1. Letter of Transmittal
- ☐ 2. Pricing Schedule (including option buses, spare parts package, engineering, manuals, training, special tools and test equipment)

Package 3: Qualifications Package

- ☐ 1. Pre-Award Evaluation Data Form
- ☐ 2. A copy of the three (3) most recent audited financial statements or a statement from the Proposer regarding how financial information may be reviewed by the Agency
- ☐ 3. Letter for insurance
- ☐ 4. Letter for performance bond (if applicable)
- ☐ 5. Letter of commitment for parental financial guarantee (if applicable)
- ☐ 6. Proposal Form

Package 4: Proprietary/Confidential Information

- ☐ 1. Proprietary/Confidential Information

There may be items in the first three packages that are included in Package 4 because they are considered to be proprietary/confidential information. When this occurs, the Proposer must note that fact in packages 1 through 3.

CER 2. Request for Pre-Offer Change or Approved Equal

This form must be used for requested clarifications, changes, substitutes or approval of items equal to items specified with a brand name and must be submitted as far in advance of the Due Date, as specified in "Questions, Clarifications and Omissions."

Pinellas Suncoast Transit Authority RFP 21-980369 Electric Transit Buses with Charging and Associated Equipment

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."

PSTA
[RFP 21-980369]

Deviation No.:	**Contractor:**	**RFP section:**	**Page:**
Complete description of Deviation:			
Rationale (pros and cons):			

CER 6. Pricing Schedule

This form is to be completed and included in the Price Package.

RFP 21-980369 Electric Transit Buses with Charging and Associated Equipment

Battery Leasing

PSTA is requesting all Proposers submit detailed information pertaining to the ability to lease the onboard ESS battery packs from the manufacturer; if available. Proposers should provide all pricing, financing terms, interest rates, along with duration of leasing term as part of their Proposal.

PINELLAS SUNCOAST TRANSIT AUTHORITY (PSTA) RFP 21-98369

SCHEDULE

CAUTION: A false statement in any offer submitted to PSTA may be a criminal OFFENSE.

NOTE: For Invitations for Bids the terms "Offer" and "Offeror" shall mean "Bid" and "Bidder", respectively; and for Request for Proposals the terms "Bid" and "Bidder" shall mean "Offer" and "Offeror", respectively, in this solicitation and any associated exhibits.

The rates include all costs that the offeror(s) intends to recover, such as, but not limited to: supervision, labor, equipment, materials, vehicle licensing, vehicle title, pick-up, financing, carrying charges, and all other such charges to accommodate the services and requirements. No price adjustments will be made, unless specifically provided for by an additional provision included in this contract.

PRICING

Line Item	Description	Part #	QTY	Yr1	Yr2	Yr3	Yr 4	Yr5
1	Cost of (1) 30FT, low floor, all electric bus, per the specifications		1					
2	Cost of (1) 35FT, low floor, all electric bus, per the specifications		1					
3	Cost of (1) 40FT, low floor, all electric bus, per the specifications		1					
4	Cost of (1) Depot Charger		1					
5	ADVERTISING FRAMES	None	1					

6	ADVERTISING FRAMES	Advertising Frame - Interior 22" X 21",RH Load, Open Back, Clear Aluminum Finish	1					
7	ADVERTISING FRAMES	(1) Information Board (#15-55401-000)	1					
8	AIR SYSTEM	Bendix AD9 Air Dryer	1					
9	AIR SYSTEM	Shop Air Connection (Milton S790)	1					
10	AIR SYSTEM	Kingston Auto Drain Valve at Ping Tanks	1					
11	AIR SYSTEM	Bendix ADIP , Heated, Air Dryer	1					
12	AIR SYSTEM	Bendix Puraguard Air / Oil Separator	1					
13	AIR SYSTEM	Chicago Rawhide Dual Turbo 2000 Air Dryer	1					
14	AIR SYSTEM	Graham White Sludge Braker QBA15 Air Dryer	1					
15	AIR SYSTEM	Graham White Sludge Braker QBA60 Air Dryer	1					
16	AIR SYSTEM	Haldex Consep Moisture Ejector, Heated, at Air Dryer	1					
17	AIR SYSTEM	SKF, HCT 2000 Duraguard, 24V Heated, Filtration Plus Air Dryer	1					
18	AIR SYSTEM	SKF, HCT_2000 Duraguard Air Dryer	1					
19	AIR SYSTEM	Wabco SS 1800, Heated, Air Dryer	1					
20	AIR SYSTEM	Shop Air Connection (Milton 770)	1					
21	AIR SYSTEM	Shop Air Connection (Milton 727)	1					
22	AUTOMATIC PASSENGER COUNTER	UTA APC Sensors, Cabling, CPU Only (Integrated w/ ITS)	1					
23	AUTOMATIC PASSENGER COUNTER	UTA Automatic Passenger Counter System with GPS, WLAN Capabilities	1					

24	AUTOMATIC PASSENGER COUNTER	UTA Automatic Passenger Counter System with GPS, WLAN Capabilities (without APC software & Wi-Fi data transfer	1					
25	AUTOMATIC PASSENGER COUNTER	Clever Devices Clever-Count System	1					
26	AXLES & SEALS	Stud Piloted Wheels and Axles w/ Oil Seals	1					
27	AXLES & SEALS	Synthetic 75W90 Gear Oil	1					
28	AXLES & SEALS	Hub Piloted Wheels and Axles w/ Grease Seals	1					
29	AXLES & SEALS	Hub Piloted Wheels, Axles with Oil Seals	1					
30	AXLES & SEALS	Stud Piloted Wheels and Axles w/ Grease Seals	1					
31	AXLES & SEALS	Rear Axle Oil Drain Plug--Magnetic Internal Hex Head Plug	1					
32	BATTERIES	(2) DEKA 8D Side or Top Post Connections	1					
33	BATTERIES	Anderson 350 Jump Start Connector (Front & Rear)	1					
34	BATTERIES	Group 31 Batteries	1					
35	BATTERIES	Anderson 350 Jump Start Connector (Each)	1					
36	BATTERIES	Anderson 350 Jump Start Delete	1					
37	BIKE RACKS	Sportworks DL2, 2-Position, Stainless Steel	1					
38	BIKE RACKS	Bike Rack Deployed Indicator Lamp on Driver's Dash	1					
39	BIKE RACKS	Sportworks APEX 2, 2-Position, Stainless Steel	1					
40	BIKE RACKS	Sportworks APEX 2, 2-Position, Powder Coated	1					
41	BIKE RACKS	Sportworks DL2, 2-Position, Powder Coated	1					
42	BIKE RACKS	Sportworks APEX3, 3-Position, Stainless Steel	1					

