

Pinellas Suncoast Transit Authority



Florida Electric Transit Buses with Charging and Associated Equipment



AGREEMENT FOR ELECTRIC TRANSIT BUSES WITH CHARGING AND ASSOCIATED EQUIPMENT

THIS AGREEMENT for ELECTRIC TRANSIT BUSES WITH CHARGING AND ASSOCIATED EQUIPMENT ("Agreement") is made on October 27, 2021, by and between the Pinellas Suncoast Transit Authority ("PSTA"), an independent special district with its principal place of business located at 3201 Scherer Drive, St. Petersburg, Florida, 33716 and Proterra Operating Company ("Contractor"), a Inc. with its principal place of business located at 1815 Rollins Rd Burlingame, CA 94010 (collectively, the "Parties").

WHEREAS, PSTA issued RFP 21-980369 for Electric Transit Buses with Charging and Associated Equipment on July 15, 2021 (the "RFP"); and

WHEREAS, Contractor timely submitted its response to the RFP on or before September 23, 2021 ("Contractor's Response"); and

WHEREAS, PSTA's Board of Directors awarded the contract to Contractor at its duly held Board of Directors meeting on October 27, 2021 (the "Effective Date").

NOW, THEREFORE, in consideration of the mutual promises and agreements set forth herein, and for other good and valuable consideration, the receipt and adequacy of which is hereby acknowledged, the Parties agree as follows:

1. RECITALS. The above recitals are true and correct and incorporated herein by reference.

2. CONTRACT DOCUMENTS. The "Contract Documents" shall mean and refer to this Agreement, the RFP including all exhibits attached thereto including any and all duly executed and issued addenda (attached hereto as **Exhibit 1**), any and all Purchase Orders (as defined below and attached as composite **Exhibit 2**), Contractor's Best and Final Offer (BAFO), if any (attached hereto as **Exhibit 3**), and Contractor's Response (attached hereto as **Exhibit 4**). All of the foregoing are incorporated herein by reference and are made a part of this Agreement. In interpreting this Agreement and resolving any ambiguities or conflicts between this Agreement and the exhibits, this Agreement takes precedence over the exhibits and any inconsistency between the exhibits will be resolved in the following order:

Exhibit 1	RFP
Exhibit 2	Purchase Order(s)
Exhibit 3	Contractor's BAFO
Exhibit 4	Contractor's Response

3. SCOPE OF SERVICES. Contractor, at the direction of PSTA, shall furnish to PSTA Electric Transit Buses with Charging and Associated Equipment as described in, and in accordance with the specifications, tasks, and scope of work set forth in the RFP (the "Services"), and in the amount set forth in the RFP. Contractor acknowledges that it has read the specifications and understands them. Contractor also agrees to provide electric transit buses with charging and associated equipment to all permissible assignees of PSTA. PSTA's permissible assignees shall have the option to purchase electric transit buses and charging and associated equipment in accordance with the terms and conditions of the RFP, and specifically SP 3 of the RFP.

4. EFFECTIVE DATE AND TERM OF AGREEMENT. This Agreement shall become effective and commence on the Effective Date and shall remain in effect for five (5) years.



5. TERMS OF PERFORMANCE.

- 5.01. *Time for Completion/Purchase Orders.* PSTA will issue purchase orders for the electric buses with charging and associated equipment it needs provided under this Agreement ("Purchase Order(s)"). Upon issuance, the Purchase Order shall be appended to this Agreement and incorporated as an exhibit, Contractor shall immediately begin providing the Services pursuant to the Purchase Order, and all work and deliverables shall be completed by the date set forth in the Purchase Order, unless modified in writing by the Parties. In the event a Purchase Order approved during the term of the Contract Term has a completion date beyond the Contract Term, the terms and conditions of this Agreement shall be automatically extended through the completion of the Purchase Order to the full satisfaction of PSTA.
- 5.02. *Representatives.* Prior to the start of any ordering or supplying the Services under this Agreement, Contractor shall designate a primary and alternate representative, who will have management responsibility for the Services and who will have authority to act on technical matters and resolve problems with the Services, Purchase Order(s), and the Contract Documents, to PSTA in writing. Such designation shall include the contact information (including phone numbers) of Contractor's representative. PSTA will advise Contractor in writing of the personnel who will represent PSTA in the administration of the Contract Documents. Such writing from PSTA may include the specific duties of each individual and each representative's limits of authority.
- 5.03. *Non-exclusive Contract.* PSTA specifically reserves the right to contract with other entities for the Services described in the Contract Documents or for similar products if it deems, in its sole discretion, such action to be in PSTA's best interest.
- 5.04. *Contractor Responsibility.* Contractor shall provide electric buses with charging and associated equipment of first quality, and the workmanship must be in accordance with customary standards of the various trades and industries involved in the manufacturing and furnishing of such products. The Services and the work associated therewith shall be of high-quality in all respects. No advantage will be taken by 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 manufacturing and furnishing of the electric buses and charging and associated equipment, whether the same is manufactured by Contractor or purchased readymade from a source outside Contractor's company.
- 5.05. *Compliance with Laws.* Contractor shall comply with all federal, state, county, and local laws, rules and/or regulations, and lawful orders of public authorities including those set forth in this Agreement and that, in any manner, could bear on the provision of the Services under the Contract Documents. Omission of any applicable laws, ordinances, rules, regulations, standards or orders by PSTA in the Contract Documents shall be construed as an oversight and shall not relieve Contractor of its obligations to comply with such laws fully and completely. Upon request, Contractor shall furnish to PSTA certificates of compliance with all such laws, orders and regulations. Contractor shall be responsible for obtaining all necessary permits and licenses required for performance under this Agreement.

6. COMPENSATION.

In consideration of Contractor's faithful performance of the Contract Documents, PSTA agrees to pay Contractor pursuant to the rates and pricing set forth in Contractor's Response or Contractor's BAFO, if any. However, all payments to Contractor individually and in the aggregate shall not exceed the Contract Total. Payment shall be made in accordance with the RFP and the Florida Prompt Payment Act, section 218.70, *et seq.*, Florida Statutes.

- 6.01. *Invoices.* All invoices shall be submitted in accordance with the Florida Prompt Payment Act, section 218.72, *et seq.*, Florida Statutes, with all details prescribed by PSTA, and delivered to the following address:



RFP 21-980369

Electric Transit Buses with Charging and Associated Equipment

Pinellas Suncoast Transit Authority
Attention: Finance Department/Accounts Payable
Purchase Order or Contract #: C-22-MT-004
3201 Scherer Drive
St. Petersburg, Florida 33716

or via electronic mail to:

AccountsPayable@psta.net

6.02. *Disputed Invoices.* In the event of a disputed invoice, only that portion so contested may be withheld from payment and the undisputed portion shall be due and payable on the terms set forth herein.

6.03. *Availability of Funds.* Contractor understands that the funds are not presently available under this Agreement beyond the current fiscal year. PSTA's obligation for performance under this Agreement beyond the current fiscal year is contingent upon the availability of funds from which payments can be made. PSTA is not legally liable for any payment that may arise under this Agreement beyond the current fiscal year, until the Contractor receives a written notice of availability of funds from the PSTA's Contracting Officer.

7. WARRANTIES AND COVENANTS.

7.01. *Patent, Trademark, Copyright, and Trade Secret.* Contractor warrants that the Services, and all goods and work associated therewith, do not infringe on any patent, trademark, copyright or trade secret of any third parties and agrees to defend, indemnify and hold PSTA, its officers, agents, employees, trustees and its successors and assigns, harmless 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 this Agreement. PSTA shall promptly notify Contractor of any such claim. PSTA makes no warranty that the production, sale or use of goods or services under this Agreement will not give rise to any such claim and PSTA shall not be liable to Contractor for any such claim brought against Contractor. If any invention, improvement, or discovery of the Contractor is conceived or first actually reduced to practice in the course of providing the Services under this Agreement, and that invention, improvement, or discovery is patentable under the laws of the United States of America or any foreign country, the Contractor agrees to notify the PSTA immediately and provide a detailed report. The rights and responsibilities of the Contractor and PSTA with respect to such invention, improvement, or discovery will be determined in accordance with applicable Federal laws, regulations, policies, and any waiver thereof.

7.02. *Covenants against Gratuities.* Contractor warrants that he or she 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 performance of this Agreement.

7.03. *E-Verify.* 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 Agreement; and (b) all persons, including subcontractors, retained or hired by Contractor, regardless of compensation, to perform work on the Services provided pursuant to the Contract Documents.

8. DELAY IN PERFORMANCE/FORCE MAJEURE.

8.01. *Time of the Essence.* The timely receipt of the Services and deliverables to PSTA is essential. If the Services and all deliverables under each Purchase Order are not received by PSTA within the date specified in each Purchase Order, PSTA may cancel the unfilled portion of the Purchase Order and this



Agreement for cause, purchase substitutes elsewhere, and recover from Contractor any increased costs and damages thereby incurred by PSTA.

8.02. *Unavoidable Delay.* If completion of the Services under any Purchase Order is unavoidably delayed, PSTA may, in its sole and absolute discretion, extend the time for completion for a determined number of days of excusable delay. A delay is unavoidable only if the delay was not reasonably expected to occur in connection with or during Contractor's performance; was not caused directly or substantially by negligent errors, omissions, or mistakes of Contractor, its subcontractors, or its suppliers or their agents; was substantial; and, in fact, caused Contractor to miss delivery dates and could not adequately have been guarded against by contractual or legal means.

8.03. *No Damages for Delay.* Contractor shall not be entitled to any claim for damages on account of hindrances or delays in the work from any cause whatsoever, including any delays or hindrances caused by PSTA. This paragraph shall include, but not be limited to, any actions which result in delays in scheduling, substantial changes in scope of the Services or deliverables or substantial increases in the costs of performing the work under the Contract Documents.

8.04. *Notification.* Contractor will notify PSTA as soon as Contractor has, or should have, knowledge that an event has occurred which will delay completion of the Services under a Purchase Order. Within five (5) working days, Contractor will confirm such notice in writing, furnishing as much detail as is available and including any request for extension of time. Contractor shall supply, as soon as such data is available, any reasonable proofs that are required by PSTA to make a decision on any request for extension. PSTA will examine the request and any documents supplied by Contractor and will determine if Contractor is entitled to an extension and the duration of such extension. PSTA will notify Contractor of its decision in writing. It is expressly understood and agreed that Contractor will not be entitled to any extension and the granting of such extension is in the sole discretion of PSTA. It is further expressly understood that Contractor shall not be entitled to any damages or compensation, and will not be reimbursed for any losses, on account of delays resulting from any cause.

9. DISPUTES, BREACHES, DEFAULTS, OR OTHER LITIGATION.

9.01. *Rights and Remedies.* The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by law. No action or failure to act by PSTA or Contractor shall constitute a waiver of any right or duty afforded any of them under this Agreement, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach thereunder, except as may be specifically agreed in writing.

9.02. *Attorneys' Fees.* In the event of legal action or other proceeding arising under this Agreement, PSTA shall be entitled to recover from Contractor all its reasonable attorneys' fees and cost incurred by PSTA in the prosecution or defense of such action, or in any post-judgment or collection proceedings and whether incurred before suit, at the trial level or at the appellate level. This shall include any bankruptcy proceedings filed by or against Contractor. PSTA also shall be entitled to recover any reasonable attorneys' fees and costs incurred in litigating the entitlement to attorneys' fees and costs, as well as in determining the amount of attorneys' fees and costs due to PSTA. The reasonable costs to which PSTA will be entitled include costs that are taxable under any applicable statute, rule, or guideline, as well as costs of investigation, copying costs, electronic discovery costs, mailing and delivery charges, costs of conducting legal research, consultant and expert witness fees, travel expenses, court reporter fees and mediator fees, regardless of whether such costs are taxable under any applicable statute, rule or guideline.

10. INDEMNIFICATION.

10.01 *Indemnification.* 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, or loss of use, arising out of the execution, performance, nonperformance, or enforcement of this Agreement, 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. 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. Contractor's liability hereunder shall include all attorneys' fees and costs incurred by PSTA in the enforcement of this indemnification provision. 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. The obligations contained in this provision shall survive termination of this Agreement, however terminated, and shall not be limited by the amount of any insurance required to be obtained or maintained under this Agreement.

10.02 Control of Defense. Subject to the limitations set forth in this provision, 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 Agreement 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 such records and information, and attend such conferences, discovery proceedings, hearings, trials, or appeals, as may be reasonably requested in connection therewith.

11. MISCELLANEOUS PROVISIONS.

11.01 Entire Agreement. The Contract Documents, including all exhibits, constitute the entire agreement between the parties with respect to the subject matter hereof and supersedes all previous written or oral negotiations, agreements, proposals and/or understandings. There are no representations or warranties unless set forth in the Contract Documents.

11.02 Notices. All notices required or made pursuant to this Agreement shall be made in writing and sent by certified U.S. mail, return receipt requested, addressed to the following:

To PSTA:

Pinellas Suncoast Transit Authority
Attn: Brad Miller, CEO
3201 Scherer Drive
St. Petersburg, FL 33716

To Contractor:

Proterra Operating Company, Inc.
Attn: John Dunn
1815 Rollins Rd.
Burlingame, CA 94010

***With required copy to:***

Alan S. Zimmet, B.C.S.
Bryant Miller Olive
One Tampa City Center
Suite 2700
Tampa, FL. 33602

Either party may change its above noted address by giving written notice to the other party in accordance with the requirements of this section.

- 11.03 *Waiver of Remedies for any Breach.*** In the event that PSTA elects to waive its remedies for any breach by Contractor of any covenant, term or condition of this Agreement, such waiver by PSTA shall only be valid if set forth in writing and shall not limit PSTA's remedies for any succeeding breach of that or of any other term, covenant, or condition of this Agreement.
- 11.04 *Modification.*** The Contract Documents, including the scope, specification, and details of the Services may only be modified by written agreement of the Parties. No modification shall serve to increase the Contract Total unless such change has been approved by PSTA's Board of Directors prior to any work being performed that would serve to increase the Contract Total.
- 11.05 *Headings and Section References.*** The headings and section references in this Agreement are inserted only for the purpose of convenience and shall not be construed to expand or limit the provisions contained in such sections.
- 11.06 *Authorization.*** Both parties to this Agreement represent and warrant that they are authorized to enter into this Agreement without the consent and joinder of any other party and that the parties executing this Agreement have full power and authority to bind their respective parties to the terms hereof.
- 11.07 *Assignment.*** The terms and provisions of this Agreement shall be binding upon the Parties and their respective partners, successors, heirs, executors, administrators, assigns and legal representatives. Notwithstanding the foregoing, a party's rights and obligations under this Agreement may only be transferred, assigned, sublet, mortgaged, pledged or otherwise disposed of or encumbered in any way with the other party's prior written consent.
- 11.08 *Severability.*** If any one or more provisions of this Agreement shall be held to be invalid, illegal, or unenforceable in any respect by a court of competent jurisdiction, the validity, legality, and enforceability of the remaining provisions hereof shall not in any way be affected or impaired thereby and this Agreement shall be treated as though the invalidated portion(s) had never been a part hereof.
- 11.09 *Electronic Signatures.*** This Agreement may be executed by electronic signature technology and such electronic signature shall act as the Parties' legal signatures on this Agreement and shall be treated in all respects as an original handwritten signature.
- 11.010 *Counterparts.*** This Agreement may be executed in one or more counterparts, any one of which need not contain the signatures of more than one party, but all such counterparts taken together will constitute one and the same instrument.

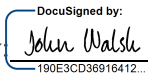
(SIGNATURES ON FOLLOWING PAGE)

RFP 21-980369
Electric Transit Buses with Charging and Associated Equipment




IN WITNESS WHEREOF the Parties hereto have caused this Agreement to be duly executed on the date first above written.

CONTRACTOR:

By:  _____
DocuSigned by:
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Print Name: John Walsh

PSTA:

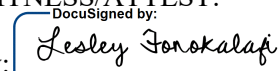
By:  _____
Brad Miller, CEO

Title: CCO

Attest:

 _____
Rachael Cappolla, Executive Assistant

WITNESS/ATTEST:

By:  _____
DocuSigned by:
1B486623D3DE4C1...
By: _____

Approved as to form:

Print Name: Lesley Fonokalafi

Alan S. Zimmet, General Counsel



Exhibit 1

Pinellas Suncoast Transit Authority



Florida Electric Transit Buses with Charging and
Associated Equipment

Request for Proposals

Pinellas Suncoast Transit Authority



Florida Electric Transit Buses with Charging and
Associated Equipment

RFP 21-980369

July 15, 2021

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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 Proposer 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: $\text{Lowest Proposed Price} / \text{Proposer's Proposed Price} \times 20 = \text{Proposal Score}$

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

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 which 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 °F to 120 °F, 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.

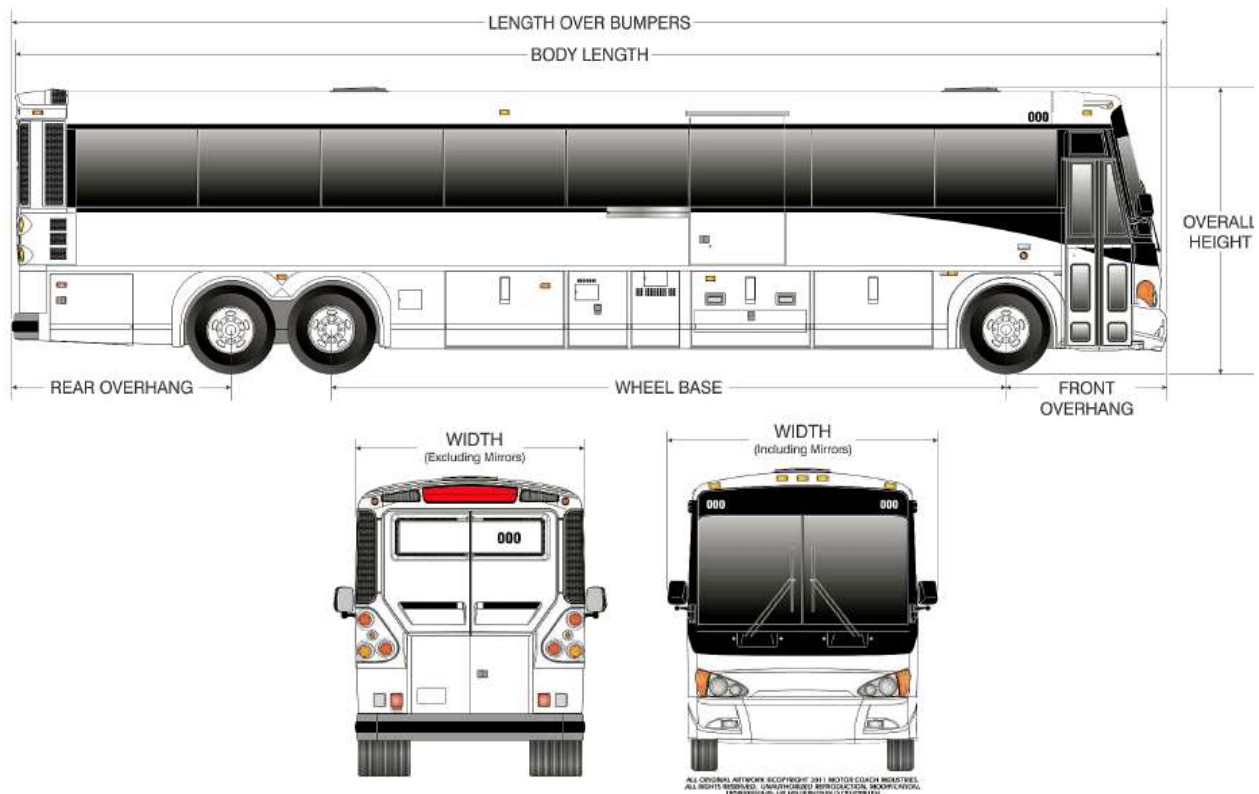
The Contractor shall provide a plan for reuse or recycling of replaced battery cells and/or battery packs.

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

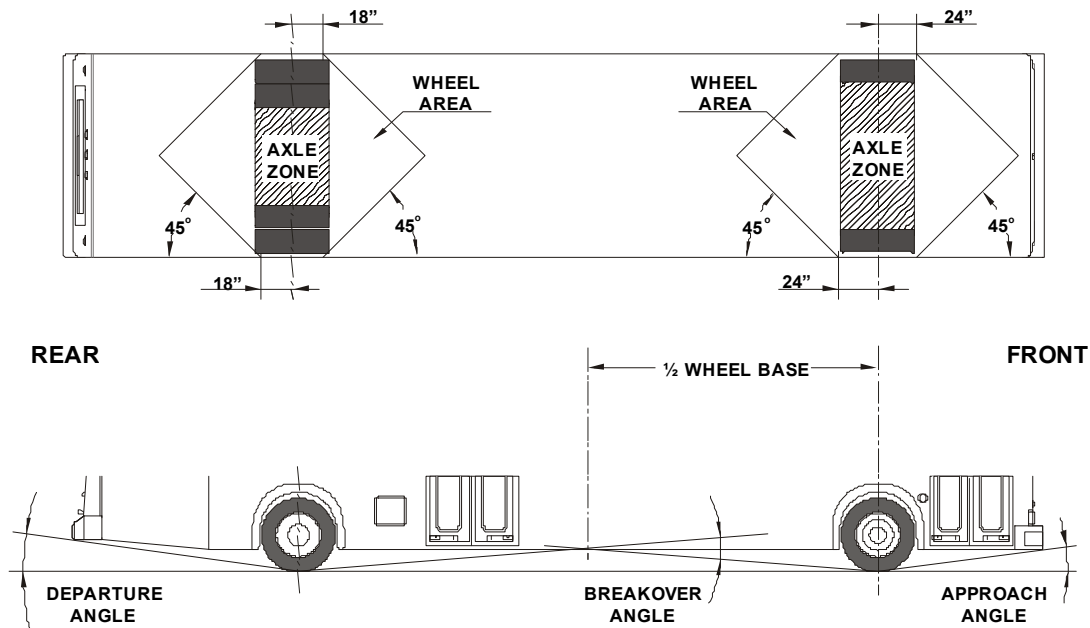
Ground clearance shall be no less than 9 in., (8 in. at jacking pad) except within the axle zone and wheel area.

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 Surface¹

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)		

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 $\frac{1}{4}$ 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 $\frac{1}{4}$ 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 deflection of no more than 0.375 in. (10 mm) from the normal plane. The floor shall withstand the application of 3.0 times gross load weight without permanent detrimental deformation.

TS 27. Platforms**TS 27.1 Driver’s Area**

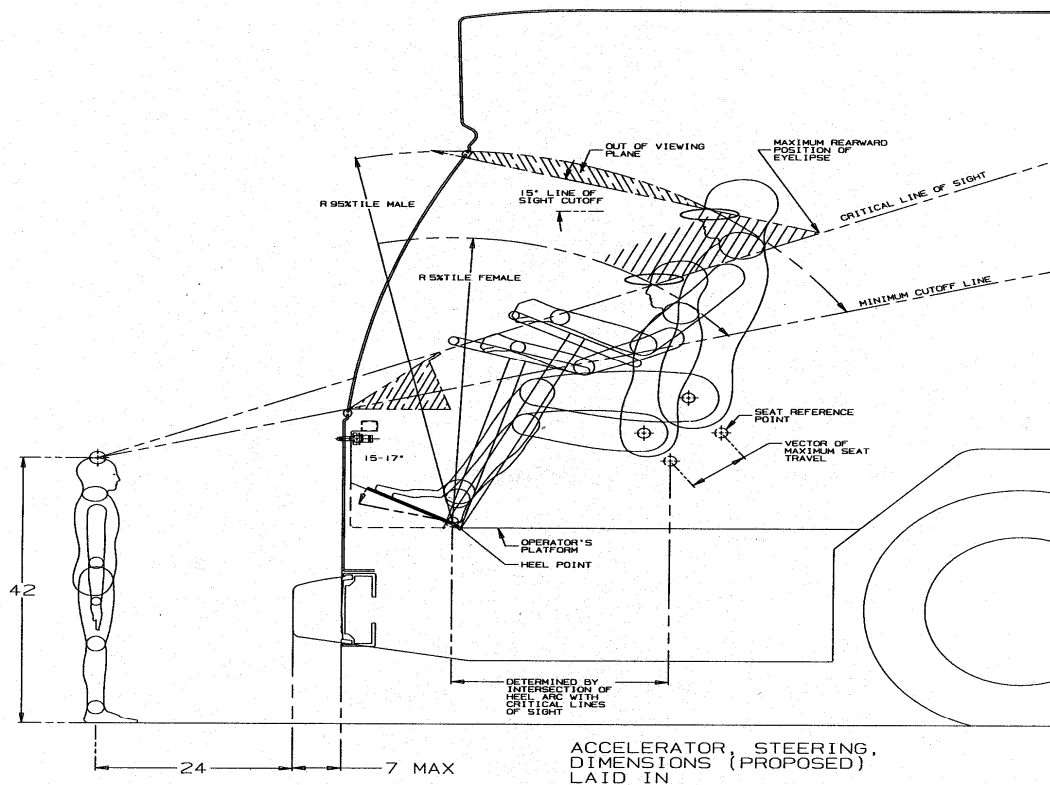
The covering of platform surfaces and risers, except where otherwise indicated, shall be the same material as specified for floor covering. Trim shall be provided along top edges of platforms unless integral nosing is provided.