43	BIKE RACKS	Sportworks APEX 3, 3-Position, Powder Coated	1					
44	BIKE RACKS	Sportworks Trilogy (DL3), 3-Position, Stainless Steel	1					
45	BIKE RACKS	Sportworks Trilogy (DL3), 3-Position, Powder Coated	1					
46	BIKE RACKS	Sportworks Pivot Plate Only	1					
47	BIKE RACKS	Sportworks Mounting Brackets Only	1					
48	BIKE RACKS	Byk-Rak, 2-Position, Stainless Steel	1					
49	BIKE RACKS	Byk-Rak, 2-Position, Powder Coated	1					
50	BIKE RACKS	Byk-Rak, 3-Position, Stainless Steel	1					
51	BIKE RACKS	Byk-Rak, 3-Position, Powder Coated	1					
52	BIKE RACKS	Byk-Rak Pivot Plate Only	1					
53	BIKE RACKS	Byk-Rak-Mounting Brackets Only	1					
54	BRAKES	MGM E-Stroke Brake Wear Monitoring System	1					
55	BRAKES	Four Wheel Disc Brakes with ABS	1					
56	COMMUNICATIONS SYSTEM	DC Power Filter for Radio Wiring	1					
57	COMMUNICATIONS SYSTEM	Power Circuit (Route to RH Dash & Electrical Equipment Box) Roof Mount RF/GPS/Cellular Antenna	1					
58	COMMUNICATIONS SYSTEM	Motorola APX 4500	1					
59	COMMUNICATIONS SYSTEM	Motorola APX 6500	1					
60	COMMUNICATIONS SYSTEM	Harris XG-25M	1					
61	COMMUNICATIONS SYSTEM	Antenna Specialist ASP 572 Antenna	1					
62	COMMUNICATIONS SYSTEM	Antenna Specialist ASP 931 Antenna	1					
63	COMMUNICATIONS SYSTEM	Antenna Specialist ASP 930T Antenna with	1					

		RG58 coax cable and TNC connector						
64	COMMUNICA-TIONS SYSTEM	GPS Antenna (Trimble 502 Model 18334)	1					
65	DESTINATION SIGNS	Hanover 100% White LED Sign (17 x 160)--Front ,Side, Rear	1					
66	DESTINATION SIGNS	Hanover 100% Amber LED Sign (17 x 160)--Front ,Side, Rear	1					
67	DESTINATION SIGNS	Hanover 100% Full Color LED Sign (17 x 160)--Front ,Side, Rear	1					
68	DESTINATION SIGNS	Hanover--Add Front Run Sign--White LED	1					
69	DESTINATION SIGNS	Hanover--Add Front Run Sign--Amber LED	1					
70	DESTINATION SIGNS	Hanover--Add Front Run Sign--Color LED	1					
71	DESTINATION SIGNS	Hanover--Delete Rear Sign	1					
72	DESTINATION SIGNS	Hanover Program Soft-ware	1					
73	DESTINATION SIGNS	TwinVision Smart Se-ries 3 100% Silver LED Sign (16 X 160)--Front, Side, and Rear	1					
74	DESTINATION SIGNS	TwinVision Smart Se-ries 3 100% Amber LED Sign (16 x 160)--Front, Side, and Rear	1					
75	DESTINATION SIGNS	Luminator Titan Silver Series LED Sign (24 X 200)--Front, Side, and Rear	1					
76	DESTINATION SIGNS	Luminator Titan Amber Series Sign (24 x 200)--Front, Side, and Rear	1					
77	DESTINATION SIGNS	Luminator GEN 4 Horizon 100% Silver LED Sign (16 x 160)--Front, Side , and Rear	1					
78	DESTINATION SIGNS	Luminator GEN 4 Horizon 100% Amber LED Sign (16x 160)--Front, Side , and Rear	1					
79	DESTINATION SIGNS	Luminator Spectrum 100% Full Color LED	1					

		GEN IV Front Sign (16 x 112)						
80	DESTINATION SIGNS	Luminator/Twinvision--Add Front Run Sign--Amber LED	1					
81	DESTINATION SIGNS	Luminator/Twinvision--Add Front Run Sign--Silver LED	1					
82	DESTINATION SIGNS	Luminator/Twinvision--Add Front Run Sign--Color LED	1					
83	DESTINATION SIGNS	Luminator RearView Camera Integraded into Rear LED Sign	1					
84	DESTINATION SIGNS	Luminator Rearview Camera without Rear LED Sign	1					
85	DESTINATION SIGNS	Luminator--Delete Rear Sign	1					
86	DESTINATION SIGN SOFT-WARE	Luminator Program Software	1					
87	DESTINATION SIGN SOFT-WARE	TwinVision Program Software	1					
88	DESTINATION SIGN SOFT-WARE	Luminator Destination Sign Wireless Program-ming	1					
89	DOOR SYSTEM--FRONT	OEM Standard Air Open/Spring Close Front Door with Full Driver Control--31.75" Minimum Doorway Clear Width	1					
90	DOOR SYSTEM--REAR	OEM Standard Air Open/Spring Close Rear Door with Full Driver Control--31.75" Minimum Doorway Clear Width	1					
91	DOOR SYSTEM--REAR	Add Touch Bars (Air Open / Spring Close) at Rear Door with Driver Override	1					
92	DOOR SYSTEM--REAR	Add Touch Tape at Rear Doors	1					
93	DOOR SYSTEM	Add Exterior Air Re-lease (Front Door Con-trol Valve)	1					

94	DOOR SYSTEM	Add Vapor Class 5 Position Analog Controller	1					
95	DOOR SYSTEM	Add Push Button Door Controls	1					
96	DOOR SYSTEM	Add--Vapor Activair Differential Engine for Slide-Glide Doors	1					
97	DOOR SYSTEM	Add--Vapor CLASS Acoustic (Photo Sensor)	1					
98	DOOR SYSTEM	Add--Vapor Digital Door Control - DDC	1					
99	DOOR SYSTEM	Add--Vapor Electric Transit Operator - ETO	1					
100	DOOR SYSTEM	Add--Vapor Light Touch Bars	1					
101	DOOR SYSTEM	Add--Vapor Optical Pressure Switch - OPS	1					
102	DRIVER BARRIER	None	1					
103	DRIVER BARRIER	Drivers Barrier Storage Box	1					
104	DRIVER BARRIER	Driver's Security Enclosure	1					
105	DRIVER BARRIER	Flat Melamine, Two Piece	1					
106	DRIVER BARRIER	Plexiglass Drivers Security Enclosure Door	1					
107	DRIVER BARRIER	Wrap Around Fiberglass Drivers Barrier	1					
108	DRIVER BARRIER	Wraparound fiberglass, without schedule holders, with drivers barrier grap handle	1					
109	DRIVER CONTROLS	Williams Controls 41 Degree Throttle and Brake Pedal (Non-Adjustable)	1					
110	DRIVER CONTROLS	Kongsberg Adjustable Throttle and Brake Pedal	1					
111	DRIVER CONTROLS	Teleflex Adjustable Throttle and Brake Pedal	1					
112	DRIVER CONTROLS	12 V Cigarette Light Adaptor for PC	1					

		auxilary power- Drivers area						
113	DRIVER HEAT-ERS	Dash Fan	1					
114	DRIVERS SEAT	USSC G2A Evolution, with Fabric, with 3-Point Belt (Lap & Shoulder)	1					
115	DRIVERS SEAT	Recaro Ergo Metro, with Fabric, with 2-Point Belt (Lap)	1					
116	DRIVERS SEAT	Recaro Ergo Metro, with Fabric, with 3-Point Belts (Lap & Shoulder)	1					
117	DRIVERS SEAT	Add Vinyl Upholstery to Recaro Ergo Metro	1					
118	DRIVERS SEAT	Add Orange Shoulder Belt to Recaro Ergo Metro	1					
119	DRIVERS SEAT	Add Adjustable D-Ring to Recaro Ergo Metro	1					
120	DRIVERS SEAT	Add Headrest to Recaro Ergo Metro	1					
121	DRIVERS SEAT	Add Drivers Seat Va-cancy Alarm to Recaro Ergo Metro	1					
122	DRIVERS SEAT	Add Seat Belt Alarm to Recaro Ergo Metro	1					
123	DRIVERS SEAT	USSC 9100 ALX, with Fabric, with 2-Point Belt (Lap)	1					
124	DRIVERS SEAT	USSC 9100 ALX, with Fabric, with 3-Point Belt (Lap & Shoulder)	1					
125	DRIVERS SEAT	USSC G2 Evolution, with Fabric, with 2-Point Belt (Lap)	1					
126	DRIVERS SEAT	USSC G2 Evolution, with Fabric, with 3-Point Belt (Lap & Shoulder)	1					
127	DRIVERS SEAT	USSC G2A Evolution, with Fabric, with 2-Point Belt (Lap)	1					
128	DRIVERS SEAT	USSC Q Series, with Fabric, with 2-Point Belt (Lap)	1					