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 $\frac{7}{8}$ to $1\frac{1}{4}$ in. and shaped for firm grip with comfort for long periods of time.

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

TS 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 Height¹ Relative to Angle of Slope

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

1. Measured from bottom portion closest to driver.

TS 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)

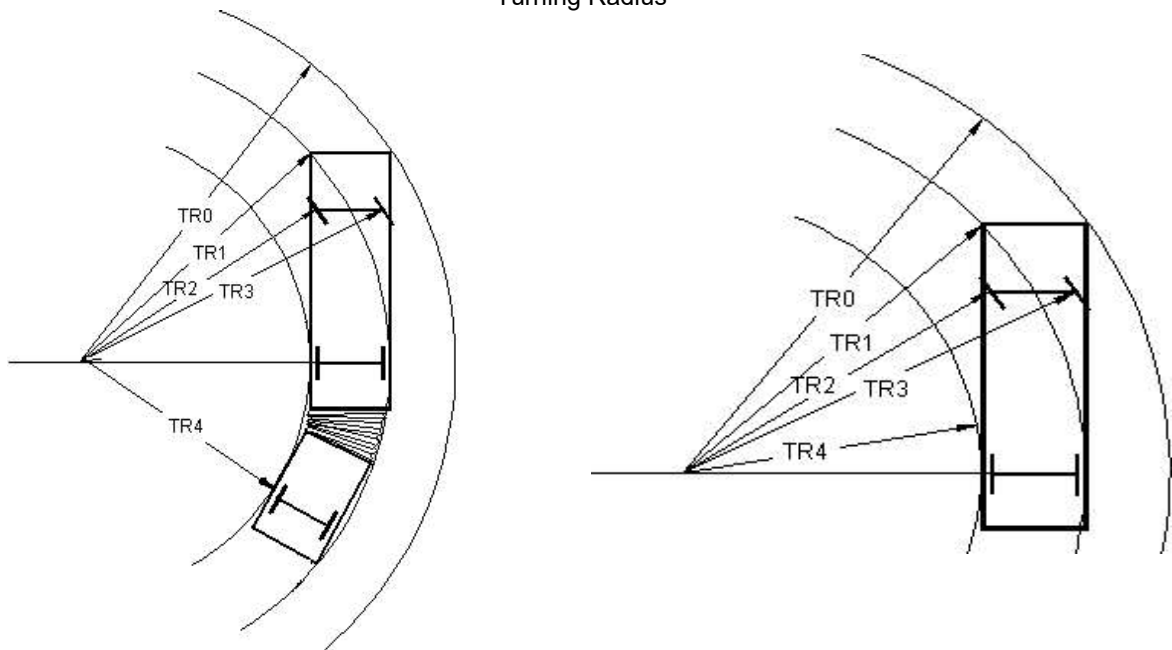
A tag axle shall be located behind the drive axle. The tag axle shall be a solid beam type with fixed steering. The tag axle shall have single tires the same size as the tires on the front and drive axles. Tag axle weight shall not exceed 14,000 lb. With full passenger seating capacity, load on any axle 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.

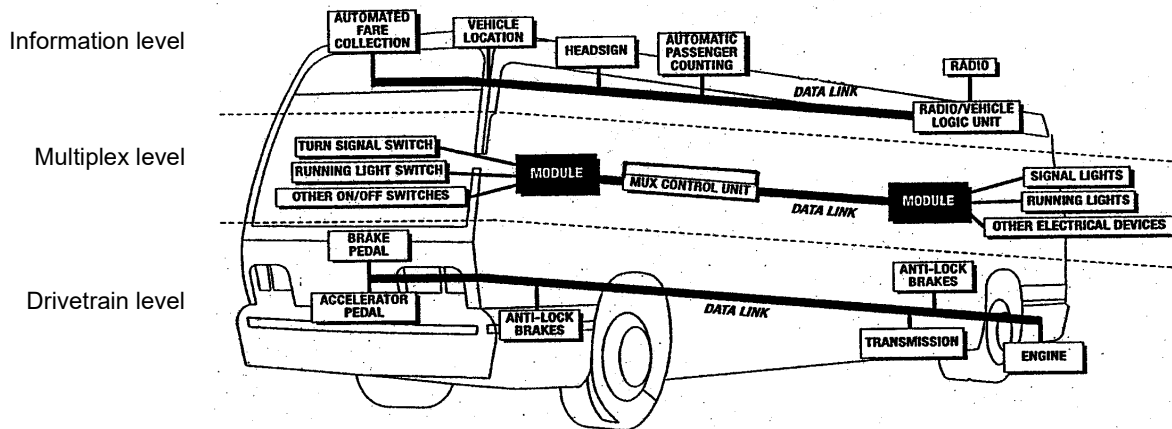
Information level systems that require vehicle information for their operations or provide information shall adhere to J1939 data standard.

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 contactors 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 button), 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 or 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 fault 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 dashboard-warning 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 through the addition of new modules and/or the utilization of existing spare inputs and outputs. All like components in the multiplex system shall be modular and interchangeable with self-diagnostic capabilities. The modules shall be easily accessible for troubleshooting electrical failures and performing system maintenance. Multiplex input/output modules shall use solid-state devices to provide extended service life and individual circuit protection.

Ten percent of the total number of inputs and outputs, or at least one each for each voltage type utilized (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.

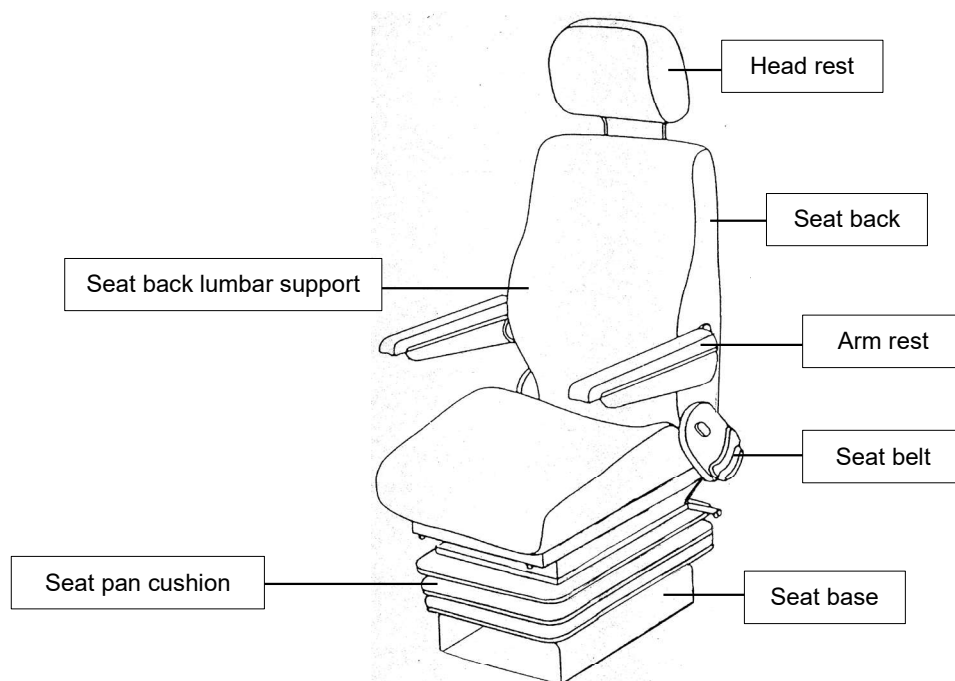
TS 46.2 Windshield Washers

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 appliques. All decals shall be installed per the decal Supplier recommendations. Signs shall be provided in compliance with the ADA requirements defined in 49 CFR Part 38, Subpart B, 38.27.

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 litter 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 m³) to allow for ample storage space for carry-on items.

Passenger service modules mounted on the underside of the parcel rack shall include individually controlled and adjustable LED passenger reading lights; an exit signal push button, red in color; and individual air distribution outlets. These outlets shall be adjustable from fully closed to fully open position. A minimum of

26 speakers shall also be provided in the cluster panels for the driver-controlled public address system. Speakers shall broadcast, in a clear tone, announcements that are clearly perceived from all seat positions at approximately the same volume level. Passengers using the securement systems shall be provided identical amenities as provided for all other passengers, except that the parcel rack shall be deleted in the area of the wheelchair lift door. Separate and independent notification will be provided on the dashboard indicator panel for stop request notification from securement positions.

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 grommited 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).

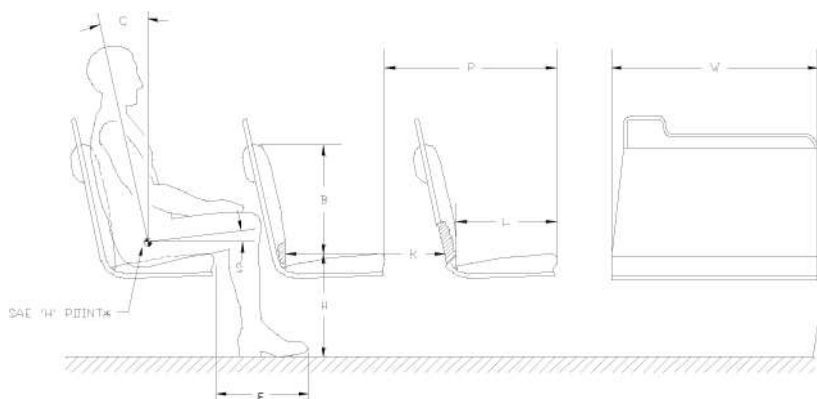
TS 76.11 Aisles (Commuter Coach)

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 $\frac{1}{4}$ 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 $\frac{1}{4}$ 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 $3\frac{1}{2}$ 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 $\frac{7}{8}$ in. in diameter for standees and seat access/egress. The handhold shall not be a safety hazard during severe decelerations. The handhold shall extend above the seat back near the aisle so that standees shall have a convenient vertical assist, no less than 4 in. long, that may be grasped with the full hand. This handhold shall not cause a standee using this assist to interfere with a seated 50th-percentile male passenger. The handhold shall also be usable by a 5th-percentile female, as well as by larger passengers, to assist with seat access/egress for either transverse seating position. The upper rear portion of the seat back and the seat back handhold immediately forward of transverse seats shall be padded and/or constructed of energy-absorbing materials. During a 10g deceleration of the bus, the HIC number (as defined by SAE J211a) shall not exceed 400 for passengers ranging in size from a 5th percentile female through a 95th percentile male.

The seat back handhold may be deleted from seats that do not have another transverse seat directly behind and where a vertical assist is provided.

Longitudinal seats shall be the same general design as transverse seats but without seat back handholds. Longitudinal seats may be mounted on the wheelhouses. Armrests shall be included on the ends of each set of longitudinal seats except on the forward end of a seat set that is immediately to the rear of a transverse seat, the driver's barrier or a modesty panel, when these fixtures perform the function of restraining passengers from sliding forward off the seat. Armrests are not required on longitudinal seats located in the wheelchair parking area that fold up when the armrest on the adjacent fixed longitudinal seat is within $3\frac{1}{2}$ 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 $\frac{1}{4}$ 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 $\frac{1}{4}$ 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 $\frac{1}{4}$ 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 $1\frac{1}{4}$ and $1\frac{1}{2}$ in. or shall provide an equivalent gripping surface with no corner radii less than $\frac{1}{4}$ in. All passenger assists shall permit a full hand grip with no less than $1\frac{1}{2}$ 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

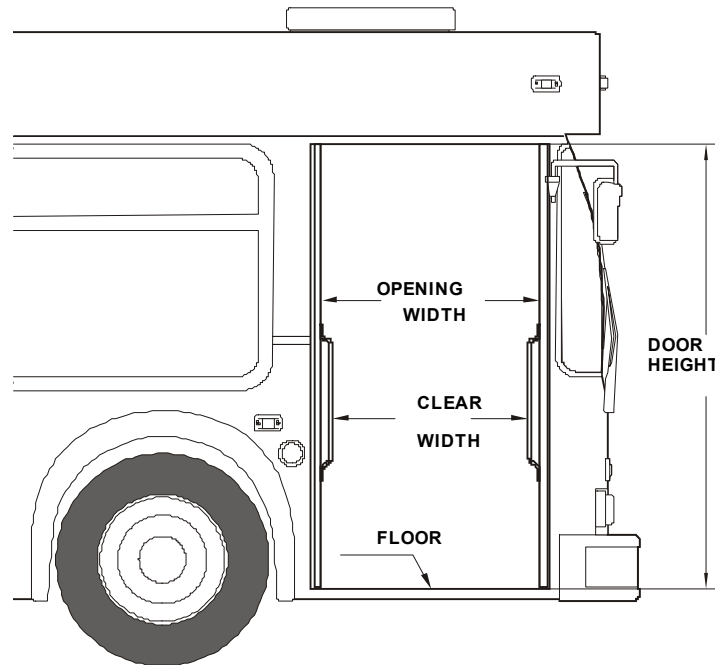
Structure of the doors, their attachments, inside and outside trim panels and any mechanism exposed to the elements shall be corrosion resistant. Door panel construction shall be of corrosion-resistant metal or reinforced non-metallic composite materials. When fully opened, the doors shall provide a 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 a rear door ramp or lift is provided, then the clear door opening width shall be a minimum of 31¾ in. with door fully opened.

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 processor 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 Agency and its 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 a 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 50°F to 115°F, 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 safely 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 50°F to 115°F, 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 Agency understands 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 reporting 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:	<input type="checkbox"/> Approved <input type="checkbox"/> See addendum
	<input type="checkbox"/> Denied <input type="checkbox"/> See response below
Agency response:	

CER 3. Acknowledgement of Addenda

Failure to acknowledge receipt of all addenda may cause the Proposal to be considered nonresponsive to the Solicitation. Acknowledged receipt of each addendum must be clearly established and included with the Proposal.

The undersigned acknowledges receipt of the following addenda to the documents:	
Addendum No.:	Dated:
Addendum No.:	Dated:
Addendum No.:	Dated:
Addendum No.:	Dated:
Proposer: Name: Title: Phone: Street address: City, state, ZIP:	
<hr/>	
Authorized signature	Date

CER 4. Contractor Service and Parts Support Data

Location of nearest Technical Service Representative to Agency

Name:

Address:

Telephone:

Describe technical services readily available from said representative:

Location of nearest Parts Distribution Center to Agency:

Name:

Address:

Telephone:

Describe the extent of parts available at said center:

Policy for delivery of parts and components to be purchased for service and maintenance:

Regular method of shipment:

Cost to Agency:

CER 5. Form for Proposal Deviation

This form shall be completed for each condition, exception, reservation or understanding (i.e., Deviation) in the Proposal according to “Conditions, Exceptions, Reservations or Understandings.” One copy without any price/cost information is to be placed in the Technical Proposal as specified in “Technical Proposal Requirements,” and a separate copy with any price/cost information placed in the Price Proposal as specified in “Price Proposal Requirements.”

PSTA

[RFP 21-980369]

Deviation No.:	Contractor:	RFP section:	Page:
<p>Complete description of Deviation:</p>			
<p>Rationale (pros and cons):</p>			

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	Haldux 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	COMMUNICATIONS 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 Software	1					
73	DESTINATION SIGNS	TwinVision Smart Series 3 100% Silver LED Sign (16 X 160)--Front, Side, and Rear	1					
74	DESTINATION SIGNS	TwinVision Smart Series 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 Integrated 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 Programming	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 Release (Front Door Control 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					

		auxiliary 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 Vacancy 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 Adjustable D-Ring to USSC Seat	1					
133	DRIVERS SEAT	Add Headrest to USSC Seat	1					
134	DRIVERS SEAT	Add Drivers Seat Vacancy 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 Ventilation 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 Pro-vided Farebox Base Plate	1					
169	FIRE SUPPRES-SION SYSTEM	Fogmaker Water Mist Fire Suppression Sys-tem	1					
170	FIRE SUPPRES-SION SYSTEM	Amerex V-25 Fire Sup-pression 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 Ply-wood	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 Wheelhous-ings	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 Pres-sure 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/Auto-matic Stop Annuncia-tion)	1					
210	ITS SYSTEM	Clever Devices Auto-matic Vehicle Monitor-ing System	1					
211	ITS SYSTEM	Clever Devices Bus-Time System	1					
212	ITS SYSTEM	Clever Devices Clever-CAD 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 Visu-alization System AVL	1					
219	ITS SYSTEM	Intelligent Vehicle Sys-tem Prewire Only (Pending System Speci-fication)	1					
220	ITS SYSTEM	Luminator InfoTransit--2 Monitors (18.5") Proxys Module	1					
221	ITS SYSTEM	Luminator InfoTransit--Upgrade to 29" Moni-tors	1					
222	ITS SYSTEM	Luminator InfoTransit--Upgrade to 37" Moni-tors	1					
223	ITS SYSTEM	Luminator InfoLite--2 Monitors (18.5") Proxys Module	1					
224	ITS SYSTEM	Luminator InfoLite--Upgrade to 29" Moni-tors	1					

225	ITS SYSTEM	Luminator InfoLite-- Upgrade to 37"Moni- tors	1					
226	MISCELLA- NOUS	Scissor Style Sun- shades--Drivers Win- dows	1					
227	MISCELLA- NOUS	Drivers Coat Hook	1					
228	MISCELLA- NOUS	Roller Style Sunshades- -Drivers Windows	1					
229	MISCELLA- NOUS	Euramatic Cup Holder	1					
230	MISCELLA- NOUS	Registration Card holder	1					
231	MISCELLA- NOUS	Stainless Steel Waste Basket and Bracket	1					
232	MODESTY PAN- ELS	Standard Melamine Panels on Lower Sec- tion	1					
233	MODESTY PAN- ELS	Quick Changing Glaz- ing Upper Clear Plexi- glas Modesty Panels Both Sides of Rear Exit Door	1					
234	MODESTY PAN- ELS	Front Door Modesty Panel	1					
235	MODESTY PAN- ELS	Lower Modesty Panel Forward of Rear Door	1					
236	MODESTY PAN- ELS	Melamine Panel Lower Section (Aft Rear Door)	1					
237	MODESTY PAN- ELS	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-- Curbside 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/Exterior Speaker Selct Toggle 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 Devices - Speakeasy II	1					
273	PUBLIC AN-NOUNCEMENT SYSTEM	Luminator VAS System	1					
274	PUBLIC AN-NOUNCEMENT SYSTEM	Clever Devices Automated Voice Announcement 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 Temperature--Mechanical	1					
278	REAR RUN GAUGES	Add Coolant Temperature--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 OBIC10P2LTRMC	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 Mod- esty Panel Tubes	1					
299	STANCHIONS/GRAB RAILS	Yellow Powder Coated Vertical Stanchions Only	1					

300	STANCHIONS/GRAB RAILS	Vehicle Stanchion at Front Wheel Wells--Each	1					
301	STANCHIONS/GRAB RAILS	Add Farebox Grabrail	1					
302	STANCHIONS/GRAB RAILS	Horizontal Grabrail on Curbside & Streetside Wheelhousing	1					
303	STANCHIONS/GRAB RAILS	SSTL Spring Loaded Grab Handle--Each	1					
304	STEERING SYSTEM	Douglas, Single Tilt, Without Column Turn Signal, Without High-Low Beam Switch	1					
305	STEERING SYSTEM	Steering Wheel--Standard 20" Non-Padded 3 Spoke Wheel with Center Horn Button	1					
306	STEERING SYSTEM	Ross Model TS 65	1					
307	STEERING SYSTEM	Steering Box--TRW TAS6505	1					
308	STEERING SYSTEM	TRW Electric Assisted Steering	1					
309	STEERING SYSTEM	VIP Textured Steering Wheel	1					
310	STYLING PACKAGES	Standard Styling Package	1					
311	STYLING PACKAGES	Windshield 2-Piece	1					
312	STYLING PACKAGES	Windshield 1-Piece	1					
313	STYLING PACKAGES	BRT Front Cap Styling Only	1					
314	STYLING PACKAGES	BRT Front Cap, Rear Cap and Engine Door Styling	1					
315	STYLING PACKAGES	BRT PLUS Front Cap, Rear Cap, Roof Line and Engine Door Styling	1					
316	STYLING PACKAGES	BRT Roof Fairings, Front or Rear (each)	1					
317	SURVEILLANCE CAMERA SYSTEMS	Apollo (8) Standard Definition Color Camera System, 6TB HDD,	1					

		GPS, Wireless, Impact Sensor						
318	SURVEILLANCE CAMERA SYSTEMS	Apollo--Add (1) Standard Definition Color 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 Wheel-chair 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	Wheelchair Securement Decals--"WHEEL-CHAIR 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 Proplulsion 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)	SIGNATURE & DATE:
_____	_____
(Name & Title)	(Signature of Offeror's Representative) Date

(Offeror's Name)	

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

<p>1. Name of firm:</p> <p>2. Address:</p> <p>3. <input type="checkbox"/> Individual <input type="checkbox"/> Partnership <input type="checkbox"/> Corporation <input type="checkbox"/> Joint Venture</p> <p>4. Date organized: State in which incorporated:</p> <p>5. Names of officers or partners:</p> <p>a.</p> <p>b.</p> <p>c.</p> <p>d.</p> <p>e.</p> <p>6. How long has your firm been in business under its present name?</p>
<p>7. Attach as SCHEDULE ONE a list of similar current contracts that demonstrates your available capacity, including the quantity and type of bus, name of contracting party, percentage completed and expected completion date.</p> <p>8. Attach as SCHEDULE TWO a list of at least three similar contracts that demonstrates your technical proficiency, each with the name of the contracting party and number and they type of buses completed within the last five years.</p> <p>9. Have you been terminated or defaulted, in the past five years, on any Contract you were awarded? <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, then attach as SCHEDULE THREE the full particulars regarding each occurrence.</p> <p>10. Attach as SCHEDULE FOUR Proposer's last three (3) financial statements prepared in accordance with generally accepted accounting principles of the jurisdiction in which the Proposer is located, and audited by an independent certified public accountant; or a statement from the Proposer regarding how financial information may be reviewed by the Agency (This may require execution of an acceptable nondisclosure agreement between the Agency and the Proposer.)</p> <p>11. Attach as SCHEDULE FIVE a list of all principal Subcontractors and the percentage and character of Work (Contract amount) that each will perform on this Contract.</p> <p>12. If the Contractor or Subcontractor is a joint venture, submit PRE-AWARD EVALUATION DATA forms for each member of the joint venture.</p>
<p>The above information is confidential and will not be divulged to any unauthorized personnel.</p>
<p>The undersigned certifies to the accuracy of all information: Name and title: Company:</p> <p>_____ Authorized signature</p> <p>_____ Date</p>

CER 8. Federal Certifications**CER 8.1 Buy America Certification**

This form is to be submitted with an offer exceeding the small purchase threshold for federal assistance programs, currently set at \$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 8.5 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	<input type="text"/>	Amps
Reserve Capacity	<input type="text"/>	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)	<input type="text"/>	kWh
Fuel Economy (w/full passenger load, HVAC, and all electric accessories in use)	<input type="text"/>	MPGE
Max Gradeability	<input type="text"/>	%
Top Speed	<input type="text"/>	MPH
Battery Range	<input type="text"/>	Miles
Acceleration (20 MPH)	<input type="text"/>	Seconds
Acceleration (40 MPH)	<input type="text"/>	Seconds
Top Speed (stated above)	<input type="text"/>	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		
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./
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		
<p>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.</p>		

SECTION 10: CONTRACT

ADDENDUM OF SOLICITATION

1. SOLICITATION NO.:	2. ADDENDUM NO.:	3. EFFECTIVE DATE:	4. BRIEF SOLICITATION DESCRIPTION:
RFP 21-980369	1	07/29/2021	FLORIDA ELECTRIC TRANSIT BUSES

5. REVISED OFFER SUBMISSION DUE DATE AND TIME:

(Note: Unless identified below, this solicitation Addendum does not change the Offer Submission Date and Time.)