129	DRIVERS SEAT	USSC Q Series, with Fabric, with 3-Point Belt (Lap & Shoulder)	1					
130	DRIVERS SEAT	Add Vinyl Upholstery to USSC Seat	1					
131	DRIVERS SEAT	Add Orange Shoulder Belt to USSC Seat	1					
132	DRIVERS SEAT	Add Adustable D-Ring to USSC Seat	1					
133	DRIVERS SEAT	Add Headrest to USSC Seat	1					
134	DRIVERS SEAT	Add Drivers Seat Va-cancy Alarm to USSC Seat	1					
135	DRIVERS SEAT	Add Seat Belt Alarm to USSC Seat	1					
136	ELECTRICAL EQUIPMENT CABINET	44"H x 22.5"W x 20"D, 1-Door	1					
137	ELECTRICAL EQUIPMENT CABINET	33"H x 20"D x 22.5"W, 2-Doors	1					
138	ELECTRICAL EQUIPMENT CABINET	33"H x 20"D x 22.5"W, 1-Door	1					
139	ELECTRICAL EQUIPMENT CABINET	33"H x 20"D x 22.5"W, 1-Door, Louvered Back Panel	1					
140	ELECTRICAL EQUIPMENT CABINET	8.25"H x 20"W x 13"D, 1-Door, Curbside Wheelhousing Storage Box	1					
141	ELECTRICAL EQUIPMENT CABINET	Add 5/16" Square Key Lock--Each	1					
142	ELECTRICAL EQUIPMENT CABINET	Add Exhaust Ventila-tion Fan--Each	1					
143	ELECTRICAL EQUIPMENT CABINET	Add Standard Key Lock--Each	1					
144	EXTERIOR LIGHTS	4" Diameter LED Tail Lights--Turn, Tail, Stop, Reverse	1					
145	EXTERIOR LIGHTS	4 LED Headlights (Low & High Beam)	1					
146	EXTERIOR LIGHTS	7" Diameter LED Tail Lights--Turn, Tail, Stop, Reverse	1					

147	EXTERIOR LIGHTS	Add 4" Diameter LED Brake Light--Each	1					
148	EXTERIOR LIGHTS	Add 7" Diameter LED Brake Light--Each	1					
149	EXTERIOR LIGHTS	Add 18" Red LED Strip Brake Light--Each	1					
150	EXTERIOR LIGHTS	Add 18" Amber LED Strip Brake Light--Each	1					
151	EXTERIOR LIGHTS	Add Red LED "STOP" Sign	1					
152	EXTERIOR LIGHTS	Add Amber Triangle Style LED "Yield" Sign	1					
153	EXTERIOR LIGHTS	2 LED Headlights (Low Beam Only)	1					
154	EXTERIOR LIGHTS	2 LED Headlights (High Beam Only)	1					
155	EXTERIOR LIGHTS	Dual Halogen Headlights (Low & High Beam Only)	1					
156	EXTERIOR LIGHTS	Fog Lights	1					
157	EXTERIOR MIRRORS	B&R 10"x11", 2-Piece, Heated, Remote Control (Both Sides)	1					
158	EXTERIOR MIRRORS	B&R 8"x8", 1-Piece, Remote Control Both Sides, Stainless Steel Arms	1					
159	EXTERIOR MIRRORS	B&R 8"x10", 2-Piece, Heated, Remote Control (Both Sides)	1					
160	EXTERIOR MIRRORS	B&R 8"x15", 2-Piece, Heated, Remote Control (Both Sides)	1					
161	EXTERIOR MIRRORS	B&R 10"x13", 1-Piece, Heated, Remote Control (Both Sides)	1					
162	EXTERIOR MIRRORS	Delete Remote Control (Per Side)	1					
163	EXTERIOR MIRRORS	Add Turn Signal Indicator on Exterior Mirror Head	1					
164	EXTERIOR MIRRORS	5" Mirror Front Bike Rack Mirror	1					
165	FARE COLLECTION	No Farebox , Provide Power Circuit and Groundstrap Only	1					

166	FARE COLLEC-TION	GFI 41" Tall Odyssey	1					
167	FARE COLLEC-TION	Add Farebox Lamp, Ceiling mounted	1					
168	FARE COLLEC-TION	Install Customer Provided Farebox Base Plate	1					
169	FIRE SUPPRES-SION SYSTEM	Fogmaker Water Mist Fire Suppression System	1					
170	FIRE SUPPRES-SION SYSTEM	Amerex V-25 Fire Suppression System	1					
171	FIRE SUPPRES-SION SYSTEM	Kidde Dual Spectrum LTD Fire Detection and Suppression System	1					
172	FIRE SUPPRES-SION SYSTEM	Add Kidde Armored LTD	1					
173	FIRE SUPPRES-SION SYSTEM	Add Kidde TLSE	1					
174	FIRE SUPPRES-SION SYSTEM	Add Kidde Optical Sensor (each)	1					
175	FLOORING	Greenwood ACQ Plywood	1					
176	FLOORING	Altro Transflor	1					
177	FLOORING	RCA Rubber Flooring	1					
178	FLOORING	Composite Sub Floor	1					
179	FLOORING	Gerflor Tarabus Helios Flooring	1					
180	FLOORING	Stainless Steel Trim on Risers and Wheelhousings	1					
181	FRAME	None	1					
182	FRAME	Engine Skid Protection with Extended Tow Eyes	1					
183	FRAME	Engine Skid Protection W/ Extended Tow Eyes & 2" Thick x 2" Wide Wear Plate	1					
184	FRAME	Reinforced A-Post Skid Plates (Per Side)	1					
185	FRAME	Frame Undercoating	1					
186	GAUGES--DRIV-ERS DASH	Speedometer, Air Pressure Gauge, 12/24 volt Gauges, Coolant Temp Gauge, State of Charge	1					
187	GAUGES--DRIV-ERS DASH	Add Low State of Charge Alarm	1					

188	GAUGES--DRIVERS DASH	Add Low State of Charge Warning Indicator	1					
189	GAUGES--DRIVERS DASH	Add Engine Hour Meter	1					
190	GAUGES--DRIVERS DASH	Add Auxiliary Stop Request Light	1					
191	GAUGES--DRIVERS DASH	Add Mutil Function Display (MFD)	1					
192	HEATING/AIR CONDITIONING	Thermo King TE-14 All-Electric	1					
193	HEATING/AIR CONDITIONING	Sutrak All-Electric HVAC SYSTEM--(Roof Mounted/Rear Mounted HVAC system)	1					
194	HEATING/AIR CONDITIONING	SanUVAire- Safe Breathe Air Purification System	1					
195	HEATING/AIR CONDITIONING	Thermo King Pressure and Return Display Mounted to Unit	1					
196	HUBOMETER	Veeder Root Mechanical without Tenths, without Guard	1					
197	HUBOMETER	E J Ward Data System (Includes CANceiver, Display Unit, and Antenna)	1					
198	HUBOMETER	Engler (Stemco) Mechanical without Tenths, without Guard	1					
199	HUBOMETER	S/A Fleetwatch Data Logger JX 55	1					
200	HUBOMETER	Add Hubodometer Guard	1					
201	INTERIOR LIGHTS	LED Interior Lights	1					
202	INTERIOR MIRRORS	8.25" x 16" Interior Rear View Mirror, Flat Faced	1					
203	INTERIOR MIRRORS	12" Convex at Rear Door Stanchion	1					
204	INTERIOR MIRRORS	6" Flat Faced Spot Mirror at Bottom of Front Destination Sign Compartment	1					
205	INTERIOR MIRRORS	4.75" x 15" Interior Mirror, Flat Faced	1					

206	ITS SYSTEM	None	1					
207	ITS SYSTEM	Avail IVU with MDC, GPS, APC, and WLAN	1					
208	ITS SYSTEM	Avail System Pre-Wire (IVU, MDT, APC, Fare Box)	1					
209	ITS SYSTEM	Clever Devices IVN 5 (AVL/GPS/CAD/Automatic Stop Annunciation)	1					
210	ITS SYSTEM	Clever Devices Automatic Vehicle Monitoring System	1					
211	ITS SYSTEM	Clever Devices BusTime System	1					
212	ITS SYSTEM	Clever Devices CleverCAD System	1					
213	ITS SYSTEM	Clever Devices CleverVision	1					
214	ITS SYSTEM	Clever Devices Secure Bus Access System	1					
215	ITS SYSTEM	Clever Devices Turn Warning System	1					
216	ITS SYSTEM	Opticom Traffic Signal Priority	1					
217	ITS SYSTEM	MobileEye Collision Avoidance System	1					
218	ITS SYSTEM	Transloc Transit Visualization System AVL	1					
219	ITS SYSTEM	Intelligent Vehicle System Prewire Only (Pending System Specification)	1					
220	ITS SYSTEM	Luminator InfoTransit--2 Monitors (18.5") Proxys Module	1					
221	ITS SYSTEM	Luminator InfoTransit--Upgrade to 29" Monitors	1					
222	ITS SYSTEM	Luminator InfoTransit--Upgrade to 37" Monitors	1					
223	ITS SYSTEM	Luminator InfoLite--2 Monitors (18.5") Proxys Module	1					
224	ITS SYSTEM	Luminator InfoLite--Upgrade to 29" Monitors	1					

225	ITS SYSTEM	Luminator InfoLite--Upgrade to 37"Monitors	1					
226	MISCELLANOUS	Scissor Style Sunshades--Drivers Windows	1					
227	MISCELLANOUS	Drivers Coat Hook	1					
228	MISCELLANOUS	Roller Style Sunshades--Drivers Windows	1					
229	MISCELLANOUS	Euramatic Cup Holder	1					
230	MISCELLANOUS	Registration Card holder	1					
231	MISCELLANOUS	Stainless Steel Waste Basket and Bracket	1					
232	MODESTY PANELS	Standard Melamine Panels on Lower Section	1					
233	MODESTY PANELS	Quick Changing Glazing Upper Clear Plexiglas Modesty Panels Both Sides of Rear Exit Door	1					
234	MODESTY PANELS	Front Door Modesty Panel	1					
235	MODESTY PANELS	Lower Modesty Panel Forward of Rear Door	1					
236	MODESTY PANELS	Melamine Panel Lower Section (Aft Rear Door)	1					
237	MODESTY PANELS	Upper Clear Plexiglas Modesty Panel Forward Rear Door	1					
238	PAINT	One Color w/ Black Mask at Windows	1					
239	PAINT	Add--Additional Color--Per Pass	1					
240	PAINT	Add--Clear Coat	1					
241	PAINT	Add Roof Numbers	1					
242	PAINT	Custom Paint / Decal Design (Per Spec)	1					
243	PASSENGER BARRIERS	Wheelchair Barrier--Curbisde Aft of ADA Area	1					
244	PASSENGER BARRIERS	Wheelchair Barrier--Streetside Aft of ADA Area	1					

245	PASSENGER SEATING	USSC 4ONE Gemini	1					
246	PASSENGER SEATING	Kiel North America Citos	1					
247	PASSENGER SEATING	Kiel North America Intra	1					
248	PASSENGER SEATING	USSC 4One Angel	1					
249	PASSENGER SEATING	AMSECO Vision	1					
250	PASSENGER SEATING	AMSECO Insight	1					
251	PASSENGER SEATING	AMESCO Insight Prime Plus	1					
252	PASSENGER SEATING	Add--USB Charging Ports at Passenger Locations	1					
253	PASSENGER SEATING	Add--Hinged Rear Settee	1					
254	PASSENGER SEATING	Add--3rd Step To Perimeter Seating (Except Settee)	1					
255	PASSENGER SIGNALS	Pull Cords (Neutral) with Touch Pad at Wheelchair Location	1					
256	PASSENGER SIGNALS	Stop Request Button At Rear Door Stanchion	1					
257	PASSENGER SIGNALS	Touch Tape (At Window Mullions)	1					
258	PASSENGER WINDOWS	Ricon Hidden Frame/Bonded--Full Fixed	1					
259	PASSENGER WINDOWS	Ricon Standard Frame, Safety Glass--Full Sliders	1					
260	PASSENGER WINDOWS	Ricon Standard Frame, Safety Glass--Full Fixed	1					
261	PASSENGER WINDOWS	Add Thermo Guard to Ricon Standard Frame	1					
262	PASSENGER WINDOWS	Add Thermo Guard to Ricon Hidden Frame/Bonded	1					
263	PASSENGER WINDOWS	Arow Standard Frame, Safety Glass--Full Sliders	1					
264	PASSENGER WINDOWS	Arow Standard Frame, Safety Glass--Full Fixed	1					

265	PASSENGER WINDOWS	Arow Hidden Frame/Bonded--Full Fixed	1					
266	PASSENGER WINDOWS	Add Thermo Guard to Arow Standard Frame	1					
267	PASSENGER WINDOWS	Add Thermo Guard to Arow Hidden Frame/Bonded	1					
268	PASSENGER WINDOWS	Add Window Guards (Acrylic or Film)	1					
269	PUBLIC AN-NOUNCEMENT SYSTEM	PA with Handheld Mic w / (8) Flush Mount Speakers 40' (6) w / 30'	1					
270	PUBLIC AN-NOUNCEMENT SYSTEM	(1) Interior/Both/Exte-rior Speaker Selct Tog-gle Switch without Guard & (1) Rheostat Volume Control with XLR Mic Jack	1					
271	PUBLIC AN-NOUNCEMENT SYSTEM	Boom Microphone--Soundview SVA50SF (24") without ON/OFF Switch on Microphone, Momentary Button toe Switch, Floor Bracket Mounted	1					
272	PUBLIC AN-NOUNCEMENT SYSTEM	Clever Devises - Speakeasy II	1					
273	PUBLIC AN-NOUNCEMENT SYSTEM	Luminator VAS Sys-tem	1					
274	PUBLIC AN-NOUNCEMENT SYSTEM	Clever Devices Auto-mated Voice An-nouncement System	1					
275	REAR RUN GAUGES	Add Hour Meter	1					
276	REAR RUN GAUGES	Add A/C Hour Meter	1					
277	REAR RUN GAUGES	Add Coolant Tempera-ture--Mechanial	1					
278	REAR RUN GAUGES	Add Coolant Tempera-ture--Electrical	1					
279	REAR RUN GAUGES	Add Voltmeter (12V or 24V)	1					
280	ROOF HATCHES	Manual Hatch at Front and Rear Positions	1					
281	ROOF HATCHES	Delete (1) Roof hatch	1					