The date and/or time specified for receipt of offers is changed as follows:

DATE:

TIME: AM/PM Local

6. REVISED PRE-BID/PROPOSAL CONFERENCE:

(Note: Unless identified below, this solicitation Addendum does not change the Pre-Bid/Proposal Conference, if a conference is scheduled.)

The scheduled pre-bid/proposal conference is changed as follows:

DATE:

TIME: AM/PM Local

LOCATION:

7. ADDENDUM OF SOLICITATION:

The Solicitation identified in Block 1, above, is hereby amended as described in Block 11, below. Except as provided herein, all other provisions of the solicitation, or as heretofore amended, remain unchanged and in full force and effect.

8. REQUIREMENT TO ACKNOWLEDGE ADDENDUM:

Offerors must acknowledge receipt of this Addendum prior to the deadline specified in the solicitation for receipt of offers by the following method:

- Shall acknowledge the receipt of each individual addendum in their Proposals on the form Acknowledgement of Addenda.

WARNING: Failure of an Offeror to acknowledge receipt of this Addendum, as described herein, may result in REJECTION OF THE OFFER.

NOTE: For Invitations for Bids the terms "Offer" and Offeror" shall mean "Bid" and "Bidder", respectively; and for Requests for Proposals or Quotation the terms "Bid" and "Bidder" shall mean "Offer" and "Offeror", respectively, in this solicitation and any associated exhibits.

9. FOR FURTHER INFORMATION CALL CONTRACTS SPECIALIST:

Name: Alvin Burns

Email: aburns@psta.net

10. DESCRIPTION OF ADDENDUM:

- Please see the attached list for all questions and the Authority's responses
- Attachment - Electric Transit Buses with Charging and Associated Equipment Contract
- The following Clause has been incorporated into the solicitation in section 5 Federal Requirements:

FR18

Disputes, Breaches, Defaults, and Litigation.

(b) Notification to FTA; Flow Down Requirement. If a current or prospective legal matter that may affect the Federal Government emerges, the Recipient must promptly notify the FTA Chief Counsel and FTA Regional Counsel for the Region in which the Recipient is located. The Recipient must include a similar notification requirement in its Third Party Agreements and must require each Third Party Participant to include an equivalent provision in its subagreements at every tier, for any agreement that is a "covered transaction" according to 2 C.F.R. §§ 180.220 and 1200.220.

(3) Additional Notice to U.S. DOT Inspector General. The Recipient must promptly notify the U.S. DOT Inspector General in addition to the FTA Chief Counsel or Regional Counsel for the Region in which the Recipient is located, if the Recipient has knowledge of potential fraud, waste, or abuse occurring on a Project receiving assistance from FTA. The notification provision applies if a person has or may have submitted a false claim under the False Claims Act, 31 U.S.C. § 3729, et seq., or has or may have committed a criminal or civil violation of law pertaining to such matters as fraud, conflict of interest, bid rigging, misappropriation or embezzlement, bribery, gratuity, or similar misconduct involving federal assistance. This responsibility occurs whether the Project is subject to this Agreement or another agreement between the Recipient and FTA, or an agreement involving a principal, officer, employee, agent, or Third Party Participant of the Recipient. It also applies to subcontractors at any tier. Knowledge, as used in this

paragraph, includes, but is not limited to, knowledge of a criminal or civil investigation by a Federal, state, or local law enforcement or other investigative agency, a criminal indictment or civil complaint, or probable cause that could support a criminal indictment, or any other credible information in the possession of the Recipient. In this paragraph, "promptly" means to refer information without delay and without change. This notification provision applies to all divisions of the Recipient, including divisions tasked with law enforcement or investigatory functions.

	Amendment	VENDOR QUESTION	PSTA RESPONSE
1	1	Will this procurement cover the design & installation of chargers?	No
2	1	Can you confirm if charger design and installation is being requested from this RFP?	No
3	1	As seen in section TS 19. Altoona Testing, it states <i>“Buses which have not successfully completed an Altoona Test for the type and sizes requested under this RFP will not be considered.”</i> Please confirm if a proposal will be considered if Altoona testing is to be completed after the proposal submission, and tests from our current similar models are provided in our proposal.	The bus will need to satisfy meeting FTA Pre Award, Post delivery and FAST Act requirements.
4	1	Will the agency allow the submission of question using an excel spreadsheet instead of using CER 2. Request for Pre-Offer Change or Approved Equal, which can facilitate response. Please advise.	Yes



AGREEMENT FOR ELECTRIC TRANSIT BUSES WITH CHARGING AND ASSOCIATED EQUIPMENT

THIS AGREEMENT for ELECTRIC TRANSIT BUSES WITH CHARGING AND ASSOCIATED EQUIPMENT ("Agreement") is made on _____, 2021, by and between the Pinellas Suncoast Transit Authority ("PSTA"), an independent special district with its principal place of business located at 3201 Scherer Drive, St. Petersburg, Florida, 33716 and _____ ("Contractor"), a _____ with its principal place of business located at _____ (collectively, the "Parties").

WHEREAS, PSTA issued RFP 21-980369 for Electric Transit Buses with Charging and Associated Equipment on July 14, 2021 (the "RFP"); and

WHEREAS, Contractor timely submitted its response to the RFP on or before September 14, 2021 ("Contractor's Response"); and

WHEREAS, PSTA's Board of Directors awarded the contract to Contractor at its duly held Board of Directors meeting on _____, 2021 (the "Effective Date").

NOW, THEREFORE, in consideration of the mutual promises and agreements set forth herein, and for other good and valuable consideration, the receipt and adequacy of which is hereby acknowledged, the Parties agree as follows:

1. RECITALS. The above recitals are true and correct and incorporated herein by reference.

2. CONTRACT DOCUMENTS. The "Contract Documents" shall mean and refer to this Agreement, the RFP including all exhibits attached thereto including any and all duly executed and issued addenda (attached hereto as **Exhibit 1**), any and all Purchase Orders (as defined below and attached as composite **Exhibit 2**), Contractor's Best and Final Offer (BAFO), if any (attached hereto as **Exhibit 3**), and Contractor's Response (attached hereto as **Exhibit 4**). All of the foregoing are incorporated herein by reference and are made a part of this Agreement. In interpreting this Agreement and resolving any ambiguities or conflicts between this Agreement and the exhibits, this Agreement takes precedence over the exhibits and any inconsistency between the exhibits will be resolved in the following order:

Exhibit 1	RFP
Exhibit 2	Purchase Order(s)
Exhibit 3	Contractor's BAFO
Exhibit 4	Contractor's Response

3. SCOPE OF SERVICES. Contractor, at the direction of PSTA, shall furnish to PSTA Electric Transit Buses with Charging and Associated Equipment as described in, and in accordance with the specifications, tasks, and scope of work set forth in the RFP (the "Services"), and in the amount set forth in the RFP. Contractor acknowledges that it has read the specifications and understands them. Contractor also agrees to provide electric transit buses with charging and associated equipment to all permissible assignees of PSTA. PSTA's permissible assignees shall have the option to purchase electric transit buses and charging and associated equipment in accordance with the terms and conditions of the RFP, and specifically SP 3 of the RFP.

4. EFFECTIVE DATE AND TERM OF AGREEMENT. This Agreement shall become effective and commence on the Effective Date and shall remain in effect for five (5) years.



5. TERMS OF PERFORMANCE.

- 5.01. *Time for Completion/Purchase Orders.* PSTA will issue purchase orders for the electric buses with charging and associated equipment it needs provided under this Agreement ("Purchase Order(s)"). Upon issuance, the Purchase Order shall be appended to this Agreement and incorporated as an exhibit, Contractor shall immediately begin providing the Services pursuant to the Purchase Order, and all work and deliverables shall be completed by the date set forth in the Purchase Order, unless modified in writing by the Parties. In the event a Purchase Order approved during the term of the Contract Term has a completion date beyond the Contract Term, the terms and conditions of this Agreement shall be automatically extended through the completion of the Purchase Order to the full satisfaction of PSTA.
- 5.02. *Representatives.* Prior to the start of any ordering or supplying the Services under this Agreement, Contractor shall designate a primary and alternate representative, who will have management responsibility for the Services and who will have authority to act on technical matters and resolve problems with the Services, Purchase Order(s), and the Contract Documents, to PSTA in writing. Such designation shall include the contact information (including phone numbers) of Contractor's representative. PSTA will advise Contractor in writing of the personnel who will represent PSTA in the administration of the Contract Documents. Such writing from PSTA may include the specific duties of each individual and each representative's limits of authority.
- 5.03. *Non-exclusive Contract.* PSTA specifically reserves the right to contract with other entities for the Services described in the Contract Documents or for similar products if it deems, in its sole discretion, such action to be in PSTA's best interest.
- 5.04. *Contractor Responsibility.* Contractor shall provide electric buses with charging and associated equipment of first quality, and the workmanship must be in accordance with customary standards of the various trades and industries involved in the manufacturing and furnishing of such products. The Services and the work associated therewith shall be of high-quality in all respects. No advantage will be taken by 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 manufacturing and furnishing of the electric buses and charging and associated equipment, whether the same is manufactured by Contractor or purchased readymade from a source outside Contractor's company.
- 5.05. *Compliance with Laws.* Contractor shall comply with all federal, state, county, and local laws, rules and/or regulations, and lawful orders of public authorities including those set forth in this Agreement and that, in any manner, could bear on the provision of the Services under the Contract Documents. Omission of any applicable laws, ordinances, rules, regulations, standards or orders by PSTA in the Contract Documents shall be construed as an oversight and shall not relieve Contractor of its obligations to comply with such laws fully and completely. Upon request, Contractor shall furnish to PSTA certificates of compliance with all such laws, orders and regulations. Contractor shall be responsible for obtaining all necessary permits and licenses required for performance under this Agreement.

6. COMPENSATION. In consideration of Contractor's faithful performance of the Contract Documents, PSTA agrees to pay Contractor pursuant to the rates and pricing set forth in Contractor's Response or Contractor's BAFO, if any. However, all payments to Contractor individually and in the aggregate shall not exceed the Contract Total. Payment shall be made in accordance with the RFP and the Florida Prompt Payment Act, section 218.70, *et seq.*, Florida Statutes.

- 6.01. *Invoices.* All invoices shall be submitted in accordance with the Florida Prompt Payment Act, section 218.72, *et seq.*, Florida Statutes, with all details prescribed by PSTA, and delivered to the following address:



Pinellas Suncoast Transit Authority
Attention: Finance Department/Accounts Payable
Purchase Order or Contract #: _____
3201 Scherer Drive
St. Petersburg, Florida 33716

or via electronic mail to:
AccountsPayable@psta.net

- 6.02. *Disputed Invoices.* In the event of a disputed invoice, only that portion so contested may be withheld from payment and the undisputed portion shall be due and payable on the terms set forth herein.
- 6.03. *Availability of Funds.* Contractor understands that the funds are not presently available under this Agreement beyond the current fiscal year. PSTA's obligation for performance under this Agreement beyond the current fiscal year is contingent upon the availability of funds from which payments can be made. PSTA is not legally liable for any payment that may arise under this Agreement beyond the current fiscal year, until the Contractor receives a written notice of availability of funds from the PSTA's Contracting Officer.

7. WARRANTIES AND COVENANTS.

- 7.01. *Patent, Trademark, Copyright, and Trade Secret.* Contractor warrants that the Services, and all goods and work associated therewith, do not infringe on any patent, trademark, copyright or trade secret of any third parties and agrees to defend, indemnify and hold PSTA, its officers, agents, employees, trustees and its successors and assigns, harmless 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 this Agreement. PSTA shall promptly notify Contractor of any such claim. PSTA makes no warranty that the production, sale or use of goods or services under this Agreement will not give rise to any such claim and PSTA shall not be liable to Contractor for any such claim brought against Contractor. If any invention, improvement, or discovery of the Contractor is conceived or first actually reduced to practice in the course of providing the Services under this Agreement, and that invention, improvement, or discovery is patentable under the laws of the United States of America or any foreign country, the Contractor agrees to notify the PSTA immediately and provide a detailed report. The rights and responsibilities of the Contractor and PSTA with respect to such invention, improvement, or discovery will be determined in accordance with applicable Federal laws, regulations, policies, and any waiver thereof.
- 7.02. *Covenants against Gratuities.* Contractor warrants that he or she 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 performance of this Agreement.
- 7.03. *E-Verify.* 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 Agreement; and (b) all persons, including subcontractors, retained or hired by Contractor, regardless of compensation, to perform work on the Services provided pursuant to the Contract Documents.

8. DELAY IN PERFORMANCE/FORCE MAJEURE.

- 8.01. *Time of the Essence.* The timely receipt of the Services and deliverables to PSTA is essential. If the Services and all deliverables under each Purchase Order are not received by PSTA within the date specified in each Purchase Order, PSTA may cancel the unfilled portion of the Purchase Order and this



Agreement for cause, purchase substitutes elsewhere, and recover from Contractor any increased costs and damages thereby incurred by PSTA.

8.02. Unavoidable Delay. If completion of the Services under any Purchase Order is unavoidably delayed, PSTA may, in its sole and absolute discretion, extend the time for completion for a determined number of days of excusable delay. A delay is unavoidable only if the delay was not reasonably expected to occur in connection with or during Contractor's performance; was not caused directly or substantially by negligent errors, omissions, or mistakes of Contractor, its subcontractors, or its suppliers or their agents; was substantial; and, in fact, caused Contractor to miss delivery dates and could not adequately have been guarded against by contractual or legal means.

8.03. No Damages for Delay. Contractor shall not be entitled to any claim for damages on account of hindrances or delays in the work from any cause whatsoever, including any delays or hindrances caused by PSTA. This paragraph shall include, but not be limited to, any actions which result in delays in scheduling, substantial changes in scope of the Services or deliverables or substantial increases in the costs of performing the work under the Contract Documents.

8.04. Notification. Contractor will notify PSTA as soon as Contractor has, or should have, knowledge that an event has occurred which will delay completion of the Services under a Purchase Order. Within five (5) working days, Contractor will confirm such notice in writing, furnishing as much detail as is available and including any request for extension of time. Contractor shall supply, as soon as such data is available, any reasonable proofs that are required by PSTA to make a decision on any request for extension. PSTA will examine the request and any documents supplied by Contractor and will determine if Contractor is entitled to an extension and the duration of such extension. PSTA will notify Contractor of its decision in writing. It is expressly understood and agreed that Contractor will not be entitled to any extension and the granting of such extension is in the sole discretion of PSTA. It is further expressly understood that Contractor shall not be entitled to any damages or compensation, and will not be reimbursed for any losses, on account of delays resulting from any cause.

9. DISPUTES, BREACHES, DEFAULTS, OR OTHER LITIGATION.

9.01. Rights and Remedies. The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by law. No action or failure to act by PSTA or Contractor shall constitute a waiver of any right or duty afforded any of them under this Agreement, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach thereunder, except as may be specifically agreed in writing.

9.02. Attorneys' Fees. In the event of legal action or other proceeding arising under this Agreement, PSTA shall be entitled to recover from Contractor all its reasonable attorneys' fees and cost incurred by PSTA in the prosecution or defense of such action, or in any post-judgment or collection proceedings and whether incurred before suit, at the trial level or at the appellate level. This shall include any bankruptcy proceedings filed by or against Contractor. PSTA also shall be entitled to recover any reasonable attorneys' fees and costs incurred in litigating the entitlement to attorneys' fees and costs, as well as in determining the amount of attorneys' fees and costs due to PSTA. The reasonable costs to which PSTA will be entitled include costs that are taxable under any applicable statute, rule, or guideline, as well as costs of investigation, copying costs, electronic discovery costs, mailing and delivery charges, costs of conducting legal research, consultant and expert witness fees, travel expenses, court reporter fees and mediator fees, regardless of whether such costs are taxable under any applicable statute, rule or guideline.

10. INDEMNIFICATION.

10.01 Indemnification. 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, or loss of use, arising out of the execution, performance, nonperformance, or enforcement of this Agreement, 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. 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. Contractor's liability hereunder shall include all attorneys' fees and costs incurred by PSTA in the enforcement of this indemnification provision. 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. The obligations contained in this provision shall survive termination of this Agreement, however terminated, and shall not be limited by the amount of any insurance required to be obtained or maintained under this Agreement.

10.02 Control of Defense. Subject to the limitations set forth in this provision, 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 Agreement 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 such records and information, and attend such conferences, discovery proceedings, hearings, trials, or appeals, as may be reasonably requested in connection therewith.

11. MISCELLANEOUS PROVISIONS.

11.01 Entire Agreement. The Contract Documents, including all exhibits, constitute the entire agreement between the parties with respect to the subject matter hereof and supersedes all previous written or oral negotiations, agreements, proposals and/or understandings. There are no representations or warranties unless set forth in the Contract Documents.

11.02 Notices. All notices required or made pursuant to this Agreement shall be made in writing and sent by certified U.S. mail, return receipt requested, addressed to the following:

To PSTA:
Pinellas Suncoast Transit Authority
Attn: Brad Miller, CEO
3201 Scherer Drive
St. Petersburg, FL 33716

To Contractor:



With required copy to:

Alan S. Zimmet, B.C.S.
Bryant Miller Olive
One Tampa City Center
Suite 2700
Tampa, FL. 33602

Either party may change its above noted address by giving written notice to the other party in accordance with the requirements of this section.

- 11.03 *Waiver of Remedies for any Breach.*** In the event that PSTA elects to waive its remedies for any breach by Contractor of any covenant, term or condition of this Agreement, such waiver by PSTA shall only be valid if set forth in writing and shall not limit PSTA's remedies for any succeeding breach of that or of any other term, covenant, or condition of this Agreement.
- 11.04 *Modification.*** The Contract Documents, including the scope, specification, and details of the Services may only be modified by written agreement of the Parties. No modification shall serve to increase the Contract Total unless such change has been approved by PSTA's Board of Directors prior to any work being performed that would serve to increase the Contract Total.
- 11.05 *Headings and Section References.*** The headings and section references in this Agreement are inserted only for the purpose of convenience and shall not be construed to expand or limit the provisions contained in such sections.
- 11.06 *Authorization.*** Both parties to this Agreement represent and warrant that they are authorized to enter into this Agreement without the consent and joinder of any other party and that the parties executing this Agreement have full power and authority to bind their respective parties to the terms hereof.
- 11.07 *Assignment.*** The terms and provisions of this Agreement shall be binding upon the Parties and their respective partners, successors, heirs, executors, administrators, assigns and legal representatives. Notwithstanding the foregoing, a party's rights and obligations under this Agreement may only be transferred, assigned, sublet, mortgaged, pledged or otherwise disposed of or encumbered in any way with the other party's prior written consent.
- 11.08 *Severability.*** If any one or more provisions of this Agreement shall be held to be invalid, illegal, or unenforceable in any respect by a court of competent jurisdiction, the validity, legality, and enforceability of the remaining provisions hereof shall not in any way be affected or impaired thereby and this Agreement shall be treated as though the invalidated portion(s) had never been a part hereof.
- 11.09 *Electronic Signatures.*** This Agreement may be executed by electronic signature technology and such electronic signature shall act as the Parties' legal signatures on this Agreement and shall be treated in all respects as an original handwritten signature.
- 11.10 *Counterparts.*** This Agreement may be executed in one or more counterparts, any one of which need not contain the signatures of more than one party, but all such counterparts taken together will constitute one and the same instrument.

(SIGNATURES ON FOLLOWING PAGE)



IN WITNESS WHEREOF the Parties hereto have caused this Agreement to be duly executed on the date first above written.

CONTRACTOR:

PSTA:

By: _____

By: _____

Print Name: _____

Brad Miller, CEO

Title: _____

Attest:

Rachael Cappolla, Executive Assistant

WITNESS/ATTEST:

Approved as to form:

By: _____

By: _____

Print Name: _____

Alan S. Zimmet, General Counsel

ADDENDUM OF SOLICITATION

1. SOLICITATION NO.:	2. ADDENDUM NO.:	3. EFFECTIVE DATE:	4. BRIEF SOLICITATION DESCRIPTION:
RFP 21-980369	2	August 5, 2021	FLORIDA ELECTRIC TRANSIT BUSES

5. REVISED OFFER SUBMISSION DUE DATE AND TIME:

(Note: Unless identified below, this solicitation Addendum does not change the Offer Submission Date and Time.)

The date and/or time specified for receipt of offers is changed as follows:

DATE:

TIME: [AM/PM](#) Local

6. REVISED PRE-BID/PROPOSAL CONFERENCE:

(Note: Unless identified below, this solicitation Addendum does not change the Pre-Bid/Proposal Conference, if a conference is scheduled.)

The scheduled pre-bid/proposal conference is changed as follows:

DATE:

TIME: [AM/PM](#) Local

LOCATION:

7. ADDENDUM OF SOLICITATION:

The Solicitation identified in Block 1, above, is hereby amended as described in Block 11, below. Except as provided herein, all other provisions of the solicitation, or as heretofore amended, remain unchanged and in full force and effect.

8. REQUIREMENT TO ACKNOWLEDGE ADDENDUM:

Offerors must acknowledge receipt of this Addendum prior to the deadline specified in the solicitation for receipt of offers by one of the following methods:

- a. Shall acknowledge the receipt of each individual addendum in their Proposals on the form Acknowledgement of Addenda.

WARNING: Failure of an Offeror to acknowledge receipt of this Addendum, as described herein, may result in REJECTION OF THE OFFER.

NOTE: For Invitations for Bids the terms "Offer" and Offeror" shall mean "Bid" and "Bidder", respectively; and for Requests for Proposals or Quotation the terms "Bid" and "Bidder" shall mean "Offer" and "Offeror", respectively, in this solicitation and any associated exhibits.

9. FOR FURTHER INFORMATION CALL CONTRACTS SPECIALIST:

Name: Alvin Burns

Email: aburns@psta.net (cc: erandle@psta.net)

10. DESCRIPTION OF ADDENDUM:

1. Vendor questions and the Authority's Responses.
2. Request for Pre-Offer Change or Approved Equal & RFP Updates
3. Revised Excel Pricing Schedule (Attachment)

Amendment		VENDOR QUESTION	PSTA RESPONSE
1	1	Will this procurement cover the design & installation of chargers?	No
2	1	Can you confirm if charger design and installation is being requested from this RFP?	No
3	1	As seen in section TS 19. Altoona Testing, it states “Buses which have not successfully completed an Altoona Test for the type and sizes requested under this RFP will not be considered.” Please confirm if a proposal will be considered if Altoona testing is to be completed after the proposal submission, and tests from our current similar models are provided in our proposal.	The bus will need to satisfy meeting FTA Pre Award, Post delivery and FAST Act requirements.
4	1	Will the agency allow the submission of question using an excel spreadsheet instead of using CER 2. Request for Pre-Offer Change or Approved Equal, which can facilitate response. Please advise.	Yes
5	2	Is there a desired kW power level for the Depot Charger ?	No
6	2	Can the Proposer submit multiple equipment model options for depot chargers ? In order to best accommodate fleet operators needs, we believe it is important to provide a larger range of chargers capable of various power levels.	Yes. As long as supporting documentation is included in your proposal
7	2	Can sequential charging be proposed, in lieu of simultaneous charging ? In many, if not most instances, sequential charging will meet the fleet's recharging needs.	Please clarify what you are define as sequential charging and simultaneous charging
8	2	Can the Proposer submit additional unit pricing options to supply charger accessories, as well as corrective and preventative maintenance plans, in addition to charger hardware supply?	Yes
9	2	In the RFP under TS 19. Altoona Testing it states the following... 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. The Proposer would like to confirm that an Altoona Test Report is required at time of submission?	Please see addendum 1, question #3

Request for Pre-Offer Change or Approved Equal & RFP Updates

PSTA RFP 21-980369

Request #	Addendum	RFP Section	Page	RFP	Questions/Clarification or Approved Equal	Agency Action	Agency Response:
1	2	TS 84.1 Camera Surveillance System	179	Provide all wiring and mounting locations for a multi-camera surveillance system, including the installation of cameras, recorder, microphone, etc..	Proposer requests information on whether or not a camera system should be included in the base bus price. Currently, various information pertinent to details of this system such as supplier, number of cameras, type of DVR and functionalities are missing from the technical specifications. Such information is essential to be able to provide accurate pricing and configuration. In light of this, proposer requests approval to provide price of such systems only through optional items included in CER 6, Pricing Schedule	See Response	DEFAULT No camera system. ALTERNATIVE A camera system shall be installed. Agency to select from list of available camera systems from OEM options list including installation locations. ALTERNATIVE Pre-wire only. Agency may select to have vehicle pre-wired only for a camera system.
2	2	CER 6, Pricing Schedule	NA	NA	The specification of several systems such as Destination signs, Camera Systems, and Automatic Passenger Counters are missing configuration details that are essential for costing. Proposer understands that the base bus configuration will not have any of such systems, but optional pricing for those will be provided via CER 6, Pricing Schedule for interested agencies. Please confirm our understanding.	See Addendum	Pricing Scheduled has be updated
3	2	TS 81 Destination Signs	177	<p>A destination sign system shall be furnished on the front, on the right side near the front door.</p> <p>Route sign on the rear of the vehicle.</p> <p>All signs shall be convoluted 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.</p> <p>The driver shall be able to access the sign while seated.</p> <p>The destination sign compartments shall meet the following minimum requirements:</p> <p>1. Compartments shall be designed to prevent condensation and entry of moisture and dirt.</p> <p>2. Compartments shall be designed to prevent fogging of both compartment window and glazing on the unit itself.</p> <p>3. Access shall be provided to allow cleaning of inside compartment window and unit glazing.</p> <p>4. The front window shall have an exterior display area of no less than 8.5 in. high by 56 in. wide.</p> <p>Run number sign shall be installed.</p>	NA	RFP Update	<p>DEFAULT A destination sign shall be furnished on the front and on the right side (curbside) near the front door.</p> <p>The destination signs shall be Luminator Smart Series III with white LED, or approved equal.</p> <p>ALTERNATIVE Agency to select from list of available destination sign systems from OEM provided options list.</p> <p>ALTERNATIVE A rear route sign, if available, shall be installed on the rear of the vehicle.</p> <p>ALTERNATIVE A run number sign, if available, shall be installed on the vehicle</p>
4	2	TS 84.3 Automatic Passenger Counters (APC)	179	An infrared APC system shall be installed. Agency to provide details of APC system, including installation locations and number of buses to be equipped.	NA	RFP Update	<p>DEFAULT No automatic passenger counter system.</p> <p>ALTERNATIVE An automatic passenger counter system shall be installed. Agency to select from list of available automatic passenger counter systems from OEM options list including installation locations.</p>
5	2	TS 84.4.2 Handset	180	Contractor will install a handset for driver use.	NA	RFP Update	<p>DEFAULT No handset.</p> <p>ALTERNATIVE A handset for driver use shall be installed. Agency to select from list of available handsets including installation location from OEM option list.</p>
6	2	TS 86. Computer Assisted Dispatching System (CAD/AVL)	181	<p>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.</p> <p>Each PSTA bus is equipped with various components provided by Clever Devices to include all necessary wiring and software installation. The on board computing processor 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.</p> <p>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.</p>	NA	RFP Update	<p>DEFAULT No computer assisted dispatching system (CAD/AVL).</p> <p>ALTERNATIVE A computer assisted dispatching system (CAD/AVL) shall be installed. Agency to select from list of available CAD/AVL systems from OEM options list including installation requirements and configuration.</p> <p>ALTERNATIVE Pre-wire only. Agency may select to have vehicle pre-wired only for a CAD/AVL system.</p>

ADDENDUM OF SOLICITATION

1. SOLICITATION NO.:	2. ADDENDUM NO.:	3. EFFECTIVE DATE:	4. BRIEF SOLICITATION DESCRIPTION:
RFP 21-980369	3	August 17, 2021	FLORIDA ELECTRIC TRANSIT BUSES

5. REVISED OFFER SUBMISSION DUE DATE AND TIME:

(*Note: Unless identified below, this solicitation Addendum does not change the Offer Submission Date and Time.*)

The date and/or time specified for receipt of offers is changed as follows:

DATE:

TIME: [AM/PM](#) Local

6. REVISED PRE-BID/PROPOSAL CONFERENCE:

(*Note: Unless identified below, this solicitation Addendum does not change the Pre-Bid/Proposal Conference, if a conference is scheduled.*)

The scheduled pre-bid/proposal conference is changed as follows:

DATE:

TIME: [AM/PM](#) Local

LOCATION:

7. ADDENDUM OF SOLICITATION:

The Solicitation identified in Block 1, above, is hereby amended as described in Block 11, below. Except as provided herein, all other provisions of the solicitation, or as heretofore amended, remain unchanged and in full force and effect.

8. REQUIREMENT TO ACKNOWLEDGE ADDENDUM:

Offerors must acknowledge receipt of this Addendum prior to the deadline specified in the solicitation for receipt of offers by one of the following methods:

- a. Shall acknowledge the receipt of each individual addendum in their Proposals on the form Acknowledgement of Addenda.

WARNING: Failure of an Offeror to acknowledge receipt of this Addendum, as described herein, may result in REJECTION OF THE OFFER.

NOTE: For Invitations for Bids the terms "Offer" and Offeror" shall mean "Bid" and "Bidder", respectively; and for Requests for Proposals or Quotation the terms "Bid" and "Bidder" shall mean "Offer" and "Offeror", respectively, in this solicitation and any associated exhibits.

9. FOR FURTHER INFORMATION CALL CONTRACTS SPECIALIST:

Name: Alvin Burns

Email: aburns@psta.net (cc: erandle@psta.net)

10. DESCRIPTION OF ADDENDUM:

1. Request for Pre-Offer Change or Approved Equal & RFP Updates
2. Revised Table 1 - Contract Deliverables

Request for Pre-Offer Change or Approved Equal & RFP Updates

PSTA RFP 21-980369

Request #	Addendum	RFP Section	Page	RFP	Questions/Clarification or Approved Equal	Agency Action	Agency response:
1	2	TS 84.1 Camera Surveillance System	179	Provide all wiring and mounting locations for a multi-camera surveillance system, including the installation of cameras, recorder, microphone, etc...	Proposer requests information on whether or not a camera system should be included in the base bus price. Currently, various information pertinent to details of this system such as supplier, number of cameras, type of DVR and functionalities are missing from the technical specifications. Such information is essential to be able to provide accurate pricing and configuration. In light of this, proposer requests approval to provide price of such systems only through optional items included in CER 6, Pricing Schedule	See Response	DEFAULT No camera system. ALTERNATIVE A camera system shall be installed. Agency to select from list of available camera systems from OEM options list including installation locations. ALTERNATIVE Pre-wire only. Agency may select to have vehicle pre-wired only for a camera system.
2	2	CER 6, Pricing Schedule	NA	NA	The specification of several systems such as Destination signs, Camera Systems, and Automatic Passenger Counters are missing configuration details that are essential for costing. Proposer understands that the base bus configuration will not have any of such systems, but optional pricing for those will be provided via CER 6, Pricing Schedule for interested agencies. Please confirm our understanding.	See Addendum	Pricing Scheduled has be updated
3	2	TS 81 Destination Signs	177	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.	NA	RFP Update	DEFAULT A destination sign shall be furnished on the front and on the right side (curbside) near the front door. ALTERNATIVE The destination signs shall be Luminator Smart Series III with white LED, or approved equal. ALTERNATIVE Agency to select from list of available destination sign systems from OEM provided options list. ALTERNATIVE A rear route sign, if available, shall be installed on the rear of the vehicle. ALTERNATIVE A run number sign, if available, shall be installed on the vehicle
4	2	TS 84.3 Automatic Passenger Counters (APC)	179	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.	NA	RFP Update	DEFAULT No automatic passenger counter system. ALTERNATIVE An automatic passenger counter system shall be installed. Agency to select from list of available automatic passenger counter systems from OEM options list including installation locations.
5	2	TS 84.4.2 Handset	180	Contractor will install a handset for driver use.	NA	RFP Update	DEFAULT No handset. ALTERNATIVE A handset for driver use shall be installed. Agency to select from list of available handsets including installation location from OEM option list.
6	2	TS 86. Computer Assisted Dispatching System (CAD/AVL)	181	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 processor 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.	NA	RFP Update	DEFAULT No computer assisted dispatching system (CAD/AVL). ALTERNATIVE A computer assisted dispatching system (CAD/AVL) shall be installed. Agency to select from list of available CAD/AVL systems from OEM options list including installation requirements and configuration. ALTERNATIVE Pre-wire only. Agency may select to have vehicle pre-wired only for a CAD/AVL system.
7	3	SP 2.4	51-53	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.	We request clarification regarding the quantities of manuals needed. Please clarify which section prevails between Table 1: Contract deliverables and SP 5.2 Documentation.	See Addendum	Revised Table 1—Contract Deliverables attached. 3

Request for Pre-Offer Change or Approved Equal & RFP Updates

PSTA RFP 21-980369

Request #	Addendum	RFP Section	Page	RFP	Questions/Clarification or Approved Equal	Agency Action	Agency response:
8	3	SP 2.4	51	<p>SP 2.4 Contract Deliverables</p> <p>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.</p>	As per Item 18 of Table 1, we understand that the City requests 20 bus orientation video. We propose to offer PSTA the right to film the on-site orientation training which includes a tour of the bus for future internal use.	Approved	NA
9	3	SP 2.5	54	<p>SP 5.2 Documentation</p> <p>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 of current parts manual(s), and an electronic copy of 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 manuals 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 subcontract Supplier will be provided.</p>	<p>There are incoherencies between the two section regarding the documentation specifications and Nova Bus would like to offer the best service according to the real needs of PSTA.</p>	See Response	<p>Revised SP 5.2 Documentation: The Contractor shall provide an electronic of current maintenance manual(s) to include preventative maintenance procedures, diagnostic procedures or troubleshooting guides and major component service manuals, an electronic copy of current parts manual(s), and an electronic copy of 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 manuals 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 subcontract Supplier will be provided.</p>

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 Electronic Copy	1
2.	List of serialized units installed on each bus	Review		With each delivered bus	Electronic media Electronic Copy	1 per bus
3.	Copy of Manufacturers' formal Quality Assurance Program	Review		Pre-award site visit	Hardcopy or Electronic media Electronic Copy	1
4.	QA manufacturing certificate	Review		With each delivered bus	Hardcopy or Electronic media Electronic Copy	1 per bus
5.	QA purchasing certifications acknowledging receipt of applicable specification	Review		30 days following first Pre- Production Meeting	Hardcopy or Electronic media Electronic Copy	1 per major Supplier
6.	Pre-Delivery Bus Documentation Package	Review		With each delivered bus	Hardcopy or Electronic media	1 per bus
9.	Pre-Production Meeting minutes	Approval		30 days after each meeting	Hardcopy or Electronic media Electronic Copy	2 originals 1
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 Electronic Copy	1
13.	Insurance certificates	Approval		Before Work commences	Hardcopy or Electronic media Electronic Copy	1

TABLE 1
Contract Deliverables

Deliverable		Agency Action	Reference Section	Due Date	Format	Quantity Due
14.	Engineering support	Review		During Pre-Production Meeting	Contracts 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	Qty Per OEM
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 Qty Per OEM
19.	Final preventative maintenance manuals	Review		90 days after Agency written approval	Hardcopy Electronic media Electronic Copy	10/100 buses 20 1
20.	Final diagnostic procedures manuals	Review		90 days after Agency written approval	Hardcopy Electronic media Electronic Copy	10/100 buses 20 1
21.	Final parts manuals	Approval		90 days after Agency written approval	Hardcopy Electronic media Electronic Copy	10/100 buses 20 1
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 Electronic Copy	2 2 1
23.	Draft preventative maintenance manuals (Agency approval/review period of 90 days from date of receipt)	Approval		With pilot bus	Hardcopy or Electronic media Electronic Copy	10 1
24.	Draft diagnostic procedures manuals (Agency approval/review period of 90 days from date of receipt)	Approval		With pilot bus	Hardcopy or Electronic media Electronic Copy	10 1
25.	Draft parts manuals (Agency approval/review period of 90 days from date of receipt)	Approval		With pilot bus	Hardcopy or Electronic media Electronic Copy	10 1

TABLE 1
Contract Deliverables

Deliverable		Agency Action	Reference Section	Due Date	Format	Quantity Due
26.	List of OEM component repair manuals	Approval		With pilot bus	Hardcopy or Electronic media Electronic Copy	40 1
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 Electronic Copy	40 1
28.	Final operators' manuals	Review		30 days following Agency approval of draft manual	Hardcopy or Electronic media Electronic Copy	1 per bus 1
29.	Recommended spare parts list, including bill of materials	Review		60 days prior to shipment of first bus	Hardcopy or Electronic media Electronic Copy	1 1
30.	Part number index	Approval		60 days prior to shipment of first bus	Hardcopy Spreadsheet Electronic Copy	1 1
31.	Current price list	Review		90 days after Agency written approval of draft parts manual	Hardcopy Electronic Copy	20 1
32.	In-process drawings	Review		30 days prior to production	Scale drawings Electronic Copy	1
33.	Electrical and air schematics	Review		30 days prior to production	Hardcopy or Electronic media Electronic Copy	1
34.	As-built drawings	Review		Within 60 days after final bus delivery	Electronic media Electronic Copy	1
35.	Material samples	Review		By conclusion of Pre-Production Meetings	Per OEM	Per OEM
36.	Undercoating system program	Approval		First Pre-Production Meeting	Hardcopy or Electronic media Electronic Copy	1

TABLE 1
Contract Deliverables

	Deliverable	Agency Action	Reference Section	Due Date	Format	Quantity Due
37.	Flooring certificate	Review		First Pre-Production Meeting	Certificate/ copy of purchase order Electronic Copy	1
38.	Interior features – fire-resistance certificates	Review		Prior to pilot bus completion	Certificates Electronic Copy	1
39.	Crashworthiness	Review		Pre-award audit	Certificate Electronic Copy	1
40.	Technical review of electronic functionality	Approval		Prior to production	Hardcopy or Electronic media Electronic Copy	1
41.	Interior security camera layout	Approval		Prior to pilot bus completion	Electronic Copies of interior views	1 each
42.	Technical review of power plant			Prior to production	Electronic Copy	1
43.	Power plant certifications	Review		Prior to pilot bus completion	Hardcopy or Electronic media Electronic Copy	1 each
44.	Striping layout	Approval		Prior to production	Hardcopy or Electronic media Electronic Copy	1
45.	Resolution of issues “subject to Agency approval”	Approval		Prior to production	Hardcopy or Electronic media Electronic Copy	1

ADDENDUM OF SOLICITATION

1. SOLICITATION NO.:	2. ADDENDUM NO.:	3. EFFECTIVE DATE:	4. BRIEF SOLICITATION DESCRIPTION:
RFP 21-980369	4	August 30, 2021	FLORIDA ELECTRIC TRANSIT BUSES

5. REVISED OFFER SUBMISSION DUE DATE AND TIME:

(*Note: Unless identified below, this solicitation Addendum does not change the Offer Submission Date and Time.*)

The date and/or time specified for receipt of offers is changed as follows:

DATE:

TIME: [AM/PM](#) Local

6. REVISED PRE-BID/PROPOSAL CONFERENCE:

(*Note: Unless identified below, this solicitation Addendum does not change the Pre-Bid/Proposal Conference, if a conference is scheduled.*)

The scheduled pre-bid/proposal conference is changed as follows:

DATE:

TIME: [AM/PM](#) Local

LOCATION:

7. ADDENDUM OF SOLICITATION:

The Solicitation identified in Block 1, above, is hereby amended as described in Block 11, below. Except as provided herein, all other provisions of the solicitation, or as heretofore amended, remain unchanged and in full force and effect.

8. REQUIREMENT TO ACKNOWLEDGE ADDENDUM:

Offerors must acknowledge receipt of this Addendum prior to the deadline specified in the solicitation for receipt of offers by one of the following methods:

- a. Shall acknowledge the receipt of each individual addendum in their Proposals on the form Acknowledgement of Addenda.

WARNING: Failure of an Offeror to acknowledge receipt of this Addendum, as described herein, may result in REJECTION OF THE OFFER.

NOTE: For Invitations for Bids the terms "Offer" and Offeror" shall mean "Bid" and "Bidder", respectively; and for Requests for Proposals or Quotation the terms "Bid" and "Bidder" shall mean "Offer" and "Offeror", respectively, in this solicitation and any associated exhibits.

9. FOR FURTHER INFORMATION CALL CONTRACTS SPECIALIST:

Name: Alvin Burns

Email: aburns@psta.net (cc: erandle@psta.net)

10. DESCRIPTION OF ADDENDUM:

1. Vendor questions and the Authority's responses.
2. Request for Pre-Offer Change or Approved Equal & RFP Updates
3. Revised Table 1 - Contract Deliverables

Amendment		VENDOR QUESTION	PSTA RESPONSE
1	1	Will this procurement cover the design & installation of chargers?	No
2	1	Can you confirm if charger design and installation is being requested from this RFP?	No
3	1	As seen in section TS 19. Altoona Testing, it states <i>"Buses which have not successfully completed an Altoona Test for the type and sizes requested under this RFP will not be considered."</i> Please confirm if a proposal will be considered if Altoona testing is to be completed after the proposal submission, and tests from our current similar models are provided in our proposal.	The bus will need to satisfy meeting FTA Pre Award, Post delivery and FAST Act requirements.
4	1	Will the agency allow the submission of question using an excel spreadsheet instead of using CER 2. Request for Pre-Offer Change or Approved Equal, which can facilitate response. Please advise.	Yes
5	2	Is there a desired kW power level for the Depot Charger ?	No
6	2	Can the Proposer submit multiple equipment model options for depot chargers ? In order to best accommodate fleet operators needs, we believe it is important to provide a larger range of chargers capable of various power levels.	Yes. As long as supporting documentation is included in your proposal
7	2	Can sequential charging be proposed, in lieu of simultaneous charging ? In many, if not most instances, sequential charging will meet the fleet's recharging needs.	Please clarify what you are defining as sequential charging and simultaneous charging
8	2	Can the Proposer submit additional unit pricing options to supply charger accessories, as well as corrective and preventative maintenance plans, in addition to charger hardware supply?	Yes
9	2	In the RFP under TS 19. Altoona Testing it states the following... 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.	Please see addendum 1, question #3
		The Proposer would like to confirm that an Altoona Test Report is required at time of submission?	

Amendment		VENDOR QUESTION	PSTA RESPONSE
10	4	In package 3 Qualification are the following required as it states if applicable and we cannot determine if they are applicable and required as part of our submission. 4. Letter for performance bond (if applicable) 5. Letter of commitment for parental financial guarantee (if applicable)	No letter for performance bond is needed
11	4	Will PSTA accept an accord insurance certificate in lieu of #3. Letter for insurance?	No. We need the letter because PSTA is not the only agency purchasing off of this contract. The submittal of the letter is a matter of responsiveness.
12	4	Will PSTA accept a link instead of the complete annual reports as this will increase the size of the file upload. Req: 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.	Yes a link is ok to submit.
13	4	#12 Performance Bond. - Please confirm if a performance bond will be required as our surety as advised of the following language: See FTA language as provided by the Surety: The FTA's own website (https://www.transit.dot.gov/funding/procurement/third-party-procurement/bonds) specifically mentions that bonds are not required for Rolling Stock (i.e. buses): "The FTA requirements regarding bonds pertain only to construction contracts and facility improvement contracts. They do not pertain to contracts for equipment, rolling stock, maintenance, or other non-construction services. Grantees may choose to require bonds from contractors performing other non-construction contracts, but this is at the sole discretion of the grantee. FTA bonding requirements are discussed in FTA Circular 4220.1F, Chapter IV, 2.i. and the Best Practices Procurement Manual, Section 3.2.8 – Bonding. (Revised: May 2017)". Rolling Stock is defined as "transit vehicles such as buses, vans, cars, railcars, locomotives, trolley cars and buses, and ferry boats, as well as vehicles used for support services." Source: (https://www.transit.dot.gov/funding/procurement/third-party-procurement/definition-rolling-stock).	There is no Bonding requirement for this solicitation.
14	4	Will PSTA accept the accord certificate to meet this requirement?	No. We need the letter because PSTA is not the only agency purchasing off of this contract. The submittal of the letter is a matter of responsiveness.
15	4	Section 3 - Qualification Section Requirements does not have this requirement. Please confirm if a letter from a surety is required.	There is no Bonding requirement for this solicitation.

	Amendment	VENDOR QUESTION	PSTA RESPONSE
16	4	Does this procurement require any bonds and if so for how much and for how long as well as how will the bond be released.	No
17	4	What is the qty needed for each model(s) for this RFP? A quantity will assist us in meeting providing PSTA the required delivery schedule.	This is a state schedule that may be used by any agency. All quantities should be based on the assumption of one.
18	4	Shall bidder provide production schedule for each model based on (1) unit of vehicle? If the proposed schedule is identical for each model, can bidder provide one schedule that covers all models?	Yes
19	4	Th Payment due date for purchase of goods or services other than construction services is net forty-five (45) days from the accepted date. We requested approval to reduce the net forty-five days to net thirty days from the accepted date.	As this is a procurement for the state we are bound by Florida statue 218.74. Unfortunately, we have to deny this request.
20	4	<p>Requests approval to limit the liquidated damages to be capped on a per bus basis at 2% of the value of the bus price.</p> <p>The timely performance of the work by the Contractor is of utmost importance to ensure successful completion of the deliveries stipulated in the Contract.</p> <p>Nonetheless, an unlimited liability obligation creates a severe restriction on our ability to disclose financial provision in accordance with Securities Exchange requirements. Hence, the Contractor considers that liquidated damages should be an assessment of direct damages suffered by the Customer, and, in addition be a mechanism to dissuade poor performance.</p>	<p>PSTA is agreeable to the 2% limit provided it does not exceed 80 days. In the event the delivery exceeds 80 days, the contractor would be agreeable to pay \$200.00 per day not to exceed 10% of the cost of the vehicle.</p>

Request for Pre-Offer Change or Approved Equal & RFP Updates

PSTA RFP 21-980369

Request #	Addendum	RFP Section	Page	RFP	Questions/Clarification or Approved Equal	Agency Action	Agency response:
1	2	TS 84.1 Camera Surveillance System	179	Provide all wiring and mounting locations for a multi-camera surveillance system, including the installation of cameras, recorder, microphone, etc...	Proposer requests information on whether or not a camera system should be included in the base bus price. Currently, various information pertinent to details of this system such as supplier, number of cameras, type of DVR and functionalities are missing from the technical specifications. Such information is essential to be able to provide accurate pricing and configuration. In light of this, proposer requests approval to provide price of such systems only through optional items included in CER 6, Pricing Schedule	See Response	DEFAULT No camera system. ALTERNATIVE A camera system shall be installed. Agency to select from list of available camera systems from OEM options list including installation locations. ALTERNATIVE Pre-wire only. Agency may select to have vehicle pre-wired only for a camera system.
2	2	CER 6, Pricing Schedule	NA	NA	The specification of several systems such as Destination signs, Camera Systems, and Automatic Passenger Counters are missing configuration details that are essential for costing. Proposer understands that the base bus configuration will not have any of such systems, but optional pricing for those will be provided via CER 6, Pricing Schedule for interested agencies. Please confirm our understanding.	See Addendum	Pricing Scheduled has be updated
3	2	TS 81 Destination Signs	177	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.	NA	RFP Update	DEFAULT A destination sign shall be furnished on the front and on the right side (curbside) near the front door. The destination signs shall be Luminator Smart Series II with white LED, or approved equal. ALTERNATIVE Agency to select from list of available destination sign systems from OEM provided options list. ALTERNATIVE A rear route sign, if available, shall be installed on the rear of the vehicle. ALTERNATIVE A run number sign, if available, shall be installed on the vehicle
4	2	TS 84.3 Automatic Passenger Counters (APC)	179	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.	NA	RFP Update	DEFAULT No automatic passenger counter system. ALTERNATIVE An automatic passenger counter system shall be installed. Agency to select from list of available automatic passenger counter systems from OEM options list including installation locations.
5	2	TS 84.4.2 Handset	180	Contractor will install a handset for driver use.	NA	RFP Update	DEFAULT No handset. ALTERNATIVE A handset for driver use shall be installed. Agency to select from list of available handsets including installation location from OEM option list.
6	2	TS 86. Computer Assisted Dispatching System (CAD/AVL)	181	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 processor 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.	NA	RFP Update	DEFAULT No computer assisted dispatching system (CAD/AVL). ALTERNATIVE A computer assisted dispatching system (CAD/AVL) shall be installed. Agency to select from list of available CAD/AVL systems from OEM options list including installation requirements and configuration. ALTERNATIVE Pre-wire only. Agency may select to have vehicle pre-wired only for a CAD/AVL system.
7	3	SP 2.4	51-53	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.	We request clarification regarding the quantities of manuals needed. Please clarify which section prevails between Table 1: Contract deliverables and SP 5.2 Documentation.	See Addendum	Revised Table 1—Contract Deliverables attached.