282	SAFETY EQUIPMENT	5LBS ABC Fire Extinguisher (Mounted Behind Driver Seat)	1					
283	SAFETY EQUIPMENT	Safety Triangles (K-D 610-4645)	1					
284	SAFETY EQUIPMENT	Bio- Hazard Disposal Kit	1					
285	SAFETY EQUIPMENT	Blood Born Pathogens Kit	1					
286	SAFETY EQUIPMENT	Ten Unit First Aid Kit	1					
287	SAFETY EQUIPMENT	Wheel Chocks (Per Set)	1					
288	SCHEDULE RACK	NONE	1					
289	SCHEDULE RACK	(1) Schedule Holder OBIC 20/9 4PW-49/923BO- 4 Slots,Gray Color	1					
290	SCHEDULE RACK	22" x 21" Black, RH Load Open Back	1					
291	SCHEDULE RACK	Innocom Schedule Racks 3.75" x 7" x 1.5"	1					
292	SCHEDULE RACK	Innocom Schedule Racks 8.62" x 1 1" x 1"	1					
293	SCHEDULE RACK	OBIC To (4) Quad Pamphlet & (1) Single Pamphlet Holders	1					
294	SCHEDULE RACK	Transit Info Products OBICT10P2LTRMC	1					
295	SCHEDULE RACK	Transit Information Products -19"x 21" OBIC 19/214P1LTRMC	1					
296	STANCHIONS/GRAB RAILS	Stainless Steel Vertical Stanchions, Grabrails, and Modesty Panel Tubes	1					
297	STANCHIONS/GRAB RAILS	Vinyl Coated Nylon Grab Straps--Each	1					
298	STANCHIONS/GRAB RAILS	Yellow Powder Coated Vertical Stanchions, Grab Rails, and Modesty Panel Tubes	1					
299	STANCHIONS/GRAB RAILS	Yellow Powder Coated Vertical Stanchions Only	1					

300	STAN-CHIONS/GRAB RAILS	Vehicle Stanchion at Front Wheel Wells--Each	1					
301	STAN-CHIONS/GRAB RAILS	Add Farebox Grabrail	1					
302	STAN-CHIONS/GRAB RAILS	Horizontal Grabrail on Curbside & Streetside Wheelhousing	1					
303	STAN-CHIONS/GRAB RAILS	SSTL Spring Loaded Grab Handle--Each	1					
304	STEERING SYS-TEM	Douglas, Single Tilt, Without Column Turn Signal, Without High-Low Beam Switch	1					
305	STEERING SYS-TEM	Steering Wheel--Standard 20" Non-Padded 3 Spoke Wheel with Center Horn Button	1					
306	STEERING SYS-TEM	Ross Model TS 65	1					
307	STEERING SYS-TEM	Steering Box--TRW TAS6505	1					
308	STEERING SYS-TEM	TRW Electric Assisted Steering	1					
309	STEEERING SYSTEM	VIP Textured Steering Wheel	1					
310	STYLING PACK-AGES	Standard Styling Package	1					
311	STYLING PACK-AGES	Windshield 2-Piece	1					
312	STYLING PACK-AGES	Windshield 1-Piece	1					
313	STYLING PACK-AGES	BRT Front Cap Styling Only	1					
314	STYLING PACK-AGES	BRT Front Cap, Rear Cap and Engine Door Styling	1					
315	STYLING PACK-AGES	BRT PLUS Front Cap, Rear Cap, Roof Line and Engine Door Styling	1					
316	STYLING PACK-AGES	BRT Roof Fairings, Front or Rear (each)	1					
317	SURVEILLANCE CAMERA SYS-TEMS	Apollo (8) Standard Definition Color Camera System, 6TB HDD,	1					

		GPS, Wireless, Impact Sensor						
318	SURVEILLANCE CAMERA SYSTEMS	Apollo--Add (1) Standard Definition Coler Camera	1					
319	SURVEILLANCE CAMERA SYSTEMS	Apollo--Delete (1) Standard Definition Color Camera	1					
320	SURVEILLANCE CAMERA SYSTEMS	Apollo--Add (1) High Definition Color Camera	1					
321	SURVEILLANCE CAMERA SYSTEMS	Apollo--Add 8TB HDD	1					
322	SURVEILLANCE CAMERA SYSTEMS	Apollo Back Up Camera with LCD Screen	1					
323	SURVEILLANCE CAMERA SYSTEMS	SEON NX-16 (7) Camera System, 2TB HDD, Wireless, GPS, Impact Sensor	1					
324	SURVEILLANCE CAMERA SYSTEMS	SEON Add (1) Standard Definition Color Camera	1					
325	SURVEILLANCE CAMERA SYSTEMS	SEON Add (1) High Definition Color Camera	1					
326	SURVEILLANCE CAMERA SYSTEMS	SEON Add Solid State Harddrive (SSD)	1					
327	SURVEILLANCE CAMERA SYSTEMS	AngelTrax (7) Standard Definition Color Camera System, 1TB HDD, Wireless, GPS, Impact Sensor	1					
328	SURVEILLANCE CAMERA SYSTEMS	AngelTrax--Add (1) Standard Definition Color Camera	1					
329	SURVEILLANCE CAMERA SYSTEMS	AngelTrax--Add (1) High Definition Color Camera	1					
330	SURVEILLANCE CAMERA SYSTEMS	AngelTrax--Add 1TB HDD (Double stacked 500GB HDD)	1					
331	SURVEILLANCE CAMERA SYSTEMS	March Network 5412 (10) Camera--Kalatel Mobileview	1					

332	SURVEILLANCE CAMERA SYS-TEMS	Mobileview NVR7000 (10) Camera System, High Definition, 4TB HDD, Wireless, GPS, Impact Sensor	1					
333	SURVEILLANCE CAMERA SYS-TEMS	Mobileview--Add (1) High Definition Cam-era	1					
334	SURVEILLANCE CAMERA SYS-TEMS	Mobileview--Add Solid State Harddrive (SSD)	1					
335	SURVEILLANCE CAMERA SYS-TEMS	REI Bus Watch Digital	1					
336	SURVEILLANCE CAMERA SYS-TEMS	Camera Pre Wire Pack-age	1					
337	TIRES	Agency Supplied Tires	1					
338	TIRES	OEM Supplied Tires	1					
339	TIRES	Tire Pressure Monitor-ing System	1					
340	TOWING	None	1					
341	TOWING	Cole Hersee 12063 Electrical Tow Con-nector	1					
342	TOWING	Delete Cole Hersee Tow Connector	1					
343	WHEELCHAIR RAMP	Lift U--Ramp (LU-18 Dual Mode Front Door Ramp Only)	1					
344	WHEELCHAIR RAMP	Ricon--6:1 Ratio, Sin-gle Slope Ramp – SSR - Front Door Only	1					
345	WHEELCHAIR RAMP	Ricon – 4:1 Ratio, FR2E - Front Door Only	1					
346	WHEELCHAIR SECUREMENT	USSC--V-PRO-Reliant	1					
347	WHEELCHAIR SECUREMENT	Kiel North America K-Pod with Secubar	1					
348	WHEELCHAIR SECUREMENT	American Seating--Dual Auto Lok with Advanced Restraint Module (ARM)	1					
349	WHEELCHAIR SECUREMENT	American Seating--Ad-vanced Restraint Mod-ule (ARM) with Re-mote Belt Release	1					