Request for Pre-Offer Change or Approved Equal & RFP Updates

PSTA RFP 21-980369

Request #	Addendum	RFP Section	Page	RFP	Questions/Clarification or Approved Equal	Agency Action	Agency response:
8	3	SP 2.4	51	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.	As per item 18 of Table 1, we understand that the City requests 20 bus orientation video. We propose to offer PSTA the right to film the on-site orientation training which includes a tour of the bus for future internal use.	Approved	NA
9	3	SP 2.5	54	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 of current parts manual(s), and an electronic copy of 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 manuals 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 subcontract Supplier will be provided.	There are incoherencies between the two section regarding the documentation specifications and Nova Bus would like to offer the best service according to the real needs of PSTA.	See Response	Revised SP 5.2 Documentation: The Contractor shall provide an electronic of current maintenance manual(s) to include preventative maintenance procedures, diagnostic procedures or troubleshooting guides and major component service manuals, an electronic copy of current parts manual(s), and an electronic copy of 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 manuals 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 subcontract Supplier will be provided.
10	4	TS 7.4	85	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.	Will PSTA specify the minimum operating range requirement?	See Response	There are no minimum range requirement specifications established in this RFP. As stated in the RFP and during the pre-proposal meeting, Proposers shall supply the range information requested in TS 8.1 for each size bus being submitted for consideration utilizing the Alcoa On-Road Energy Consumption and Range Tests for buses. Specifically, CBD, ART, and COM Duty Cycles.
11	4	TS 7.3	85	TS 7.3 Acceleration Braking application and performance shall remain consistent regardless of system state of charge (SOC) or other variances related to regenerative braking.	We would like to clarify that electric bus is equipped with two braking systems to decelerate the bus. One is a pneumatic friction-based brake system, and another is a regenerative braking system. The braking performance is different with and without regenerative braking. Regenerative braking is available (braking performance is consistent) regardless of system SOC in our design. While, if the regenerative braking is limited or not available due to special condition, the braking performance is different. We request approval of the design.	Approved	NA
12	4	TS 8.2	87	TS 8.2 Design Operating Profile (Battery Electric Bus) 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).	We would like clarity that as operating range varies with road conditions, weather, bus configuration, driver behavior etc., we request the agency to provide a detail route profile data (including bus speed vs time, route grades vs bus speed, preferably at a sampling frequency of 1 Hz or greater)	See Response	Detailed route data is not available. As stated in the RFP and during the pre-proposal meeting, Proposers shall supply the range information requested in TS 8.1 for each size bus being submitted for consideration utilizing the Alcoa On-Road Energy Consumption and Range Tests for buses. Specifically, CBD, ART, and COM Duty Cycles. Assume ambient temperature of 90 deg F and weather customary to the State of Florida.
13	4	TS 8.2	87	TS 8.2 Design Operating Profile (Battery Electric Bus) 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).	If detail route profile data is not available, we request approval to provide Alcoa cycle operating range for reference.	See Response	See answers to previous questions.
14	4	TS 9.1.4	90	TS 9.1.4 Energy Storage System and Controller Energy Storage System A phased automatic shutdown system shall be provided	We would like PSTA to clarify the "A phased automatic shutdown system". What is the function? How does it work?	See Response	The intent of the specification is that sufficient warnings will be given to the operator that the SOC is running low. The intent of a "phase automatic shutdown" is, as an example, at 30% SOC a warning indicator, audible tone, is given, at 20% SOC the bus may derate in performance to conserve energy, at 10% SOC the bus goes into "limp-home" mode, at 0% the bus automatically shuts down. The levels of SOC stated previously are only used to illustrate the intent. Proposers shall specify what form of low-SOC shutdown protocols are in use.
15	4	TS 9.1.4	92	TS 9.1.4 Energy Storage System and Controller Energy Storage System Battery Charging The bus shall support an SAE approved charging standard (SAE J13068 AC and/or SAE J1772 DC).	Will PSTA accept our AC charging as an option? Our AC charging has SAE J-3068 connector but not fully compliant to SAE J-3068.	See Response	Manufacturer shall provide a detailed description of its charging system and specify its compliance with one of the listed standards. If the charging system cannot meet compliance provide detailed information as part of the Proposal so that the Evaluation Committee may review and make a determination on acceptance.
16	4	TS 9.1.6	93	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.	We request to delete this requirement as the RFP is for electric bus.	See Response	If the specification does not apply to a manufacturer's bus design the Proposer may consider it not applicable.

Request for Pre-Ofier Change or Approved Equal & RFP Updates

PSTA RFP 21-980369

Request #	Addendum	RFP Section	Page	RFP	Questions/Clarification or Approved Equal	Agency Action	Agency response:																											
17	4	TS 19	99	TS 19. Altona Testing DEFAULT An Altona Test Report shall be provided to the Agency with the Proposal submittal.	Will PSTA accept to provide altona report prior to first bus delivery? And FTA does allow for test to be accepted upon delivery of the first bus.	See Response	The bus will need to satisfy meeting FTA Pre Award, Post delivery and FAST Act requirements.																											
18	4	TS 26.5	103	TS 26.5 Construction 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).	We would like clarity that the standard floor is Coosa Composite fiberglass composite floor. Coosa fiberglass composite floor can meet both FMVSS 302 and docket 90 requirement. And it is also Altona tested in our bus. We request approval of Coosa fiberglass floor.	Approved	NA																											
19	4	TS 56	148	TS 56. Roof Ventilators ALTERNATIVE Three Roof Ventilators (Used in articulated buses.)	Will PSTA accept two roof ventilators in articulated bus?	See Response	Yes, so long as number of ventilators satisfies compliance with FMVSS for minimum number of escape hatches.																											
20	4	TS 52	144	TS 52. Capacity and Performance ALTERNATIVE R134a The air conditioning system shall meet these performance requirements using R134a	R410a has a greater efficiency/lower price than R134a. Also R410a is more friendly to environment. We request approval for OUR HVAC which uses R410a for the system.	Approved	NA																											
21	4	TS 78.1.2	168	TS 78.1.2 Rear Door(s) 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 <table><tr><th>Front</th><th>Curbside Rear</th><th>Street-Side Rear</th></tr><tr><td>Closed</td><td>Closed</td><td>Closed</td></tr><tr><td>Open</td><td>Closed</td><td>Closed</td></tr><tr><td>Open</td><td>Open</td><td>Closed</td></tr><tr><td>Open</td><td>Closed</td><td>Open</td></tr><tr><td>Open</td><td>Open</td><td>Open</td></tr><tr><td>Closed</td><td>Open</td><td>Closed</td></tr><tr><td>Closed</td><td>Closed</td><td>Open</td></tr><tr><td>Closed</td><td>Open</td><td>Open</td></tr></table>	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	Does PSTA need one front door, one curbside rear door and one street-side rear door in articulated bus? If not, please specify door number and door location.	See Response	Disregard all references to "street-side" doors for articulated bus in this RFP. The doors being specified will be curbside only, mounted in the standard manufacturer locations.
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																																
22	4	TS 5.9.1	78	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.	Proponent requests that requirement for full-time on-site technical support representatives for two years and beyond be removed as this will be cost prohibitive. Proponent has technical support staff for the bus that can provide solutions remotely or a technician in a service truck could be dispatched within 24-48 hours. Technical service for chargers also would be remote and an on-site representative could be provided within 24-48 hours. We request your approval.	See Response	PSTA approves of the request to delete the requirement of providing a full-time, on-site technical support representative for two years after bus delivery with annual renewal options for ten years. All other language in TS 5.9.1 Technical/Service Representatives still applies. Proposer shall provide sufficient information in their proposal detailing their field service support capabilities, including response times, staff levels, service centers (if applicable), for both the bus and charging equipment.																											

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 Electronic Copy	1
2.	List of serialized units installed on each bus	Review		With each delivered bus	Electronic media Electronic Copy	1 per bus
3.	Copy of Manufacturers' formal Quality Assurance Program	Review		Pre-award site visit	Hardcopy or Electronic media Electronic Copy	1
4.	QA manufacturing certificate	Review		With each delivered bus	Hardcopy or Electronic media Electronic Copy	1 per bus
5.	QA purchasing certifications acknowledging receipt of applicable specification	Review		30 days following first Pre- Production Meeting	Hardcopy or Electronic media Electronic Copy	1 per major Supplier
6.	Pre-Delivery Bus Documentation Package	Review		With each delivered bus	Hardcopy or Electronic media	1 per bus
9.	Pre-Production Meeting minutes	Approval		30 days after each meeting	Hardcopy or Electronic media Electronic Copy	2 originals 1
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 Electronic Copy	1
13.	Insurance certificates	Approval		Before Work commences	Hardcopy or Electronic media Electronic Copy	1

TABLE 1
Contract Deliverables

	Deliverable	Agency Action	Reference Section	Due Date	Format	Quantity Due
14.	Engineering support	Review		During Pre-Production Meeting	Contracts 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	Qty Per OEM
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 Qty Per OEM
19.	Final preventative maintenance manuals	Review		90 days after Agency written approval	Hardcopy Electronic media Electronic Copy	10/100 buses 20 1
20.	Final diagnostic procedures manuals	Review		90 days after Agency written approval	Hardcopy Electronic media Electronic Copy	10/100 buses 20 1
21.	Final parts manuals	Approval		90 days after Agency written approval	Hardcopy Electronic media Electronic Copy	10/100 buses 20 1
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 Electronic Copy	2 2 1
23.	Draft preventative maintenance manuals (Agency approval/review period of 90 days from date of receipt)	Approval		With pilot bus	Hardcopy or Electronic media Electronic Copy	10 1
24.	Draft diagnostic procedures manuals (Agency approval/review period of 90 days from date of receipt)	Approval		With pilot bus	Hardcopy or Electronic media Electronic Copy	10 1
25.	Draft parts manuals (Agency approval/review period of 90 days from date of receipt)	Approval		With pilot bus	Hardcopy or Electronic media Electronic Copy	10 1

TABLE 1
Contract Deliverables

Deliverable		Agency Action	Reference Section	Due Date	Format	Quantity Due
26.	List of OEM component repair manuals	Approval		With pilot bus	Hardcopy or Electronic media Electronic Copy	40 1
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 Electronic Copy	40 1
28.	Final operators' manuals	Review		30 days following Agency approval of draft manual	Hardcopy or Electronic media Electronic Copy	1 per bus 1
29.	Recommended spare parts list, including bill of materials	Review		60 days prior to shipment of first bus	Hardcopy or Electronic media Electronic Copy	1 1
30.	Part number index	Approval		60 days prior to shipment of first bus	Hardcopy Spreadsheet Electronic Copy	1 1
31.	Current price list	Review		90 days after Agency written approval of draft parts manual	Hardcopy Electronic Copy	20 1
32.	In-process drawings	Review		30 days prior to production	Scale drawings Electronic Copy	1
33.	Electrical and air schematics	Review		30 days prior to production	Hardcopy or Electronic media Electronic Copy	1
34.	As-built drawings	Review		Within 60 days after final bus delivery	Electronic media Electronic Copy	1
35.	Material samples	Review		By conclusion of Pre-Production Meetings	Per OEM	Per OEM
36.	Undercoating system program	Approval		First Pre-Production Meeting	Hardcopy or Electronic media Electronic Copy	1

TABLE 1
Contract Deliverables

	Deliverable	Agency Action	Reference Section	Due Date	Format	Quantity Due
37.	Flooring certificate	Review		First Pre-Production Meeting	Certificate/ copy of purchase order Electronic Copy	1
38.	Interior features – fire-resistance certificates	Review		Prior to pilot bus completion	Certificates Electronic Copy	1
39.	Crashworthiness	Review		Pre-award audit	Certificate Electronic Copy	1
40.	Technical review of electronic functionality	Approval		Prior to production	Hardcopy or Electronic media Electronic Copy	1
41.	Interior security camera layout	Approval		Prior to pilot bus completion	Electronic Copies of interior views	1 each
42.	Technical review of power plant			Prior to production	Electronic Copy	1
43.	Power plant certifications	Review		Prior to pilot bus completion	Hardcopy or Electronic media Electronic Copy	1 each
44.	Striping layout	Approval		Prior to production	Hardcopy or Electronic media Electronic Copy	1
45.	Resolution of issues “subject to Agency approval”	Approval		Prior to production	Hardcopy or Electronic media Electronic Copy	1

ADDENDUM OF SOLICITATION

1. SOLICITATION NO.:	2. ADDENDUM NO.:	3. EFFECTIVE DATE:	4. BRIEF SOLICITATION DESCRIPTION:
RFP 21-980369	5	September 1, 2021	FLORIDA ELECTRIC TRANSIT BUSES

5. REVISED OFFER SUBMISSION DUE DATE AND TIME:

(*Note: Unless identified below, this solicitation Addendum does not change the Offer Submission Date and Time.*)

The date and/or time specified for receipt of offers is changed as follows:

DATE: SEPTEMBER 21, 2021

TIME: 10:00AM EST

6. REVISED PRE-BID/PROPOSAL CONFERENCE:

(*Note: Unless identified below, this solicitation Addendum does not change the Pre-Bid/Proposal Conference, if a conference is scheduled.*)

The scheduled pre-bid/proposal conference is changed as follows:

DATE:

TIME: AM/PM Local

LOCATION:

7. ADDENDUM OF SOLICITATION:

The Solicitation identified in Block 1, above, is hereby amended as described in Block 11, below. Except as provided herein, all other provisions of the solicitation, or as heretofore amended, remain unchanged and in full force and effect.

8. REQUIREMENT TO ACKNOWLEDGE ADDENDUM:

Offerors must acknowledge receipt of this Addendum prior to the deadline specified in the solicitation for receipt of offers by one of the following methods:

- Shall acknowledge the receipt of each individual addendum in their Proposals on the form Acknowledgement of Addenda.

WARNING: Failure of an Offeror to acknowledge receipt of this Addendum, as described herein, may result in REJECTION OF THE OFFER.

NOTE: For Invitations for Bids the terms "Offer" and Offeror" shall mean "Bid" and "Bidder", respectively; and for Requests for Proposals or Quotation the terms "Bid" and "Bidder" shall mean "Offer" and "Offeror", respectively, in this solicitation and any associated exhibits.

9. FOR FURTHER INFORMATION CALL CONTRACTS SPECIALIST:

Name: Alvin Burns

Email: aburns@psta.net (cc: erandle@psta.net)

10. DESCRIPTION OF ADDENDUM:

Please reference Box #5 for Revised Offer Submission Due Date
PROPOSAL DUE DATE HAS CHANGED FROM SEPTEMBER 14, 2021, TO SEPTEMBER 21, 2021
Proposal due date in Block 5 as been corrected to match Block 10.

ADDENDUM OF SOLICITATION

1. SOLICITATION NO.:	2. ADDENDUM NO.:	3. EFFECTIVE DATE:	4. BRIEF SOLICITATION DESCRIPTION:
RFP 21-980369	6	September 10, 2021	FLORIDA ELECTRIC TRANSIT BUSES

5. REVISED OFFER SUBMISSION DUE DATE AND TIME:

(*Note: Unless identified below, this solicitation Addendum does not change the Offer Submission Date and Time.*)

The date and/or time specified for receipt of offers is changed as follows:

DATE:

TIME:

6. REVISED PRE-BID/PROPOSAL CONFERENCE:

(*Note: Unless identified below, this solicitation Addendum does not change the Pre-Bid/Proposal Conference, if a conference is scheduled.*)

The scheduled pre-bid/proposal conference is changed as follows:

DATE:

TIME: AM/PM Local

LOCATION:

7. ADDENDUM OF SOLICITATION:

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8. REQUIREMENT TO ACKNOWLEDGE ADDENDUM:

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NOTE: For Invitations for Bids the terms "Offer" and Offeror" shall mean "Bid" and "Bidder", respectively; and for Requests for Proposals or Quotation the terms "Bid" and "Bidder" shall mean "Offer" and "Offeror", respectively, in this solicitation and any associated exhibits.

9. FOR FURTHER INFORMATION CALL CONTRACTS SPECIALIST:

Name: Alvin Burns


Email: aburns@psta.net (cc: erandle@psta.net)

10. DESCRIPTION OF ADDENDUM:

1. Request for Pre-Offer Change or Approved Equal & RFP Updates
2. Revised Ordering Instruction



Request for Pre-Ofier Change or Approved Equal & RFP Updates

PSTA RFP 21-980369

Request #	Addendum	RFP Section	Page	RFP	Questions/Clarification or Approved Equal	Agency Action	Agency response:
97	6	SP 2.4 Contract Deliverables	51	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, Line 12, lists the Performance Bond as an item to be reviewed 30 days following contract execution. There does not seem to be any actual requirement for a performance bond in the RFP documents. Respectfully request that line 12 on the Contract Deliverables Table be removed or noted as not applicable.	See Response	Table 1, Line 12 is not applicable
96	6	TS 5.9.1	78	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.	In reference to section TS 5.9.1 Technical/Service Representatives, we respectfully request clarification on how cost can be captured on a per bus basis for full-time, on-site technical support representatives for two (2) years. If multiple agencies have the ability to order buses, or even a single bus, the way this is written seems to indicate that the Contractor would have to deploy a full-time support representative to each and every customer location, each for a minimum of two years. Based on the above considerations, we respectfully request that this requirement be removed.	See Addendum	See Addendum 4 Question #10
95	6	TS 88.4	187	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 Proposer's submittal 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 formulates data in three areas, TM, scheduled maintenance and major component replacement.	According to Section TS 88.4 "Cost of Ownership" a template is quoted in this section to be filled out with the cost of ownership information. However, New Flyer did not find the template in the forms section of the RFP. New Flyer would like to clarify if Finellas will provide the template.	See Response	See Question 72 for response
94	6	TS 30.1 Wheels	108	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	GILLIG wishes to advise that our design would include 9 inch wheels at the front axle and 8.25 inch wheels at the rear axle. This is inherent to our design in order to provide adequate weight ratings needed for the Battery Electric Bus to safely carry the required 75 passengers inclusive of the driver. GILLIG requests approval	See Response	Not approved, need more clarification to understand why there are different wheel sizes between the front and rear axles.
93	6	TS 31.3.4 Steering Wheel Telescopic Adjustment	110	At Maximum Telescopic Height Adjustment: 0 Degree 34in Height	GILLIG wishes to clarify that our proposed steering column with 16" wheel meets and exceeds the Table 4 chart at all levels with one small difference. GILLIG requests approval to provide a height of 33.8 in. at 0 degrees slope at Maximum Telescopic Height Adjustment	Approved	NA
92	6	TS 32 Drive Axle	110	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.	GILLIG wishes to advise that our design includes a guard that goes around and below the drive shaft. Although the guard is not above the drive shaft, the inherent position of the drive shaft is below chassis structural beam and therefore protects the coach floor. GILLIG requests concurrence	Approved	NA
91	6	TS 35.4 Hubs and Drums/Disks	113	The bus shall be equipped with brake drums. Brake drums shall allow machining for oversized linings per manufacturer's specifications.	GILLIG wishes to advise that our Battery Electric Bus design is only available with Meritor Air Disc Brakes on All Axles.	See Response	Proposer's may specify whichever braking systems are inherent to the design of the bus.
90	6	TS 44.5 Normal Bus Operation Instrumentation and Controls	129	Table 6 Transit Bus Instruments and Alarms	GILLIG requests approval to omit a Drum Brake option GILLIG requests approval that the instrumentation, switches, controls and indicators can be discussed at the pre-production meeting if GILLIG is the successful bidder. This is due to the unique design of our bus. GILLIG is providing a generic Battery Electric Bus dash layout for review. Please see attached.	See Response	Proposer's may specify whichever dash layout is inherent to the design of the bus.
89	6	TS 44.6.2 Pedal Dimensions and Position	133	The floor mounted accelerator pedal shall be 10-inches to 12-inches long and 3-inches to 4-inches wide.	 GILLIG requests approval to provide an accelerator pedal that is 9-inches long and 3.134-inches wide	Approved	NA
88	6	TS 57 Maintainability	148	High and low refrigerant pressure electronic gauges to be located in the return air area.	GILLIG requests approval to provide a Refrigerant Pressure Display Module in place of gauges in the return air area. This is the standard of the HVAC vendor Thermo King.	Approved	NA
87	6	WR 1.1.4 Propulsion System	190	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.	GILLIG wishes to clarify that our Powertrain includes a standard warranty from Cummins for Three Years / 100,000 miles with an extension available to a total of Five Years / 250,000 Miles. This is the only available powtrain warranty available from Cummins. GILLIG requests approval	See Response	Proposer's should submit warranty terms as part of their proposal for consideration by the evaluation committee.
86	6	WR 1.1.6 Extended Warranty	190	PSTA requires the following additional subsystems to be warranted to be free from Defects and Related Defects for six (6) years. <ul style="list-style-type: none">• Batteries• Traction Motor• Inverters• Battery Charger• On-Route Battery Charger	GILLIG wishes to clarify for the following components: - Batteries will include a six (6) year warranty per specification - Traction Motor and Inverters would fall into the aforementioned powertrain warranty of Three (3) Years / 100,000 miles with option to extend to Five (5) Years / 250,000 miles - Battery Charger & On-Route Chargers include a base two (2) Years warranty with optional pricing available up to six (6) years. This pricing will be noted on the Alternatives Pricing sheet. GILLIG requests approval	See Response	Proposer's should submit warranty terms as part of their proposal for consideration by the evaluation committee.