350	WHEELCHAIR SECUREMENT	American Seating--Q'Straint Q'Pod	1					
351	WHEELCHAIR SECUREMENT	USSC--Q'Straint Q' POD	1					
352	WHEELCHAIR SECUREMENT	Q'Straint Quantum	1					
353	WHEELCHAIR SECUREMENT	Belt Guard and Wheelchair Ramp Pan Identification Numbers	1					
354	WHEELS/RIMS	(7) Alcoa Aluminum Polished Finish with Durabrite	1					
355	WHEELS/RIMS	(7) Steel Powder Coated Finish, White or Black	1					
356	WHEELS/RIMS	(7) Alcoa Aluminum Clean & Buff Finish	1					
357	WHEELS/RIMS	(7) Alcoa Aluminum Polished Finish	1					
358	WHEELS/RIMS	(7) Alcoa Aluminum Clean & Buff Finish with Durabrite	1					
359	WHEELS/RIMS	Alcoa Wheels--Add Duraflange	1					
360	WHEELS/RIMS	Delete Spare Aluminum Wheel	1					
361	WHEELS/RIMS	Delete Spare Steel Wheel	1					
362	DECALS & SIGNAGE	ADA Priority Seat Decals--"PLEASE OFFER THESE SEATS TO THE ELDERLY AND PERSONS WITH DISABILITIES", White on Clear	1					
363	DECALS & SIGNAGE	Drivers Instructions & Warning--English, Black on White	1					
364	DECALS & SIGNAGE	Interior Rear Step Floor Decals--"WATCH YOUR STEP", White Lettering on Red Background	1					
365	DECALS & SIGNAGE	Interior Symbol Decals (3)--ISO Symbols, No Smoking/Eating/Drinking/Radio. White on Black	1					

366	DECALS & SIGNAGE	Vehicle Height Decal--English "Caution Clearance Height XX FT XX IN, Black on Yellow	1					
367	DECALS & SIGNAGE	Drivers /Passengers Standee Warning Decal for Florida--"It Is A Violation For This Bus To Be In Operation With Passengers Occupying The Area Forward Of Yellow Line. Therefore Passengers May Not Stand Forward Of The Yellow Line While Bus Is In Motion." White on Black	1					
368	DECALS & SIGNAGE	Wheechair Securement Decals--"WHEELCHAIR SEATING AREA SECUREMENTS ARE LOCATED BELOW THESE SEATS", Black on Optically Clear	1					
369	DECALS & SIGNAGE	TrilingualDecals	1					
370	DECALS & SIGNAGE	Yield Sign Decal	1					
371	MANUALS	Drivers, Service, Parts, Electrical, Vendor (Hardcopy) & Compact Disc (CD)--1 Set Hardcopy & 1 CD (Up to 3 buses ordered)	1					
372	MANUALS	Additional Driver's Handbook--Each	1					
373	MANUALS	Additional Service Manual (Hardcopy)--Each	1					
374	MANUALS	Additional Parts Manual (Hardcopy)--Each	1					
375	MANUALS	Additional Electrical Schematics (Hardcopy)--Each	1					
376	MANUALS	Additional Drivers, Service, Parts, or	1					

		Electrical Schematics (CD)--Each						
377	MANUALS	Additional Vendor Manuals (Hardcopy)--Each	1					
378	MANUALS	Additional Vendor Manuals (CD)--Each	1					
379	TRAINING	Operator Orientation Training--By Bus Manufacturer at Agency Property (Per Driver/Per Class)	1					
380	TRAINING	Maintenance Orientation Training--By Bus Manufacturer at Agency Property (Per Technician/Per Class)	1					
381	TRAINING	Steering System--By OEM Supplier at Agency Property (Per Technician/Per Class)	1					
382	TRAINING	Chassis & Body--By OEM Supplier at Agency Property (Per Technician/Per Class)	1					
383	TRAINING	Door Systems--By OEM Supplier at Agency Property (Per Technician/Per Class)	1					
384	TRAINING	Suspension--By OEM Supplier at Agency Property (Per Technician/Per Class)	1					
385	TRAINING	Electrical & Electronics----By Bus Manufacturer and/or OEM Supplier at Agency Property (Per Technician/Per Class)	1					
386	TRAINING	Air & Brake Systems--By OEM Supplier at Agency Property (Per Technician/Per Class)	1					
387	TRAINING	HVAC & Climate Controls--By OEM Supplier at Agency Property (Per Technician/Per Class)	1					

388	TRAINING	Wheelchair Ramp--By OEM Supplier at Agency Property (Per Technician/Per Class)	1					
389	TRAINING	Destination Sign--By OEM Supplier at Agency Property (Per Technician/Per Class)	1					
390	TRAINING	Fire Suppression--By OEM Supplier at Agency Property (Per Technician/Per Class)	1					
391	TRAINING	Camera System Training--By OEM Supplier at Agency Property (Per Technician/Per Class)	1					
392	TRAINING	Automatic Passenger Counting System--By OEM Supplier at Agency Property (Per Technician/Per Class)	1					
393	TRAINING	Fare Collection Training--By OEM Supplier at Agency Property (Per Technician/Per Class)	1					
394	TRAINING	ITS Technical Training--By OEM Supplier at Agency Property (Per Technician/Per Class)	1					
395	TRAINING	EV HV Battery ESS By OEM Supplier at Agency Property (Per Technician/Per Class)	1					
396	TRAINING	EV Proplusion Operation & Diagnostics By OEM Supplier at Agency Property (Per Technician/Per Class)	1					
397	TRAINING	High Voltage Safety By OEM Supplier at Agency Property (Per Technician/Per Class)	1					
398	TRAINING MODULES	Thermo-King Intelligaire Training Module	1					
399	TRAINING MODULES	I/O Controls Multiplex Board	1					

400	TRAINING MODULES	Air Brake Training Board	1					
401	TRAINING MODULES	Vapor Door Training Module	1					
402	BATTERY	Battery Lease	1yr					
TOTAL								

PRICE OFFER	
TOTAL PRICE	
TOTAL PRICE OFFER --->	**$**

NAME & TITLE OF OFFEROR'S REPRESENTATIVE:
(print or type)

(Name & Title)

(Offeror's Name)

SIGNATURE & DATE:

(Signature of Offeror's Representative) Date

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.

PSTA
RFP 21-980369

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 they 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 nondisclosure 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 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 $$150,000.

Certificate of Compliance

The Contractor hereby certifies that it will comply with the requirements of 49 USC 5323(j)(1) and (13), as amended, and the regulations of 49 CFR 661.11:

Name and title:
Company:

_____

Authorized signature Date

OR

Certificate of Non-Compliance

The Contractor hereby certifies that it cannot comply with the requirements of 49 USC 5323(j)(1) and (13), as amended, but may qualify for an exception to the requirements consistent with 49 USC 5323(j)(1) and (13), as amended, and regulations in 49 CFR 661.7.

Name and title:
Company:

_____

Authorized signature Date

CER 8.2 Debarment and Suspension Certification for Prospective Contractor

Primary covered transactions must be completed by Proposer for contract value over $25,000.