Request for Pre-Ofier Change or Approved Equal & RFP Updates

PSTA RFP 21-980369

Request #	Addendum	RFP Section	Page	RFP	Questions/Clarification or Approved Equal	Agency Action	Agency Response
85	6	WR 1.3.1 Pass-Through Warranty	192	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.	GILIG is formally requesting a waiver to not administer warranty claims on major components, such as Power Train Components supplied by Cummins, HVAC by Thermo King, Axles by Matorco, destination signs & wheel chair ramp	See Response	Proposer's should submit warranty terms as part of their proposal for consideration by the evaluation committee.
84	6	WR 1.4 Fleet Defects	192	A Fleet Defect shall apply only to the base warranty period in sections entitled "Complete Bus," "Propulsion System" and "Major Subsystems."	GILIG wishes to clarify that Fleet defect warranty does not apply to major components (Propulsion System, HVAC, Destination Signs, etc.). Major component manufacturers will not recognize and/or participate in fleet defect clauses. GILIG does work with and will assist the Agency and Major component suppliers to come to a satisfactory resolution in such cases that would otherwise fall into a fleet defect category.	See Response	Proposer's should submit warranty terms as part of their proposal for consideration by the evaluation committee.
					GILIG agrees to the Fleet Defects provisions for the Base warranty as detailed, but cannot guarantee the "Propulsion System" and "Major Subsystems".		
					GILIG requests concurrence		
83	6	10. INDEMNIFICATION	Addendum 1, page 4	10.01 Indemnification. The Parties recognize that Contractor is an independent 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, 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, or loss of use, arising out of the execution, performance, nonperformance, or enforcement of this Agreement, 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. 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. Contractor's liability hereunder shall include all attorneys' fees and costs incurred by PSTA in the enforcement of this indemnification provision. 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 pursuant to the doctrine of sovereign immunity or Section 768.28, Florida Statutes. The obligations contained in this provision shall survive termination of this Agreement, however terminated, and shall not be limited by the amount of any insurance required to be obtained or maintained under this Agreement.	 	See Response	This will be handled in the negotiation portion of the solicitation process
82	6	Section 2, LOCAL TAXES	19	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.	GILIG requests that the Procuring Agency advise bidders/proposers of any Local, City, County, State, Franchise or income taxes, tariffs, fees, business licenses and special taxes, or licenses that will need to be paid and/or purchased by the successful bidder/proposer as part of the performance of this contract or option of this contract.		PSTA can not advise on this. It's the contractors responsibility to do their due diligence.
81	6	Section 2, IP 10.2 MULTIPLE AWARD	19	PSTA will make the Contract awards, if any, to the responsive and responsible Proposers who are in compliance . . .	Please advise the projected award date for this procurement?		PSTA intends on taking this to our October 27, 2021 Board of Directors meeting for approval
80	6	Section 3, GC 5 TITLE & WARRANTY OF TITLE	34	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.	GILIG proposes to provide the following industry standard documents if we are the successful bidder for this procurement: 1. Our Manufacturer's Statement of Origin (MSO) document for each vehicle. This form has been approved in all 50 states and transfers ownership directly from the manufacturer to the procuring agency. 2. The procuring agency provides the MSO document to your local Department of Motor Vehicles in order to transfer ownership and secure the title for each vehicle. 3. The procuring agency would be responsible for title fees or licenses, if any.	Approved	Agree and approved
79	6	Section 4, SP 1.2 PILOT BUS	48	... 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.	GILIG requests the agency provide a written report of any non-compliance issue to the contractor within 30 days after delivery. If no issues are reported, acceptance occurs on day 31 or if the agency puts the bus in revenue service. The PILOT bus will have completed full compliance testing at the factory to allow resolution of any Agency issues prior to shipment.	Approved	PSTA approves this request
78	6	Section 4, SP 2.4 CONTRACT DELIVERABLES - TABLE 1	51	12. PERFORMANCE BOND	Please advise if a PERFORMANCE BOND will be required for this procurement? GILIG is concerned that the exclusion of this bond will permit irresponsible companies to bid without having sufficient resources to fully satisfy the contract or provide proper long term support for the procuring agency. GILIG requests the addition of a 100% Performance Bond requirement to your contractual term for all bidders.	See Response	No performance bond is required
77	6	Section 4, SP 3 PAYMENT	53	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 not 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.	GILIG requests revision of this section to the current industry standard and APTA recommended payment terms. Payment due date for purchase of goods or services other than construction services is not thirty (30) days from the accepted date.	Denied	PSTA can not approve this request, due to FL statute Florida Prompt payment Act FS218.72 and FS218.73

Request for Pre-Offer Change or Approved Equal & RFP Updates
PSTA RFP 21-980369

Request #	Addendum	RFP Section	Page	RFP	Questions/Clarification or Approved Equal	Agency Action	Agency response:
76	6	Section 4, SP 3.1, PAYMENT TERMS	53	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 30 days after the delivery and acceptance of said spare parts and/or equipment and receipt of a proper invoice.	GIUG requests revision to the current industry standard and APFA recommended payment terms for FTA funded procurements. The Agency shall make payments for buses at the unit prices itemized in the price schedule within 30 days after the delivery and acceptance of each bus and receipt of a proper invoice. The Agency shall make payments for spare parts and/or equipment at the unit prices itemized in the price schedule within 30 days after delivery and acceptance of said spare parts and/or equipment and receipt of a proper invoice.	Denied	PSTA can not approve this request, due to FL statute Florida Prompt Payment Act FS218.72 and FS218.73
75	6	Section 4, SP 7, INSURANCE	55	Contractor must provide a certificate of insurance and endorsement in accordance with the insurance re-requirements listed below by the Effective Date. ...	GIUG maintains and pays the premiums for insurance of the types and limits it deems sufficient for its protection. The Additional Insured endorsement can be provided as requested. Please note we exceed the requested limits in many areas. Enclosed is a copy of our Certificate of Liability Insurance for your information and approval.	Approved	NA
74	6	Section 4, SP 9, PROFESSIONAL LIABILITY INSURANCE	58	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 re-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 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.	GIUG requests deletion of the requirement for Contractor to have Professional Liability Insurance. This coverage is only necessary for professional services such as engineering, design, etc. Contractor's General Liability will provide the Agency with insurance protection for product related liability issues.	Approved	Request approved
73	6	SECTION 4, SP 8, Software Escrow Account	59	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) day' 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. 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."	1. GIUG requests confirmation that a "separate" Software Escrow Account is not required for this procurement? We request confirmation that a separate Software Escrow Account would only be required in the case of bankruptcy of the Contractor or material breach of the Contract. 2. Paragraph 2 - we request deletion of the requirement to provide the Agency a list of all OEM software comprising proprietary works ("Proprietary Software") or all major vehicle subsystems upon execution of the Contract. GIUG considers this information to be proprietary and the information is not available from our major subsystem suppliers. 3. GIUG confirms we will continue to support the Agency through our Field Service Department and Warranty coverage as required in your specifications.	See Response	1. Approved 2. Approved 3. Acknowledged
72	6	Section 6, TS 88.4, COST OF OWNERSHIP	187	In addition to the Proposer's submittal 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.	COST OF OWNERSHIP template is missing from the specifications.	See Response	There was no Total Cost of Ownership form included in the RFP package. PSTA is requesting Proposer's submit information related to anticipated cost of ownership on either their own form or included as a narrative in the proposal response.
71	6	IP 14, Ordering Instructions	28	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).	GIUG requests the ordering instruction be changed to the same as is currently used for the Florida Heavy Duty Bus contract with FTA - Upon receipt of quote, review and compare against to ensure that the options and pricing are in accordance with the contract documents. All purchase orders must reference Contract RFP 21-980369 Florida Electric Transit Buses. Upon issuance and approval of your agency purchase order, send directly to the contractor. Under this contract, the contractor will be responsible for providing Florida Transit Association Finance Corporation (FTAFC) a copy of each agency's purchase order upon receipt. The contractor will also provide the FTAFC with a quarterly statement of purchases made off the contract. The FTAFC will issue an invoice to the procuring agency to pay the FTAFC a transaction fee of Five Hundred dollars (\$500.00) not to exceed ten thousand dollars (\$10,000.00) per calendar year.	See Addendum	See Addendum for Revised Ordering Instructions
70	6	TS 5.9 Technical Service Representatives	78	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	GIUG requests this requirement be priced separately from the base bus as an option. GIUG believes that not every purchasing agency will require this type service and including it the base bus price will only inflate the cost.	See Response	Addendum #4 deleted the requirement of providing a full-time, on-site technical support representative for two years after bus delivery with annual renewal options for ten years. All other language in TS 5.9.1 Technical/Service Representatives still applies. Proposer shall provide sufficient information in their proposal detailing their field service support capabilities, including response times, staff levels, service centers (if applicable), for both the bus and charging equipment.
69	6	TS 88.3 Conditional Assessment	187	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.	GIUG requests this requirement be priced separately from the base bus as an option. GIUG believes that not every purchasing agency will require this type service and including it the base bus price will only inflate the cost.	See Response	Approved. Please submit pricing separately as an option.
68	6	TS 89.1 Charger Maintenance Procedures	187	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 5x 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 record of all inspections, calibrations, tests, maintenance and repairs. Information shall be provided to the Agency on a timely basis for storage.	GIUG requests this requirement be priced separately from the base bus as an option. GIUG believes that not every purchasing agency will require this type service and including it the base bus price will only inflate the cost.	See Response	Approved. Please submit pricing separately for the three (3) years of technical support as an option. However, a written maintenance plan and initial training for charging equipment shall be furnished to the agency as a contract deliverable and at no additional cost.

Request for Pre-Offer Change or Approved Equal & RFP Updates

PSTA RFP 21-980369

Request #	Addendum	RFP Section	Page	RFP	Questions/Clarification or Approved Equal	Agency Action	Agency response:
67	6	TS 89.2 Maintenance Materials and Licenses	188	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.	GLIG requests this equipment be priced separately from the base bus as an option. GLIG believes that not every purchasing agency will require this type service and including it the base bus price will only inflate the cost.	See Response	Approved. Please submit pricing separately as an option.
66	6	TS 89.4 Performance Reporting	188	The Contractor shall be responsible for monitoring the performance of the charging equipment and reporting 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.	GLIG requests this requirement be priced separately from the base bus as an option. GLIG believes that not every purchasing agency will require this type service and including it the base bus price will only inflate the cost.	See Response	Approved. Please submit pricing separately as an option.
65	6	TS 89.4 Conditional Assessment	188	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.	GLIG requests this requirement be priced separately from the base bus as an option. GLIG believes that not every purchasing agency will require this type service and including it the base bus price will only inflate the cost.	See Response	Approved. Please submit pricing separately as an option.
64	6	TS 90 Exportable Power Supply	189	Please describe the capabilities of the vehicle to provide power to auxiliary systems outside of the bus when stationary.	GLIG wishes to advise that our Battery Electric Bus is not designed to power to auxiliary systems outside of the bus and therefore will not be proposed.	See Response	Acknowledged
63	6	RP Agreement For Electric Transit Buses with Charging and Associated Equipment	Page 1	SCOPE OF SERVICES: Contractor, at the direction of PSTA, shall furnish to PSTA Electric Transit Buses with Charging and Associated Equipment as described in, and in accordance with the specifications, tasks, and scope of work set forth in the RFP (the "Services"), and in the amount set forth in the RFP. Contractor acknowledges that it has read the specifications and understands them. Contractor also agrees to provide electric transit buses with charging and associated equipment to all permissible assignees of PSTA. PSTA's permissible assignees shall have the option to purchase electric transit buses and charging and associated equipment in accordance with the terms and conditions of the RFP, and specifically SP 3 of the RFP.	GLIG requests clarification: How do you determine who is a "permissible assignee" and will PSTA authorization be required to be a permissible assignee?	See Response	1. "Permissible assignee" shall mean all State agency, the legislative and judicial branches, counties, municipalities, transit authorities, special districts, or other public agencies or authorities. 2. Will PSTA authorization be required to be a permissible assignee- NO
62	6	NR 3. Proposal Due Date and Submittal Requirements	13	Proposals must be received by 1000 am local time on Tuesday, September 21, 2021. (date changed in Addendum 5)	Request that the proposal due date be not less than three (3) weeks after receipt of responses to Requests for Pre-Offer Change or Approved Equal and/or the final Addendum. This will ensure that Offerors have sufficient time to thoroughly review any changes and secure appropriate quotes from suppliers.	See Response	Not sure if this is still applicable
61	6	SP 1.3 Pilot Bus	48	The Contractor shall produce one pilot vehicle for each type of vehicle with respect to the base order.	Request that the requirement for a pilot bus be removed as there is no clear indication of how many buses would be purchased in the base order, or which agency would be managing the base order.	See Response	PSTA prefers to keep the language "as-written" in the RFP for the purposes that it shall apply to order quantities of two (2) or greater.
60	6	TS 5.13 Fire Suppression	80	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.	Number clarify whether the base bus pricing should include a Fire Suppression System as there are lines for a number of different fire suppression systems on the pricing schedule. Note: Proterra's base design does not include Fire Suppression; however, we can add any of the options listed on the pricing schedule.	See Response	The base bus shall be equipped with a suitable fire suppression system manufacture red by Amerex, or approved equal.
59	6	TS 6.4 Step Height TS 6.4.1 Transit Coach	82	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.	Request approval for the step height to not exceed 15.3" at the front doorway and 17.1" at the rear doorway when the bus is loaded to passenger ingress (in-kneel) or 15" at the front doorway and 14.4" at the rear doorway when fully knelt.	Approved	NA
58	6	TS 6.6 Ramp Clearances	82	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. 8 deg min front breakover	Request approval for a breakover angle of 7.8 degrees at ride height. Note that our bus has an over-ride feature that can be engaged while driving that increases the breakover angle up to 8.3 degrees.	Approved	NA
57	6	TS 6.8 Floor Height TS 6.8.1 Transit Coach	83	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.	Request approval for the step height to not exceed 17.1" at the rear doorway when the doors are open to passenger ingress (in-kneel) Note that rear doorway step height decreases to 14.4" when fully knelt.	Approved	NA
56	6	TS 7.3 Acceleration	85	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 driver/train configuration.	Request approval of our standard offer which includes a choice of 3 pre-configured customer selectable settings for acceleration and regenerative braking levels per the options described in Exhibit A. These settings have been optimized for ideal performance and efficiency, and we would work with the Authority to determine the best solution based on the Authority's profile and preferences.	See Response	Approved. Please also submit these materials as part of your proposal for review by the evaluation committee.
55	6	TS 9.1.3 Primary Propulsion Unit and Traction Motor(s)	89	The propulsion and braking systems shall meet the performance requirement of the Duty Cycle. Braking application and performance 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.	Request approval of our standard offer which includes a choice of 3 pre-configured customer selectable settings for acceleration and regenerative braking levels per the options described in Exhibit A. These settings have been optimized for ideal performance and efficiency, and we would work with the Authority to determine the best solution based on the Authority's profile and preferences.	See Response	Approved. Please also submit these materials as part of your proposal for review by the evaluation committee.
54	6	TS 9.1.3 Primary Propulsion Unit and Traction Motor(s)	89	The propulsion system shall be designed so that no component operates at more than 80% of its maximum designed load, speed, or torque. The propulsion system shall be designed 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.	Request approval of our standard offer which includes a choice of 3 pre-configured customer selectable settings for acceleration and regenerative braking levels per the options described in Exhibit A. These settings have been optimized for ideal performance and efficiency, and we would work with the Authority to determine the best solution based on the Authority's profile and preferences.	See Response	Approved. Please also submit these materials as part of your proposal for review by the evaluation committee.
53	6	TS 9.1.5 Propulsion System Controller (PSC)	92	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.	Request approval of our system design which does not use a Propulsion System Controller (PSC). We utilize a powertrain controller to manage the traction motor and transmission, an ESM to interface to the batteries, a charge controller for charging, and a vehicle controller to integrate the systems all together. The vehicle controller manages all power flow and ancillary load management.	Approved	NA
52	6	TS 10.1 Component Thermal Management	94	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 160 in. above the ground. Both shall be accessible through the same access door.	Request approval of our proposed coolant system design which does not incorporate a manual pressure release valve and does not require the operator to depress a button to release pressure above 13psi. During fill, a submersed valve opens which relieves pressure while the fill pump is running.	Approved	NA

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Request #	Addendum	RFP Section	Page	RFP	Questions/Clarification or Approved Equal	Agency Action	Agency response:
51	6	TS 15 Radiator	98	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.	Request approval of our standard Mubesa radiator clamps. The clamps are steel and have passed a 1,000+ hour salt spray test. Please refer to Exhibit B for more information.	Approved	NA
50	6	TS 29.3.4 Kneeling	108	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 kneler to alert passengers and bystanders. A warning light mounted near the outside of the front door, a minimum 2.5 in. diameter amber lens, shall be provided that will blink when the kneler feature is activated. Kneeling shall not be operational while the wheelchair ramp is deployed or in operation.	Request approval of our standard warning light which is a minimum of 1.75" diameter amber lens.	See Response	Conditional approval is granted on the basis that the 1.75" diameter lenses meet FMVSS, ADA, or any other governing body specification for use on a public transit bus.
49	6	TS 37.3 Air Lines and Fittings	115	DEFAULT • Green: Indicates primary brakes and supply. • Red: Indicates secondary brakes. • Blue: Indicates parking brake. • Yellow: Indicates compressor governor signal. • Black: Indicates accessories.	Request approval of the following color combination for air lines: • Green: Indicates primary brakes and supply • Red: Indicates secondary brakes • Brown: Indicates parking brake • Yellow: Indicates transmission and ride height controller feed (we don't have governor air lines) • Black: Indicates accessories & doors • Blue: Indicates curb side air bags • Orange: Indicates street side air bags	Approved	NA
48	6	TS 38.1 Modular Design	117	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.	Request approval of our standard multiforce cable which runs from the drivetrain to the power steering motor at the front of the vehicle. It passes through 2 bulkheads and is part of a drivetrain harness. Maintaining a constant shield is important to protect other systems from Electro-Magnetic Interference. Also, reducing the number of terminations also improves the reliability of the circuit. If this cable were to be damaged and be required to be replaced, it can be done with minimal extra effort when compared to the requested design. To date, we haven't replaced this cable on any vehicle in service.	Approved	NA
47	6	TS 40.5 High Voltage Disconnect System	121	The high voltage system shall be fitted with automatic disconnecting connectors located as closely as possible to the positive and negative battery terminals with the disconnecting system being located in the battery compartment. These connectors 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 connectors 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). Connectors shall be controlled by the "High Voltage Disconnect" switch, and any safety-critical interlocks and interlock logic, motor-controller overcurrent protection functions, and vehicle crash and/or fire sensors. Reset of the connectors shall require the deliberate action of the operator or maintenance personnel. Connectors should provide a visual or electrical indication of their status (open or closed) or of a failure to function.	Request approval of our standard design high voltage disconnect system which operates as follows: - Our system utilizes redundant connectors. One set in each battery pack and another set in the main HV junction box. - A separate HV disconnect is a physical disconnect and doesn't go through the connectors. - The connectors are controlled by the BMS and vehicle controller with a number of different conditions that can disable them.	See Response	Please submit further explanation as part of your proposal for review by the evaluation committee.
46	6	TS 41.1.2 Shielding	125	All wiring that requires shielding shall meet the following minimum requirements: A shield shall be generated by connecting to a common busbar or shielded cable. Shielding shall be continuous from the point of connection to the shield termination 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 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.	Request approval of our standard design which has some shields that are grounded at both ends per the component manufacturers' installation instructions (i.e. power cables between the motor and inverter)	See Response	Please submit further explanation as part of your proposal for review by the evaluation committee.
45	6	TS 44.2 Normal Bus Operation Instrumentation and Controls	129	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.	Request that the instrumentation and controls listed be noted as representative only and that the final layout of instrumentation and controls be agreed upon in the pre-production meeting(s).	See Response	Proposer's may specify whichever dash layout is inherent to the design of the bus.
44	6	TS 44.6.1 Pedal Angle	133	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.	Request approval for the pedal angles to be as follows: - Accelerator pedal 45° at initiation and 25° at full throttle - Brake pedal 45° at initiation and 25° at full brake	Approved	NA
43	6	TS 47.2.1 Exterior Mirrors	138	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.	Request approval of our standard exterior mirrors as described in Exhibit C. Please note that additional options and sizing on the Price Sheet are not available on Proterra buses.	See Response	Proposer's may specify whichever mirrors are inherent to the design of the bus.
42	6	TS 49.1 Glazing	140	Shaded Band The upper portion of the windshield above the driver's field of view shall have a dark, shaded band and marked A-3, with a minimum luminous transmittance of 5 percent when tested in accordance to ASTM D1003.	Request approval for our standard windshield design which does not have a shaded band as our overhead panel is fairly low and a shaded band may interfere with mirror visibility. Proterra could apply a tint film with 5% LT that sits just below the blackout on the street side of the windshield.	Approved	NA
41	6	TS 50 Driver's Side Window	140	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 rearview mirror. When in an open position, the window shall not rattle or creak 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.	Request approval for our standard driver's side window which is hidden frame and non-egress as described in Exhibit D. Please note that traditional framed windows, full slider, and egress driver's side windows are not available on Proterra buses.	See Response	Proposer's may specify whichever windows are inherent to the design of the bus.
40	6	TS 50 Driver's Side Window	140	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 no 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.	Request approval for our standard driver's side window which allows the view through the glazing at the front of the assembly beginning not more than 27.2 in. above the operator's floor.	Approved	NA
39	6	TS 51 Side Windows TS 51.1 Configuration	141	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.	Request approval of our standard passenger windows which are flush and not bonded; however, our design incorporates a quarter window just ahead of the front entrance door which is bonded in place.	See Response	Proposer's may specify whichever windows are inherent to the design of the bus.
38	6	TS 51 Side Windows	142	Default and Alternative Configurations	Request approval for Proterra's streamlined body design which exclusively uses hidden frame side windows. Please note that traditional framed windows are not available on Proterra buses.	See Response	Proposer's may specify whichever windows are inherent to the design of the bus.

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37	6	TS 54.3 Controls for the Climate Control System (CCS)	146	The controls for the driver's compartment for heating, ventilation and cooling systems shall be integrated and shall meet the following requirements: <ul style="list-style-type: none">• 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.	Request approval for our standard design which does not require a manually operated control valve because the heater is electrical and does not use heated water.	See Response	Proposer's may specify whichever system/controls method is inherent to the design of the bus.
36	6	TS 54.4 Driver's Compartment Requirements	147	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.	Request approval for our standard design which does not have provisions to provide fresh air (exterior air) to the driver's area.	See Response	Please submit further explanation as part of your proposal for review by the evaluation committee.
35	6	TS 57 Maintainability	148	DEFAULT High and low refrigerant pressure electronic gauges to be located in the return air area.	Request approval for our standard design which does not incorporate remote "mechanical" gauges and has no provisions for them. The high and low pressures can be viewed through an unlocked service screen on our HVAC controller. Also, the high and low pressure are on the CAN message and are visible through the service tool.	Approved	NA
34	6	TS 62 Repair and Replacement TS 63.1 Access Doors TS 63.2 Transit Coach	149	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.	Request approval for our standard bus design which uses a composite, monocoque body that does not have exterior painting. The outer skin is integral to the body structure. When damage occurs to the exterior of the bus, repair is contained to just the damaged area. The body is repaired with a repair kit that is weldable and repairable with common composite repair techniques. The body is also covered with a gel coat that resists chips and cracks.	Approved	NA
33	6	TS 62.1 Access Doors (Transit Coach)	150	Access openings shall be sized for easy performance of tasks within the compartment, including tool operations tasks. Access doors shall be of rigid 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.	Request approval for our standard design which has lower side access doors for the motor compartment that, when opened, restrict access to the upper side access doors. All other access doors, when opened, do not restrict access for servicing other components or systems. Please see Exhibit E for additional details.	See Response	Approval is granted that your standard design which has lower side access doors for the motor compartment that, when opened, restricts access to the upper side access doors. However, upon review of the pictures contained in your Exhibit E—Access Panels, it appears that the lower panel's right hand door support strut would need to be removed into order to pull the 127V A battery tray out. Please confirm.
32	6	TS 69.1 Appearance	152	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 compromised lined panels.	Request approval for the base white color of the bus body to be gelcoat rather than paint. The gelcoat is inherent to the composite body construction and is resistant to chips and cracks. Please note that due to Proterra's design with hidden frame windows, black masking at the windows is not applicable.	Approved	NA
31	6	TS 73.19 Fairbox/Card Reader Lighting TS 73.19.1 Transit Coach	160	Provide a lexicon and card reader light.	Please clarify whether farebox and card reader lights are part of the base bus or an option. If the intent is for these to be an option, please add this item to the Pricing Schedule.	See Response	It is part of the base bus.
30	6	TS 76.15 Construction and Materials (Transit Coach)		Select all materials shall minimize damage from vandalism and shall reduce cleaning time. The seats shall be attached to the frame with a bolt through the seat back. The seat back shall be constructed throughout the entire seat back, with no welds or seams. Any exposed metal touching the sides or the floor of the bus shall be stainless steel. The seat pads and cushions shall be constructed for individually, lateral support and maximum comfort and shall fit the framework to reduce exposed edges.	Request approval of our standard seats which are bolted into the body with hex bolts and locknuts onto the bolts with the seat rail. The seats themselves are built with tamper-resistant fasteners.	Approved	NA
29	6	TS 78.5 Door Glazing	170	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 15 inches. Door glazings shall be easily replaceable.	Request approval for our standard Ventura door glazing replacement procedures as defined in Exhibit F.	See Response	Approved. Please also submit these materials as part of your proposal for review by the evaluation committee.
28	6	TS 78.9 Actuators	171	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.	Request approval for our standard design in which the exhaust from the door system is not routed below the floor, but rather, it exits through a muffler on the valve block of the actuator mechanism. Oil in the air lines is separated out by an individual air filter for each door.	Approved	NA
27	6	TS 85 Electronics/Equipment Compartment	180	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 side 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.	Request approval for our standard ITS storage box which is located on the street-side wheel housing. Please note that our storage box is designed to provide sufficient access to customer ITS-related equipment as shown in Exhibit G.	See Response	Approved. Please also submit these materials as part of your proposal for review by the evaluation committee.
26	6	TS 87 Charging System Specifications	182	The chargers shall be equipped with an submeter that: Measures real time load in KW within 1% accuracy; Is capable of RS-485 communications; Records kWh and WAtH delivered, kWh and WAtH received.	Can the submetering be handled by an external device, or must it be part of the charger?	See Response	It can be either an external device or part of the charger.
25	6	TS 87.1 "In-Shop" and/or "Dipost" Charger	183	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.	Is there a minimum cable length required?	See Response	No. Proposer shall state what their standard length offering is along with whether custom lengths are available.
24	6	S-10 Pricing Schedule	N/A	Entire form	Please clarify that it is not mandatory to quote every line item listed as some line items are not available on Proterra Electric Buses.	See Response	It is not mandatory to quote every line item. For those items not quoted please mark as "No Quote".
23	6	S-10 Pricing Schedule	N/A	Destination Signs	Per Addendum 1, through 4, the base buses should include destination signs on the front and sides; the rear sign is listed as an alternative. The Pricing Schedule lists stand-alone options for 136i Luminator Rear View Camera integrated into rear LED sign; and Luminator-Delete Rear Sign. Neither of those would be appropriate if the base buses do not include a rear sign.	See Response	The base bus shall be furnished with a front and right side (outside) destination sign, Luminator Sport Series III with white LED or approved equal. A rear sign may be quoted as an optional equipment. Being said, the call-out Luminator-Delete Rear sign is not applicable and should be disregarded.

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22	4	TS7.4	85	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.	Will PSTA specify the minimum operating range requirement?	See Response	There are no minimum range requirement specifications established in this RFP. 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. Specifically, CBD, ART, and COM Duty Cycles.
21	4	TS7.3	85	TS 7.3 Acceleration Braking application and performance shall remain consistent regardless of system state of charge (SOC) or other variances related to regenerative braking.	We would like to clarify that electric bus is equipped with two braking systems to decelerate the bus. One is a pneumatic friction-based brake system, and another is a regenerative braking system. The braking performance is different with and without regenerative braking. Regenerative braking is available/braking While, (if the regenerative braking is limited or not available due to special condition, the braking performance is different. We request approval of the design.	Approved	NA
20	4	TS8.2	87	TS 8.2 Design Operating Profile (Battery Electric Bus) 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).	We would like clarity that as operating range varies with road conditions, weather, bus configuration, driver behavior, etc., we request the agency to provide a detail route profile data(including bus speed vs time, route grades vs bus speed, preferably at a sampling frequency of 1 Hz or greater)	See Response	Detailed route data is not available. As stated in the RFP and during the pre-proposal meeting Proposers shall supply the range information requested in TS 8.1 for each size bus being submitted for consideration utilizing the Altona On-Road Energy Consumption and Range Tests for buses. Specifically, CBD, ART, and COM Duty Cycles. Assume ambient temperature of 90 deg F and weather customary to the State of Florida.
19	4	TS8.2	87	TS 8.2 Design Operating Profile (Battery Electric Bus) 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).	If detail route profile data is not available, We request approval to provide Altona cycle operating range for reference.	See Response	See answer to previous questions.
18	4	TS 9.1.4	90	TS 9.1.4 Energy Storage System and Controller Energy Storage System A phased automatic shutdown system shall be provided	We would like PSTA to clarify the "A phased automatic shutdown system". What is the function? How does it work?	See Response	The intent of the specification is that sufficient warnings will be given to the operator that the SOC is running low. The intent of a "phase automatic shutdown" is, as an example, at 30% SOC a warning indicator, audible tone, is given, at 20% SOC the bus may degrade in performance to conserve energy, at 10% SOC the bus goes into "limp-home" mode, at 0% the bus automatically shuts down. The levels of SOC stated previously are only used to illustrate the intent. Proposers shall specify what form of low SOC shutdown protocols are in use.
17	4	TS 9.1.4	92	TS 9.1.4 Energy Storage System and Controller Battery Charging The bus shall support an SAE approved charging standard (SAE J3008 AC and/or SAE J1772 DC).	Will PSTA accept our AC charging as an option? Our AC charging has SAE J3008 connector but not fully compliant to SAE J3008.	See Response	Manufacturer shall provide a detailed description of its charging system and specify its charging standard. Proposers shall provide detailed information as part of this Proposal so that the Evaluation Committee may review and make a determination on acceptance.
16	4	TS 9.1.6	93	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.	We request to delete this requirement as the RFP is for electric bus.	See Response	If the specification does not apply to a manufacturer's bus design the Proposer may consider it not applicable.
15	4	TS 19	99	TS 19 Altona Testing DEFAULT An Altona Test Report shall be provided to the Agency with the Proposal submittal.	Will PSTA accept to provide altona report prior to first bus delivery? And FTA does allow for test to be accepted upon delivery of the first bus.	See Response	The bus will need to satisfy meeting FTA Fire Award, Post delivery and FAST Act requirements.
14	4	TS 26.5	103	TS 26.5 Construction 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).	We would like clarity that the standard floor is Coosa Composite fiberglass composite floor. Coosa fiberglass composite floor can meet both FMVSS 302 and docket 90 requirement. And it is also Altona tested in our bus. We request approval of Coosa fiberglass floor.	Approved	NA
13	4	TS 56	148	TS 56. Roof/Ventilation ALTERNATIVE Three Roof Ventilators (Used in articulated buses.)	Will PSTA accept two roof ventilators in articulated bus?	See Response	Yes, so long as number of ventilators satisfies compliance with FMVSS for minimum number of escape hatches.
12	4	TS 52	144	TS 52. Capacity and Performance ALTERNATIVE R134a The air conditioning system shall meet these performance requirements using R134a	R410a has a greater efficiency/lower price than R134a. Also R410a is more friendly to environment. We request approval for OUR HVAC which use R410a for this system.	Approved	NA

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Request #	Addendum	RFP Section	Page	RFP	Questions/Clarification or Approved Equal	Agency Action	Agency response:																											
11	4	TS 78.1.2	168	<p>TS 78.1.2 Rear Door(s)</p> <p>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.</p> <p>TABLE 7 Door Operating Combinations</p> <table><tr><th>Front</th><th>Curbside Rear</th><th>Street-Side Rear</th></tr><tr><td>Closed</td><td>Closed</td><td>Closed</td></tr><tr><td>Open</td><td>Closed</td><td>Closed</td></tr><tr><td>Open</td><td>Open</td><td>Closed</td></tr><tr><td>Open</td><td>Closed</td><td>Open</td></tr><tr><td>Open</td><td>Open</td><td>Open</td></tr><tr><td>Closed</td><td>Open</td><td>Closed</td></tr><tr><td>Closed</td><td>Closed</td><td>Open</td></tr><tr><td>Closed</td><td>Open</td><td>Open</td></tr></table>	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	Does PSTA need one front door, one curbside rear door and one street-side rear door in articulated bus? If not, please specify door number and door location.	See Response	Disregard all references to "street-side" doors for articulated bus in this RFP. The doors being specified will be curbside only, mounted in the standard manufacturer locations.
Front	Curbside Rear	Street-Side Rear																																
Closed	Closed	Closed																																
Open	Closed	Closed																																
Open	Open	Closed																																
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Closed	Open	Open																																
10	4	TS 5.9.1	78	<p>TS 5.9.1 Technical/Service Representatives</p> <p>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."</p> <p>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.</p>	<p>Proponent requests that requirement for full-time on-site technical support representatives for two years and beyond be removed as this will be cost prohibitive.</p> <p>Proponent has technical support staff for the bus that can provide solutions remotely or a technician in a service truck could be dispatched within 24-48 hours. Technical service for chargers also would be remote and an on-site representative could be provided within 24-48 hours.</p> <p>We request your approval.</p>	See Response	<p>PSTA approves of the request to delete the requirement of providing a full-time, on-site technical support representative for two years after bus delivery with annual renewal options for ten years.</p> <p>All other language in TS 5.9.1 Technical/Service Representatives still applies.</p> <p>Proposer shall provide sufficient information in their proposal detailing their field service support capabilities, including response times, staff levels, service centers (if applicable), for both the bus and charging equipment.</p>																											
9	3	SP 2.4	51-53	<p>SP 2.4 Contract Deliverables</p> <p>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.</p>	<p>We request clarification regarding the quantities of manuals needed. Please clarify which section prevails between Table 1: Contract deliverables and SP 5.2 Documentation.</p>	See Addendum	<p>Revised Table 1—Contract Deliverables attached.</p> <p>B</p>																											
8	3	SP 2.4	51	<p>SP 2.4 Contract Deliverables</p> <p>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.</p> <p>SP 5.2 Documentation</p> <p>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 subcontractor supplier will be provided.</p>	<p>As per item 18 of Table 1, we understand that the City requests 20 bus orientation video. We propose to offer PSTA the right to film the on-site orientation training which includes a tour of the bus for future internal use.</p>	Approved	NA																											
7	3	SP 2.5	54	<p>SP 5.2 Documentation</p> <p>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 of current parts manual(s), and an electronic copy of 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 subcontractor Supplier will be provided.</p>	<p>There are inconsistencies between the two sections regarding the documentation specifications and Nova Bus would like to offer the best service according to the real needs of PSTA.</p>	See Response	<p>Revised SP 5.2 Documentation: The Contractor shall provide an electronic of current maintenance manual(s) to include preventative maintenance procedures, diagnostic procedures or troubleshooting guides and major component service manuals, an electronic copy of current parts manual(s), and an electronic copy of 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 manuals 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 subcontractor Supplier will be provided.</p>																											
6	2	TS 84.1 Camera Surveillance System	179	<p>Provide all wiring and mounting locations for a multi-camera surveillance system, including the installation of cameras, recorder, microphone, etc..</p>	<p>Proposer requests information on whether or not a camera system should be included in the base bus price. Currently, various information pertinent to details of this system such as supplier, number of cameras, type of DVR and functionalities are missing from the technical specifications. Such information is essential to be able to provide accurate pricing and configuration. In light of this, proposer requests approval to provide price of such systems only through optional items included in CER 6: Pricing Schedule</p>	See Response	<p>DEFAULT No camera system.</p> <p>ALTERNATIVE A camera system shall be installed. Agency to select from list of available camera systems from OEM options list including installation locations.</p> <p>ALTERNATIVE Pre-wire only. Agency may select to have vehicle pre-wired only for a camera system.</p>																											
5	2	CER 6: Pricing Schedule	NA	NA	<p>The specification of several systems such as Destination signs, Camera Systems, and Automatic Passenger Counters are missing configuration details that are essential for costing. Proposer understands that its base bus configuration will not have any of such systems, but optional pricing for those will be provided via CER 6: Pricing Schedule for interested agencies. Please confirm our understanding.</p>	See Addendum	<p>Pricing Schedule has been updated</p>																											

Request for Pre-Offer Change or Approved Equal & RFP Updates
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Request #	Addendum	RFP Section	Page	RFP	Questions/Clarification or Approved Equal	Agency Action	Agency response:
4	2	TS 81 Destination Signs	177	<p>A destination sign system shall be furnished on the front, on the right side near the front door.</p> <p>Route sign on the rear of the vehicle.</p> <p>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.</p> <p>The destination sign shall be able to access the sign while sealed.</p> <p>The destination sign compartments shall meet the following minimum requirements:</p> <ul style="list-style-type: none"> Compartments shall be designed to prevent condensation and entry of moisture and dirt. Compartments shall be designed to prevent tampering and vandalism. Access shall be provided to allow cleaning of inside compartment window and unit sealing. <p>The front window shall have an exterior display area of no less than 8.5 in. high by 56 in. wide.</p> <p>Run number sign shall be installed.</p>	NA	RFP Update	<p>DEFAULT</p> <p>A destination sign shall be furnished on the front and on the right side (curbside) near the front door.</p> <p>The destination signs shall be luminator Smart Series II with white LED, or approved equal.</p> <p>ALTERNATIVE</p> <p>Agency to select from list of available destination sign systems from ODM provided options list.</p> <p>ALTERNATIVE</p> <p>A rear route sign, if available, shall be installed on the rear of the vehicle.</p> <p>ALTERNATIVE</p> <p>A run number sign, if available, shall be installed on the vehicle.</p>
3	2	TS 84.3 Automatic Passenger Counters (APC)	179	<p>An infrared APC system shall be installed. Agency to provide details of APC system, including installation locations and number of buses to be equipped.</p>	NA	RFP Update	<p>DEFAULT</p> <p>No automatic passenger counter system.</p> <p>ALTERNATIVE</p> <p>An automatic passenger counter system shall be installed. Agency to select from list of available automatic passenger counter systems from ODM options list including installation.</p>
2	2	TS 84.4.2 Handset	180	<p>Contractor will install a handset for driver use.</p>	NA	RFP Update	<p>ALTERNATIVE</p> <p>No handset.</p> <p>ALTERNATIVE</p> <p>A handset for driver use shall be installed. Agency to select from list of available handsets including installation location from ODM option list.</p>
1	2	TS 86 Computer Assisted Dispatching System (CAD/AVL)	181	<p>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.</p> <p>Each PSTA bus is equipped with various components provided by Clever Devices to include all necessary wiring and software installation. The on board computing processor unit- IVMA is the central processing unit for each revenue service vehicle in the PSTA fleet. Along with the IVMA 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.</p> <p>Clever Devices also provides to PSTA an Automatic Vehicle Monitoring System (AVM-3) for each individual bus controlled by a central computer system. The system reports vehicle location, speed, and other components and generates automatic reports through our Wireless Access Point (file dumping) and real-time monitoring via a cellular network.</p>	NA	RFP Update	<p>DEFAULT</p> <p>No computer assisted dispatching system (CAD/AVL).</p> <p>ALTERNATIVE</p> <p>A computer assisted dispatching system (CAD/AVL) shall be installed. Agency to select from list of available CAD/AVL systems from ODM options list including installation requirements and configuration.</p> <p>ALTERNATIVE</p> <p>Pre-wire only. Agency may select to have vehicle pre-wired only for a CAD/AVL system.</p>

Revised Ordering Instructions

Each Procuring Agency will forward to PSTA and the Florida Transit Association Finance Corporation (FTAFC) 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. Once the purchase order is received by the FTAFC, the FTAFC will invoice a transaction fee of \$500 per bus (not to exceed \$10,000 per calendar year per Procuring Agency) for an in-state Procuring Agency and a transaction fee of \$1,000 per bus for an out-of-state Procuring Agency (not to exceed \$10,000 per calendar year per Procuring Agency).

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

ADDENDUM OF SOLICITATION

1. SOLICITATION NO.:	2. ADDENDUM NO.:	3. EFFECTIVE DATE:	4. BRIEF SOLICITATION DESCRIPTION:
RFP 21-980369	7	September 15, 2021	FLORIDA ELECTRIC TRANSIT BUSES

5. REVISED OFFER SUBMISSION DUE DATE AND TIME:

(*Note: Unless identified below, this solicitation Addendum does not change the Offer Submission Date and Time.*)

The date and/or time specified for receipt of offers is changed as follows:

DATE:

TIME:

6. REVISED PRE-BID/PROPOSAL CONFERENCE:

(*Note: Unless identified below, this solicitation Addendum does not change the Pre-Bid/Proposal Conference, if a conference is scheduled.*)

The scheduled pre-bid/proposal conference is changed as follows:

DATE:

TIME: AM/PM Local

LOCATION:

7. ADDENDUM OF SOLICITATION:

The Solicitation identified in Block 1, above, is hereby amended as described in Block 11, below. Except as provided herein, all other provisions of the solicitation, or as heretofore amended, remain unchanged and in full force and effect.

8. REQUIREMENT TO ACKNOWLEDGE ADDENDUM:

Offerors must acknowledge receipt of this Addendum prior to the deadline specified in the solicitation for receipt of offers by one of the following methods:

- a. Shall acknowledge the receipt of each individual addendum in their Proposals on the form Acknowledgement of Addenda.

WARNING: Failure of an Offeror to acknowledge receipt of this Addendum, as described herein, may result in REJECTION OF THE OFFER.

NOTE: For Invitations for Bids the terms "Offer" and Offeror" shall mean "Bid" and "Bidder", respectively; and for Requests for Proposals or Quotation the terms "Bid" and "Bidder" shall mean "Offer" and "Offeror", respectively, in this solicitation and any associated exhibits.

9. FOR FURTHER INFORMATION CALL CONTRACTS SPECIALIST:

Name: Alvin Burns

Email: aburns@psta.net (cc: erandle@psta.net)

10. DESCRIPTION OF ADDENDUM:

1. Vendor Questions and the Authority's Responses.
2. Request for Pre-Offer Change or Approved Equal & RFP Updates
3. Revision #2 Ordering Instruction
4. Contract Update – Section 4 **EFFECTIVE DATE AND TERM OF AGREEMENT**

Amendment		VENDOR QUESTION	PSTA RESPONSE
23	7	What is the anticipated award date/NTP? Bidder will need it as the start date of delivery schedule	PSTA intends on taking this to our October 27, 2021 Board of Directors meeting for approval
22	7	Since this procurement is not from one specific model or number of buses to be delivered. Please advise how this requirement should be provided?	Quantity is one (1) see pricing schedule
21	7	Req: 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. Since this RFP does not have a stated value is there a specific value that PSTA will accept such as a letter of bondability for certain amount to satisfy this requirement?	There is no requirement that this be bonded, however PSTA will do it's due diligence to make sure that a company is financially stable to provided the goods and services required under this solicitation.
20	4	Requests approval to limit the liquidated damages to be capped on a per bus basis at 2% of the value of the bus price. The timely performance of the work by the Contractor is of utmost importance to ensure successful completion of the deliveries stipulated in the Contract. Nonetheless, an unlimited liability obligation creates a severe restriction on our ability to disclose financial provision in accordance with Securities Exchange requirements. Hence, the Contractor considers that liquidated damages should be an assessment of direct damages suffered by the Customer, and, in addition be a mechanism to dissuade poor performance.	PSTA is agreeable to the 2% limit provided it does not exceed 80 days. In the event the delivery exceeds 80 days, the contractor would be agreeable to pay \$200.00 per day not to exceed 10% of the cost of the vehicle.
19	4	Th Payment due date for purchase of goods or services other than construction services is net forty-five (45) days from the accepted date. We requested approval to reduce the net forty-five days to net thirty days from the accepted date.	As this is a procurement for the state we are bound by Florida statue 218.74. Unfortunately we have to deny this request.
18	4	Shall bidder provide production schedule for each model based on (1) unit of vehicle? If the proposed schedule is identical for each model, can bidder provide one schedule that covers all models?	Yes
17	4	What is the qty needed for each model(s) for this RFP? A quantity will assist us in meeting providing PSTA the required delivery schedule.	This is a state schedule that may be used by any agency All quantities should be based on the assumption of one
16	4	Does this procurement require any bonds and if so for how much and for how long as well as how will the bond be released.	No
15	4	Section 3 - Qualification Section Requirements does not have this requirement. Please confirm if a letter from a surety is required.	There is no Bonding requirement for this solicitation
14	4	Will PSTA accept the accord certificate to meet this requirement?	No. We need the letter because PSTA is not the only agency purchasing off of this contract. The submittal of the letter is a matter of responsiveness.
13	4	#12 Performance Bond. - Please confirm if a performance bond will be required as our surety as advised of the following language: See FTA language as provided by the Surety: The FTA's own website (https://www.transit.dot.gov/funding/procurement/third-party-procurement/bonds) specifically mentions that bonds are not required for Rolling Stock (i.e. buses): "The FTA requirements regarding bonds pertain only to construction contracts and facility improvement contracts. They do not pertain to contracts for equipment, rolling stock, maintenance, or other non-construction services. Grantees may choose to require bonds from contractors performing other non-construction contracts, but this is at the sole discretion of the grantee. FTA bonding requirements are discussed in FTA Circular 4220.1F, Chapter IV, 2.i. and the Best Practices Procurement Manual, Section 3.2.8 – Bonding. (Revised: May 2017)". Rolling Stock is defined as "transit vehicles such as buses, vans, cars, railcars, locomotives, trolley cars and buses, and ferry boats, as well as vehicles used for support services." Source: (https://www.transit.dot.gov/funding/procurement/third-party-procurement/definition-rolling-stock).	There is no Bonding requirement for this solicitation
12	4	Will PSTA accept a link instead of the complete annual reports as this will increase the size o the file upload. Req: 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.	Yes a link is ok to submit

11	4	Will PSTA accept an accord insurance certificate in lieu of #3. Letter for insurance?	No. We need the letter because PSTA is not the only agency purchasing off of this contract. The submittal of the letter is a matter of responsiveness.
10	4	In package 3 Qualification are the following required as it states (if applicable and we cannot determine if they are applicable and required as part of our submission. 4. Letter for performance bond (if applicable) 5. Letter of commitment for parental financial guarantee (if applicable)	No letter for performance bond is needed
9	2	In the RFP under TS 19. Altoona Testing it states the following.. 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. The Proposer would like to confirm that an Altoona Test Report is required at time of submission?	Please see addendum 1, question #3
8	2	Can the Proposer submit additional unit pricing options to supply charger accessories, as well as corrective and preventative maintenance plans, in addition to charger hardware supply?	Yes
7	2	Can sequential charging be proposed, in lieu of simultaneous charging ? In many, if not most instances, sequential charging will meet the fleet's recharging needs.	Please clarify what you are define as sequential charging and simultaneous charging
6	2	Can the Proposer submit multiple equipment model options for depot chargers ? In order to best accommodate fleet operators needs, we believe it is important to provide a larger range of chargers capable of various power levels.	Yes. As long as supporting documentation is included in your proposal
5	2	Is there a desired kW power level for the Depot Charger ?	No
4	1	Will the agency allow the submission of question using an excel spreadsheet instead of using CER 2. Request for Pre-Offer Change or Approved Equal, which can facilitate response. Please advise.	Yes
3	1	As seen in section TS 19. Altoona Testing, it states "Buses which have not successfully completed an Altoona Test for the type and sizes requested under this RFP will not be considered. " Please confirm if a proposal will be considered if Altoona testing is to be completed after the proposal submission, and tests from our current similar models are provided in our proposal.	The bus will need to satisfy meeting FTA Pre Award, Post delivery and FAST Act requirements.
2	1	Can you confirm if charger design and installation is being requested from this RFP?	No
1	1	Will this procurement cover the design & installation of chargers?	No

Request for Pre-Offer Change or Approved Equal & RFP Updates
PSTA RFP 21-980369

Request #	Addendum	RFP Section	Page	RFP	Questions/Clarification or Approved Equal	Agency Action	Agency response:
98	7	Section 4. SPECIAL PROVISIONS & CER 6 Pricing Schedule 53 & 216		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. CER 6. Pricing Schedule	GILIG wishes to advise that under the FTA Exp Act, Section 3019, Innovative Procurements; Cooperative Procurement Schedules may be for an initial term of not more than 2 years and may include not more than 3 optional extensions for terms of not more than 1 year each and may be in effect for a total period of not more than 5 years. In order to best serve the interest of Procuring agencies, and to assist in properly determining and comparing the base bus price for this procurement, GILIG is requesting the price evaluation be based on the base bus price (not including any options) in year 1 of the contract. GILIG also requests pricing be fixed for the first year of the contract and recommend the use of the FTA approved Producer's Price Index (PPI) for Truck and Bus Bodies 1413 for optional years 2-5.	See Response	Contract Term has been updated see revised contract clause #8
				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, Line 12, lists the Performance Bond as an item to be reviewed 30 days following contract execution. There does not seem to be any actual requirement for a performance bond in the RFP documents. Respectfully request that line 12 on the Contract Deliverables Table be removed or noted as not applicable.	See Response	Table 1, Line 2 is not applicable
				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."	In reference to section TS 5.9.1 Technical/Service Representatives, we respectfully request clarification on how we can be captured on a per bus basis for fulltime, on site technical support representatives for two (2) years.		
96	6	TS 5.9.1	78	The Contractor shall provide fulltime, 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.	If multiple agencies have the ability to order buses, or even a single bus, the way this is written seems to indicate that the Contractor would have to deploy a full time support representative to each and every customer location, each for a minimum of two years. Based on the above considerations, we respectfully request that this requirement be removed.	See Addendum	See Addendum 4 Question #10
				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 formulates tasks in three areas, PMI, scheduled maintenance and major component.	According to Section TS 88.4 "Cost of Ownership" a template is quoted in this section to be filled out with the cost of ownership information. However, New Flyer did not find the template in the forms section of the RFP. New Flyer would like to clarify if Pinellas will provide the template.	See Response	See Question 72 for response
94	6	TS 30.1 Wheels	108	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	GILIG wishes to advise that our design would include 9 inch wheels at the front axle and 8.25 inch wheels at the rear axle. This is inherent to our design in order to provide adequate weight rating's needed for the Battery Electric Bus to safely carry the required 75 passengers inclusive of the driver. GILIG requests approval	See Response	Not approved, need more clarification to understand why there are different wheel sizes between the front and rear axles. 9/15/2021 - Approved - As previously noted, The 9" rims on the front axles are required to provide adequate weight rating's to safely carry up to 75 passengers inclusive of the driver. PSTA are not able to use 9" rims in the rear due tire spacing requirements.
93	6	TS 31.4 Steering Wheel Telescopic Adjustment	110	At Maximum Telescopic Height Adjustment: 0 Degree 34in Height	GILIG wishes to clarify that our proposed steering column with 16" wheel meets and exceeds the Table 4 chart at all levels with one small difference. GILIG requests approval to provide a height of 33.8 in. at 0 degrees slope at Maximum Telescopic Height Adjustment	Approved	NA
92	6	TS 32. Drive Axle	110	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.	GILIG wishes to advise that our design includes a guard that goes around and below the drive shaft. Although the guard is not above the drive shaft, the inherent position of the drive shaft is below chassis structural beam and therefore protects the coach floor.	Approved	NA
91	6	TS 35.4 Hubs and Drums/Disks	113	The bus shall be equipped with brake drums. Brake drums shall allow machining for oversized linings per manufacturer's specifications.	GILIG requests concurrence GILIG wishes to advise that our Battery Electric Bus design is only available with Meritor Air Disc Brakes on All Axles.	See Response	Proposer's may specify whichever braking systems are inherent to the design of the bus.
90	6	TS 44.5 Normal Bus Operation Instrumentation and Alarms Controls	129	Table 6 Transit Bus Instruments and Alarms	GILIG requests approval to omit a Drum Brake option GILIG requests approval that the instrumentation, switches, controls and indicators can be discussed at the pre-production meeting if GILIG is the successful bidder. This is due to the unique design of our bus. GILIG is providing a generic Battery Electric Bus dash layout for review. Please see attached.	See Response	Proposer's may specify whichever dash layout is inherent to the design of the bus.
89	6	TS 44.6.2 Pedal Dimensions and Position	133	The floor mounted accelerator pedal shall be 10-inches to 12-inches long and 3-inches to 4-inches wide.	GILIG requests approval to provide an accelerator pedal that is 9-inches long and 3.134-inches wide	Approved	NA
88	6	TS 57. Maintainability	148	High and low refrigerant pressure electronic gauges to be located in the return air area.	GILIG requests approval to provide a Refrigerant Pressure Display Module in place of gauges in the return air area. This is the standard of the HVAC vendor Thermo King.	Approved	NA
87	6	WR 11.4 Propulsion System	190	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.	GILIG wishes to clarify that our Powertrain includes a standard warranty from Cummins for Three Years / 100,000 miles with an extension available to a total of Five Years / 250,000 Miles. This is the only available powtrain warranty available from Cummins. GILIG requests approval	See Response	Proposer's should submit warranty terms as part of their proposal for consideration by the evaluation committee.