Choose one alternative:

☐ The Proposer, [insert name], certifies to the best of its knowledge and belief that it and its principals:

1. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any federal department or agency;
2. Have not within a three-year period preceding this Proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (federal, state or local) transaction or Contract under a public transaction; violation of federal or state antitrust statutes or commission or embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
3. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (federal, state, or local) with commission of any of the offenses enumerated in Paragraph 2 of this certification; and
4. Have not within a three-year period preceding this Proposal had one or more public transactions (federal, state or local) terminated for cause or default.

OR

☐ The Proposer is unable to certify to all of the statements in this certification, and attaches its explanation to this certification. (In explanation, certify to those statements that can be certified to and explain those that cannot.)

The Proposer certifies or affirms the truthfulness and accuracy of the contents of the statements submitted on or with this certification and understands that the provisions of Title 31 USC § Sections 3801 are applicable thereto.

Executed in [insert city and state]**.**

Name:

_____

Authorized signature Date

CER 8.3 Debarment and Suspension Certification (Lower-Tier Covered Transaction)

This form is to be submitted by each Subcontractor receiving an amount exceeding $25,000.

The prospective lower-tier participant (Proposer) certifies, by submission of this Proposal, that neither it nor its "principals" as defined at 49 CFR § 29.105(p) is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any federal department or agency.

If the prospective Proposer is unable to certify to the statement above, it shall attach an explanation, and indicate that it has done so by placing an "X" in the following space: _____

THE PROPOSER, _____, CERTIFIES OR AFFIRMS THE TRUTHFULNESS AND ACCURACY OF EACH STATEMENT OF ITS CERTIFICATION AND EXPLANATION, IF ANY. IN ADDITION, THE PROPOSER UNDERSTANDS AND AGREES THAT THE PROVISIONS OF 31 USC §§ 3801 *ET SEQ*. APPLY TO THIS CERTIFICATION AND EXPLANATION, IF ANY.

Name and title of the Proposer's authorized official:

_____

Authorized signature Date

CER 8.4 Non-Collusion Affidavit

This affidavit is to be filled out and executed by the Proposer; if a corporation makes the bid, then by its properly executed agent. The name of the individual swearing to the affidavit should appear on the line marked "Name of Affiant." The affiant's capacity, when a partner or officer of a corporation, should be inserted on the line marked "Capacity." The representative of the Proposer should sign his or her individual name at the end, not a partnership or corporation name, and swear to this affidavit before a notary public, who must attach his or her seal.

State of _____, County of _____

I, _____, being first duly sworn, do hereby state that
(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 Agency, is directly or indirectly interested therein.

_____
Signature of Affiant Date

The foregoing instrument was sworn to before me by means of ☐ physical presence or ☐ online notarization this _____ day of _____, 20_____, by _____(name), as _____(type of authority)_____ on behalf of the ___(type of business entity)_____. She/he is [ ] personally known to me or [ ] has produced _____ (type of identification) as identification.

_____
Notary public My commission expires

Seal

CER 8.5 Lobbying Certification

This form is to be submitted with an offer exceeding $100,000.

The Proposer certifies, to the best its knowledge and belief, that:

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

2. If any funds other than federal appropriated funds have been paid or will be paid to any person for making lobbying contacts to an officer or employee of any agency, a member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with this federal Contract, grant, loan or cooperative agreement, the undersigned shall complete and submit Standard Form LLL, "Disclosure Form to Report Lobbying," in accordance with its instruction, as amended by "Government wide Guidance for New Restrictions on Lobbying," 61 Fed. Reg. 1413 (1/19/96).

3. The undersigned shall require that the language of this certification be included in the award documents for all sub awards at all tiers (including subcontracts, sub grants and contracts under grants, loans and cooperative agreements) and that all sub recipients shall certify and disclose accordingly. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31, USC § 1352 (as amended by the Lobbying Disclosure Act of 1995). Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

THE PROPOSER, _____, CERTIFIES OR AFFIRMS THE TRUTHFULNESS AND ACCURACY OF EACH STATEMENT OF ITS CERTIFICATION AND DISCLOSURE, IF ANY. IN ADDITION, THE PROPOSER UNDERSTANDS AND AGREES THAT THE PROVISIONS OF 31 USC §§ 3801 ET SEQ. APPLY TO THIS CERTIFICATION AND DISCLOSURE, IF ANY.

Name of the bidder or Proposer's authorized official:

_____

Title:

_____

_____

Signature Date

Per paragraph 2 of the included form Lobbying Certification, add Standard Form–LLL, "Disclosure Form to Report Lobbying," if applicable.

CER 8.6 Certificate of Compliance with Bus Testing Requirement

The undersigned certifies that the vehicle offered in this procurement complies and will, when delivered, comply with 49 USC § 5323(c) and FTA's implementing regulation at 49 CFR Part 665 according to the indicated one of the following three alternatives.

Mark one and only one of the three blank spaces with an "X."

1. _____ The buses offered herewith have been tested in accordance with 49 CFR Part 665 on _____ (date). If multiple buses are being proposed, provide additional bus testing information below or on attached sheet. The vehicles being sold should have the identical configuration and major components as the vehicle in the test report, which must be submitted with this Proposal. If the configuration or components are not identical, then the manufacturer shall provide with its Proposal a description of the change and the manufacturer's basis for concluding that it is not a major change requiring additional testing. If multiple buses are being proposed, testing data on additional buses shall be listed on the bottom of this page.

2. _____ The manufacturer represents that the vehicle is "grandfathered" (has been used in mass transit service in the United States before October 1, 1988, and is currently being produced without a major change in configuration or components), and submits with this Proposal the name and address of the recipient of such a vehicle and the details of that vehicle's configuration and major components.

3. _____ The vehicle is a new model and will be tested and the results will be submitted to the Agency prior to acceptance of the first bus.

The undersigned understands that misrepresenting the testing status of a vehicle acquired with federal financial assistance may subject the undersigned to civil penalties as outlined in the Department of Transportation's regulation on Program Fraud Civil Remedies, 49 CFR Part 31. In addition, the undersigned understands that FTA may suspend or debar a manufacturer under the procedures in 49 CFR Part 29.

Company name:

Name and title of the Proposer's authorized official:

_____

Authorized signature Date

CER 8.7 DBE Approval Certification

I hereby certify that the Proposer has complied with the requirements of 49 CFR 26, Participation by Disadvantaged Business Enterprises in DOT Programs, and that its goals have not been disapproved by the Federal Transit Administration.

Name and title of the Proposer's authorized official:

_____

Authorized signature Date

CER 8.8 Federal Motor Vehicle Safety Standards

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

Company name:

Name of signer:

Title:

_____

Authorized signature Date

CER 9. Other Certifications

CER 9.1 Proposal Form

Proposer shall complete the following form and include it in the price Proposal.

PROPOSAL

By execution below by a duly authorized representative(s) of the Proposer, the Proposer hereby offers to furnish equipment and services as specified in its Proposal submitted to Pinellas Suncoast Transit Authority in response to Request for Proposal No. 21-980369 Electric Transit Buses with Charging and Associated Equipment

Proposer: _____

Street address: _____

City, state, ZIP: _____

Name and title of Authorized Signer(s): _____

Name and title of Authorized Signer(s): _____

Phone: _____

_____

Authorized signature Date

_____

Authorized signature Date

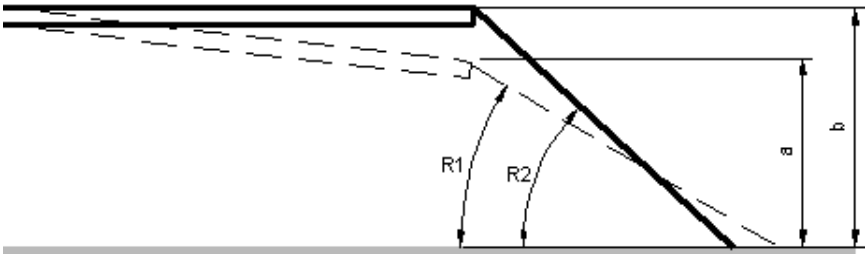
CER 10. Vehicle Technical Information

This form must be completed and included in the Technical Proposal. NOTE—one form must be completed for each type of bus submitted in response to this RFP

GENERAL COACH DATA SHEET						
Bus manufacturer:						
Bus model:						
Understructure manufacturer:						
Model number:						
Size/Type of Bus						
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.

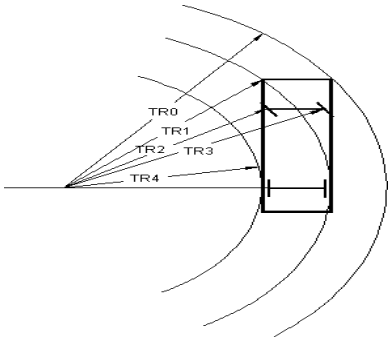
Floor height above ground (centerline of bus)

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)		sq ft		
Minimum distance between wheelhouses:	Front			in.
	Rear			in.
	Center			in.
Maximum interior floor slope (from horizontal)		deg		

Passenger capacity provided		
Total maximum seating		
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										

Energy Storage

Batteries – low voltage

Manufacturer	
Type	
Model number	
Cold Cranking Amps	Amps

Cranking Amps		Amps
Reserve Capacity		Amps

Batteries – high voltage

Manufacturer	
Type	
Model Number	
Total Battery Capacity (kWh)	
Standard Charge Time	
Charging Capacity	
Operating Temperature Range	
Cooling/Heating System	

Performance

Fuel Economy (w/full passenger load, HVAC, and all electric accessories in use)		kWh
Fuel Economy (w/full passenger load, HVAC, and all electric accessories in use)		MPGE
Max Gradeability		%
Top Speed		MPH
Battery Range		Miles
Acceleration (20 MPH)		Seconds
Acceleration (40 MPH)		Seconds
Top Speed (stated above)		Seconds

Performance information/graphs to be attached with this form:

Energy consumption vs. Vehicle speed

Vehicle speed vs. time (both loaded and unloaded)

Vehicle speed vs. grade (both loaded and unloaded)

Acceleration vs. time

Change of acceleration vs. time

Traction Motor/Drive Motor

Manufacturer				
Type				
Speeds				
Traction motor horsepower rating				
Type ventilation/cooling				
Gear ratios	Forward:		Reverse:	

Voltage Equalizer

Manufacturer	
Model	

Auxiliary Inverter (120/240)

Manufacturer	
Model	
Inverter Technology	
Output Voltage	

Traction/Drive Motor			
Manufacturer			
Type			
Model			
Quantity			
Torque Rating			
kWh Rating			
Air compressor			
Manufacturer			
Type			
Rated capacity			CFM
Capacity at idle (approximately)			CFM
Capacity at maximum speed (engine)			CFM
Maximum warranted speed			rpm
Speed idle			rpm
Drive type			
Governor:			
Cut-in pressure			psi
Cut-out pressure			psi
Axles			
First			
Manufacturer			
Type			
Model number			
Gross axle weight rating			lb
Axle load			lb
Second			
Manufacturer			
Type			
Model number			
Gross axle weight rating			lb
Axle load			lb
Third			
Manufacturer			
Type			
Model number			
Gross axle weight rating			lb

Axle load		lb	
Axle ratio			
Suspension system			
Manufacturer			
Type:	First:		
	Second:		
	Third:		
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		lb (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 (Place X denoting type)				
First:	Manufacturer			
	Part number			
	Diameter		in.	
Second:	Manufacturer			
	Part number			
	Diameter		in.	
Third:	Manufacturer			
	Part number			
	Diameter		in.	
Brake lining/pad manufacturer				
Type				
Brake lining/pad 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/pad lengths		
First		in.
Second		in.
Third		in.
Brake lining thickness/pad		in.
Brake lining/pad per axle		
First		sq. in.
Second		sq. in.
Third		sq. in.

Cooling system

Radiator				
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		qt		
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		cu in.
Primary reservoir		cu in.
Secondary reservoir		cu in.

Packing reservoir		cu in.
Accessory reservoir		cu in.
Other reservoir type		cu in.

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				lb	
Oil capacity	Dry		gal		
	Wet		gal		
Refrigerant:	Type				lb

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		lb

Condenser fan drive motors

Manufacturer	

Model			
Type			
Horsepower			hp
Operating speed			rpm
Evaporator fan drive motors			
Manufacturer			
Model			
Type			
Horsepower			hp
Operating speed			rpm
Evaporator(s)			
Manufacturer			
Model			
Number of rows			
Number of fins/in.			
Outer diameter of tube			in.
Fin thickness			in.
Number of evaporators			
Expansion valve			
Manufacturer			
Model			
Filter-drier			
Manufacturer			
Model			
Heater cores			
Manufacturer			
Model			
Capacity			Btu/hr
Number of rows			
Number of fins/in.			
Outer diameter of tube			in.
Fin thickness			in.
Number of heater cores			
Floor heater blowers			
Front			
Rear			

Controls			
Manufacturer			
Model			
Driver's heater			
Manufacturer			
Model			
Capacity		Btu/hr	
Ventilation system			
Type			
Coolant heater			
Make			
Model			
Capacity		Btu	
Interior lighting			
Manufacturer			
Type			
Number of fixtures			
Size of fixtures			
Power pack			
Doors			
Front			
Manufacturer of operating equipment			
Type of door			
Type of operating equipment			
Rear			
Manufacturer of operating equipment			
Type of door			
Type of operating equipment			
Passenger windows			
Front			
Manufacturer			
Model			
Type			
Number:	Side		

	Rear		
Sizes:			
Glazing:	Type		
	Thickness		
	Color of tint		
	Light transmission		

Mirrors

	Size	Type	Manufacturer	Part no.	Model no.
Right side exterior					
Left side exterior					
Center rearview					
Front entrance area					
Upper-right corner					
Rear exit area					

Seats

Passenger	
Manufacturer	
Model	
Type	

Operator	
Manufacturer	
Model and part number	
Type	

Paint

Manufacturer	
Type	

Wheelchair ramp equipment

Manufacturer		
Model number		
Capacity		lb
Width of platform		in.
Length of platform		in.
System fluid capacity		qt
Type of fluid used		
Operating hydraulic pressure		psi
Hydraulic cylinders:	Size	

	Number		
Wheelchair securement equipment			
Manufacturer			
Model number			
Destination signs			
Manufacturer			
Type			
Character length			
Front destination		in.	
Front route		in.	
Curbside destination		in.	
Rear route		in.	
Character height			
Front destination		in.	
Front route		in.	
Curbside destination		in.	
Rear route		in.	
Number of characters			
Front destination			
Front route			
Curbside destination			
Rear route			
Message width			
Front destination		in.	
Front route		in.	
Curbside destination		in.	
Rear route		in.	
Electrical			
Multiplex system			
Manufacturer			
Model number			
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			
Type			
Number of cells		V	
Battery pack voltage		V	
Weight		lb	
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		

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