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78	6	Section 4, SP 2.4 CONTRACT DELIVERABLES - TABLE 1	51	12. PERFORMANCE BOND	Please advise if a PERFORMANCE BOND will be required for this procurement? GILUG is concerned that the exclusion of this bond will permit irresponsible companies to bid without having sufficient resources to fully satisfy the contract or provide proper long term support for the procuring agency. GILUG requests the addition of a .100% Performance Bond requirement to your contractual term for all bidders.	See Response	No performance bond is required
77	6	Section 4, SP 3 PAYMENT	53	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.	GILUG requests revision of this section to the current industry standard and APFA recommended payment terms: Payment due date for purchase of goods or services other than construction services is net thirty (30) days from the accepted date.	Denied	PSTA can not approve this request, due to FL statute Florida Prompt payment Act FS218.72 and FS218.73
76	6	Section 4, SP 3.1 PAYMENT TERMS	53	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 a proper invoice. The Agency shall make payment 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.	GILUG requests revision to the current industry standard and APFA recommended payment terms for FTA funded procurements. The Agency shall make payments for buses at the unit prices itemized in the price schedule within 30 days after the delivery and acceptance of a proper invoice. The Agency shall make payment for spare parts and/or equipment at the unit prices itemized in the price schedule within 30 days after delivery and acceptance of said spare parts and/or equipment and receipt of a proper invoice.	Denied	PSTA can not approve this request, due to FL statute Florida Prompt payment Act FS218.72 and FS218.73
75	6	Section 4, SP 7. INSURANCE	55	Contractor must provide a certificate of insurance and endorsement in accordance with the Insurance re-requirements listed below by the Effective Date. ...	GILUG maintains and pays the premiums for insurance of the types and limits it deems sufficient for its protection. The Additional Insured endorsement can be provided as requested. Please note we exceed the requested limits in many areas. Enclosed is a copy of our Certificate of Liability Insurance for your information and approval.	Approved	NA
74	6	Section 4, SP7 PROFESSIONAL LIABILITY INSURANCE	58	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 re-respond to damages resulting from any claim arising out of the performance of professional services rendered by Contractor. The minimum limits of liability shall be: • \$1,000,000 per Claims Made Basis/for 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.	GILUG requests deletion of the requirement for Contractor to have Professional Liability Insurance. This coverage is only necessary for professional services such as engineering, architecture, etc. Contractor's General Liability will provide the Agency with insurance protection for product related liability issues.	Approved	Request approved
73	6	SECTION 4, SP 8 Software Escrow Account	59	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".	1. GILUG requests confirmation that a "separate" Software Escrow Account is not required for this procurement? We request confirmation that a separate Software Escrow Account would only be required in the case of bankruptcy of the Contractor or material breach of the Contract. 2. Paragraph 2 - we request deletion of the requirement to provide the Agency a list of all OEM software comprising proprietary works ("Proprietary Software") for all major vehicle subsystems upon execution of the Contract. GILUG considers this information to be proprietary and the information is not available from our major subsystem suppliers. 3. GILUG confirms we will continue to support the Agency through our Field Service Department and Warranty coverage as required in your specifications.	See Response	1. Approved 2. Approved 3. Acknowledged
72	6	Section 6, TS 88.4 COST OF OWNERSHIP	187	In addition to the Proposer's 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.	COST OF OWNERSHIP template is missing from the specifications.	See Response	There was no Total Cost of Ownership form included in the RFP package. PSTA is requesting Proposer's submit information related to anticipated cost of ownership on either their own form or included as a narrative in the proposal response.
71	6	IP 14. Ordering Instructions	28	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).	GILUG requests the ordering instruction be changed to the same as is currently used for the Florida Heavy Duty Bus contract with IFA - Upon receipt of quote, review and compare against to ensure that the options and pricing are in accordance with the contract documents. All purchase orders must reference Contract RFP 21-980369 Florida Electric Transit Buses. Upon issuance and approval of your agency purchase order, send directly to the contractor. Under this contract, the contractor will be responsible for providing Florida Transit Association Finance Corporation (FTAFC) a copy of each agency's purchase order upon receipt. The contractor will also provide the FTAFC with a quarterly statement of purchases made off the contract. The FTAFC will issue an invoice to the procuring agency to pay the FTAFC a transaction fee of Five Hundred dollars (\$500.00) not to exceed ten thousand dollars (\$10,000.00) per calendar year.	See Addendum	See Addendum for Revised Ordering Instructions
70	6	TS 5.9 Technical Service Representatives	78	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	GILUG requests this requirement be priced separately from the base bus as an option. GILUG believes that not every purchasing agency will require this type service and including it the base bus price will only inflate the cost.	See Response	Addendum H4 deleted the requirement of providing a full-time, on-site technical support representative for two years after bus delivery with annual renewal options for ten years. All other language in TS 5.9.1 Technical/Service Representatives still applies. Proposer shall provide sufficient information in their proposal detailing their field service support capabilities, including response times, staff levels, service centers (if applicable) for both the bus and charging equipment.
69	6	TS 88.3 Conditional Assessment	187	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.	GILUG requests this requirement be priced separately from the base bus as an option. GILUG believes that not every purchasing agency will require this type service and including it the base bus price will only inflate the cost.	See Response	Approved. Please submit pricing separately as an option.

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53	6	TS 9.1.5 Population System Controller (PSC)	92	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.	Request approval of our system design which does not use a Population System Controller (PSC). We utilize a powertrain controller to manage the traction motor and transmission, an ESM to interface to the batteries, a charge controller for charging, and a vehicle controller to integrate the systems all together. The vehicle controller manages all power flow and ancillary load management.	Approved	NA
52	6	TS 10.1 Component Thermal Management	94	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 450 in. above the ground. Both shall be accessible through the same access door.	Request approval of our proposed coolant system design which does not incorporate a manual pressure relief valve. The expansion tank cap relieves pressure above 13psi. During fill, a solenoid valve opens which relieves pressure while the fill pump is running.	Approved	NA
51	6	TS 15 Radiator	98	Radiator piping shall be stainless steel, brass tubing or painted steel rated at 1,000 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.	Request approval of our standard Mubara radiator clamps. The clamps are steel and have passed a 1,000+ hour salt spray test. Please refer to Exhibit B for more information.	Approved	NA
50	6	TS 29.3.4 Kneeing	108	An indicator visible to the driver shall be illuminated until the bus is cased to a height adequate for safe street travel. An audible warning alarm will sound simultaneously with the operation of the kneeter to alert passengers and bystanders. A warning light mounted near the outside 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.	Request approval of our standard warning light which is a minimum of 1.75" diameter amber lens.	See Response	Conditional approval is granted on the basis that the 1.75" diameter lenses meet FMVSS, ADA, or any other governing body specification for use on a public transit bus.
49	6	TS 37.3 Air Lines and Fittings	115	DEFAULT <ul style="list-style-type: none">• Green: Indicates primary brakes and supply.• Red: Indicates secondary brakes.• Brown: Indicates parking brake.• Yellow: Indicates transmission and ride height controller feed (we don't have governor air lines)• Black: Indicates accessories & doors• Blue: Indicates curb side air bags• Orange: Indicates street side air bags	Request approval of the following color combination for air lines: <ul style="list-style-type: none">• Green: Indicates primary brakes and supply• Red: Indicates secondary brakes• Brown: Indicates parking brake• Yellow: Indicates transmission and ride height controller feed (we don't have governor air lines)• Black: Indicates accessories & doors• Blue: Indicates curb side air bags• Orange: Indicates street side air bags	Approved	NA
48	6	TS 38.1 Modular Design	117	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.	Request approval of our standard multicore cable which runs from the drivetrain to the power steering motor at the front of the vehicle. It passes through 2 bulkheads and is part of a drivetrain harness. Maintaining a constant shield is important to protect other systems from Electro-Magnetic Interference. Also, reducing the number of terminations also improves the reliability of the circuit. If this cable were to be damaged and be required to be replaced, it can be done with minimal extra effort when compared to the requested design. To date, we haven't replaced this cable on any vehicle in service.	Approved	NA
47	6	TS 40.5 High Voltage Disconnect System	121	The high-voltage system shall be fitted with automatic disconnecting connectors 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 connectors shall be designed to be opened by the operator using a key or tool. The connectors 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). Connectors shall be controlled by the "High Voltage Disconnect" switch, and any safety-critical interlocks and interlock logic, motor-controller overcurrent, protection functions, and vehicle crash and/or fire sensors. Reset of the connectors shall require the deliberate action of the operator or maintenance personnel. Connectors should provide a visual or electrical indication of their status (open or closed) or of a failure to function.	Request approval of our standard design high voltage disconnect system which operates as follows: <ul style="list-style-type: none">Our system utilizes redundant connectors. One set in each battery pack and another set in the main HV junction box.A separate HV disconnect is a physical disconnect and doesn't go through the connectors.The connectors are controlled by the BMS and vehicle controller with a number of different conditions that can disable them.	See Response	Please submit further explanation as part of your proposal for review by the evaluation committee.
46	6	TS 41.1.2 Shielding	125	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 the power source. Shielding shall be applied to all cables that require shielding. Shielding shall be applied to all cables that require shielding. Shielding shall be applied to all cables that require shielding. NOTE: A shield grounded at both ends 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.	Request approval of our standard design which has some shields that are grounded at both ends per the component manufacturers installation instructions (i.e. power cables between the motor and inverter)	See Response	Please submit further explanation as part of your proposal for review by the evaluation committee.
45	6	TS 44.2 Normal Bus Operation Instrumentation and Controls	129	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.	Request that the instrumentation and controls listed be noted as representative only and that the final layout of instrumentation and controls be agreed upon in the pre-production meetings).	See Response	Proposer's may specify whichever dash layout is inherent to the design of the bus.
44	6	TS 44.6.1 Pedal Angle	133	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.	Request approval for the pedal angles to be as follows: <ul style="list-style-type: none">Accelerator pedal 45° at initiation and 25° at full throttleBrake pedal 45° at initiation and 25° at full brake	Approved	NA
43	6	TS 47.2.1 Exterior Mirrors	138	The bus shall be equipped with corrosion-resistant, outside rearview mirrors mounted with stable supports to minimize vibration. Mirrors shall be mounted on a swivel joint to allow the driver to view the roadway along the sides of the bus, including the rear wheels. Mirrors should be positioned to prevent blind spots.	Request approval of our standard exterior mirrors, as described in Exhibit C. Please note that additional options and sling on the Price Sheet are not available on Proterra buses.	See Response	Proposer's may specify whichever mirrors are inherent to the design of the bus.
42	6	TS 49.1 Glazing	140	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.	Request approval for a shaded band may interfere with mirror visibility. Proterra could apply a tint film with 5% LT that sits just below the blackout on the street side of the windshield.	Approved	NA
41	6	TS 50 Driver's Side Window	140	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.	Request approval for our standard driver's side window which is hidden frame and non-agress as described in Exhibit D. Please note that traditional framed windows, full slider, and aggress driver's side windows are not available on Proterra buses.	See Response	Proposer's may specify whichever windows are inherent to the design of the bus.
40	6	TS 50 Driver's Side Window	140	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. (500 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.	Request approval for our standard driver's side window which allows the view through the glazing at the front of the assembly beginning not more than 27.2 in. above the operator's floor.	Approved	NA

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39	6	TS 5 Side Windows TS 5.1.1 Configuration	141	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.	Request approval of our standard passenger windows which are flush and not bonded; however, our design incorporates a quarter window just ahead of the front entrance door which is bonded in place.	See Response	Proposer's may specify whichever windows are inherent to the design of the bus.
38	6	TS 5.1 Side Windows	142	Default and Alternative Configurations	Request approval for Proterra's streamlined body design which exclusively uses hidden frame side windows. Please note that traditional framed windows are not available on Proterra buses.	See Response	Proposer's may specify whichever windows are inherent to the design of the bus.
37	6	TS 4.3 Controls for the Climate Control System (CCS)	146	The controls for the driver's compartment for heating, ventilation and cooling systems shall be integrated and shall meet the following requirements: <ul style="list-style-type: none">• The temperature control 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.	Request approval for our standard design which does not require a manually operated control valve because the heater is electrical and does not use heated water.	See Response	Proposer's may specify whichever system/controls method is inherent to the design of the bus.
36	6	TS 5.4.4 Driver's Compartment Requirements	147	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. Details 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.	Request approval for our standard design which does not have provisions to provide fresh air (exterior air) to the driver's area.	See Response	Please submit further explanation as part of your proposal for review by the evaluation committee.
35	6	TS 5.7 Maintainability	148	DEFAULT High and low refrigerant pressure electronic gauges to be located in the return air area.	Request approval for our standard design which does not incorporate remote "mechanical" gauges and has no provisions for them. The high and low pressures can be viewed through an unlocked service screen on the front of the vehicle. Also, the high and low pressure are on the CAN messages and are visible through the service tool.	Approved	NA
34	6	TS 6.2 Repair and Replacement TS 6.2.1 Side Body Panels (Transit Coach)	149	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.	Request approval for our standard bus design which uses a composite, monocoque body that does not have exterior paneling. The outer skin is integral to the body structure. When damage occurs to the exterior of the vehicle, the repair is contained to just the damaged area. The side body from floor to window is repairable with common composite repair techniques. The body is also covered with a gel coat that resists chips and cracks.	Approved	NA
33	6	TS 6.7.1 Access Doors (Transit Coach)	150	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.	Request approval for our standard design which has lower side access doors for the motor compartment that, when opened, restrict access to the upper side access doors. All other access doors, when opened, do not restrict access for servicing other components or systems. Please see Exhibit C for additional details.	See Response	Approval is granted that your standard design which has lower side access doors for the motor compartment that, when opened, restricts access to the upper side access doors. However, upon review of the pictures contained in your Exhibit E – Access Panels, it appears that the lower panel's right hand door support strut would need to be removed into order to pull the ZETA V battery tray out. Please confirm.
32	6	TS 6.9.1 Appearance	152	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.	Request approval for the base white color of the bus body to be gelcoat rather than paint. The gelcoat is inherent to the composite body construction and is resistant to chips and cracks. Please note that due to Proterra's design with hidden frame windows, black masking at the windows is not applicable.	Approved	NA
31	6	Facebox/Card Reader Lighting TS 73.19.1 Transit Coach	160	ALTERNATIVE (TRANSIT COACH) Provide a facebox and card reader light.	Please clarify whether facebox and card reader lights are part of the base bus or an option. If the intent is for these to be an option, please add a line item to the Pricing Schedule.	See Response	It is part of the base bus.
30	6	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.	Request approval of our standard seats which are bolted into the body with hex bolts and locknuts onto the bolts with the seat rail. The seats themselves are built with tamper-resistant fasteners.	Approved	NA
29	6	TS 73.8.5 Door Glazing	170	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 18 inches.	Request approval for our standard Transit Coach door glazing replacement procedures as defined in Exhibit F.	See Response	Approved. Please also submit these materials as part of your proposal for review by the evaluation committee.
28	6	TS 78.5 Actuators	171	Door glazing shall be easily replaceable. 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.	Request approval of our standard design in which the exhaust from the door system is not routed below the floor of the bus. It exits through a muffler on the valve block of the actuator mechanism. Oil in the air lines is segregated out by an individual air filter for each door.	Approved	NA
27	6	TS 85 Electronics/Equipment Compartment	180	Each bus shall be equipped with a fully sealed compartment located on the left front wheelhouse to provide a mounting location for radio equipment, fire extinguisher, and other accessories. The compartment shall be constructed of steel, aluminum, or composite material, completely water resistant to steel construction. It shall be accessible from inside the bus, shall have a slide tray that automatically locks 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.	Request approval for our standard ITS storage box which is located on the street-side wheel housing. Please note that our storage box is designed to provide sufficient access to customer ITS-related equipment as shown in Exhibit G.	See Response	Approved. Please also submit these materials as part of your proposal for review by the evaluation committee.
26	6	TS 8.7 Charging System Specifications	182	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 kWh delivered, kWh and kWh received.	Can the submetering be handled by an external device, or must it be part of the charger?	See Response	It can be either an external device or part of the charger.
25	6	TS 87.1 "In-Shop" and "Out-Shop" Charger	183	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.	Is there a minimum cable length required?	See Response	No. Proposer shall state what their standard length offering is along with whether custom lengths are available.
24	6	S-30 Pricing Schedule	N/A	Entire Form	Please clarify that it is not mandatory to quote every line item listed as some line items are not available on Proterra Electric Buses.	See Response	It is not mandatory to quote every line item. For those items not quoted please mark as "No Quote".

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23	6	S-10 Pricing Schedule	N/A	Destination Signs	Per Addendum 1 (through 4), the base buses should include destination signs on the front and side; the rear sign is listed as an alternative. The Pricing Schedule lists standalone options for 126 Luminator Rear View Camera Integrated into Rear LED sign; and Luminator-Delete Rear Sign. Neither of those would be appropriate if the base buses do not include a rear sign.	See Response	The base bus shall be furnished with a front and right side (curbside) destination sign, Luminator Smart Series III with white LED, or approved equal. A rear sign may be quoted as optional equipment. Being said, the call-out Luminator-Delete Rear sign is not applicable and should be disregarded.
22	4	TS 7.4	85	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.	See Response	There are no minimum range requirements specified; established in this RFP. As stated in the RFP and during the pre-proposal meeting, Proposers shall supply the range information requested in TS 8.1 for each size bus being submitted for consideration utilizing the Altona On-Road Energy Consumption and Range Tests for buses. Specifically, CBD, ART, and COM Duty Cycles.
21	4	TS 7.3	85	TS 7.3 Acceleration	We would like to clarify that electric bus is equipped with two braking systems to decelerate the bus. One is a pneumatic friction-based brake system, and another is a regenerative braking system. The braking performance is different with and without regenerative braking. Regenerative braking is available (braking performance is consistent) regardless of system SOC in our design. While, if the regenerative braking is limited or not available due to special condition, the braking performance is different. We request approval of the design.	Approved	NA
20	4	TS 8.2	87	TS 8.2 Design Operating Profile (Battery Electric Bus)	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).	See Response	Detailed route data is not available. As stated in the RFP and during the pre-proposal meeting, Proposers shall supply the range information requested in TS 8.1 for each size bus being submitted for consideration utilizing the Altona On-Road Energy Consumption and Range Tests for buses. Specifically, CBD, ART, and COM Duty Cycles. Assume ambient temperature of 90 deg F and weather customary to the State of Florida.
19	4	TS 8.2	87	TS 8.2 Design Operating Profile (Battery Electric Bus)	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).	See Response	See answers to previous questions.
18	4	TS 9.1.4	90	TS 9.1.4 Energy Storage System and Controller Energy Storage System	A phased automatic shutdown system shall be provided	See Response	The intent of the specification is that sufficient warnings will be given to the operator that the SOC is running low. The intent of a "phase automatic shutdown" is, as an example, at 30% SOC a warning indicator, audible tone, is given, at 20% SOC the bus may decelerate in performance to conserve energy, at 10% SOC the bus goes into "limp-home" mode, at 0% the bus automatically shuts down. The levels of SOC stated previously are only used to illustrate the intent. Proposers shall specify what form of low-SOC shutdown protocols are in use.
17	4	TS 9.1.4	92	TS 9.1.4 Energy Storage System and Controller Battery Charging	The bus shall support an SAE approved charging standard (SAE J1808 AC and/or SAE J1772 DC).	See Response	Manufacturer shall provide a detailed description of its charging system and specify its compliance with one of the listed standards. If the charging system cannot meet compliance provide detailed information as part of the proposal so that the Evaluation Committee may review and make a determination on acceptance.
16	4	TS 9.1.6	93	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.	See Response	If the specification does not apply to a manufacturer's bus design the Proposer may consider it not applicable.
15	4	TS 19	99	TS 19 Altona Testing	DEFAULT in Altona Test Report shall be provided to the Agency with the Proposal submittal.	See Response	The bus will need to satisfy meeting FTA Pre Award, Post delivery and FAST Act requirements.
14	4	TS 26.5	100	TS 26.5 Construction	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).	Approved	NA
13	4	TS 56	148	TS 56: roof Ventilators	ALTERNATIVE Three roof Ventilators (Used in articulated buses.)	See Response	Yes, so long as number of ventilators satisfies compliance with FMVSS for minimum number of escape hatches.
12	4	TS 52	144	TS 52: Capacity and Performance	ALTERNATIVE R134a The air conditioning system shall meet these performance requirements using R134a	Approved	NA

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Request #	Addendum	RFP Section	Page	RFP	Questions/Clarification or Approved Equal	Agency Action	Agency Response																																					
11	4	TS 78.1.2	168	<p>TS 78.1.2 Rear Door(s)</p> <p>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.</p>	<p>TABLE 7</p> <p>Door Operating Combinations</p> <table><tr><th></th><th>Front</th><th>Curbside Rear</th><th>Street-Side Rear</th></tr><tr><td></td><td>Closed</td><td>Closed</td><td>Closed</td></tr><tr><td></td><td>Open</td><td>Closed</td><td>Closed</td></tr><tr><td></td><td>Open</td><td>Open</td><td>Closed</td></tr><tr><td></td><td>Open</td><td>Closed</td><td>Open</td></tr><tr><td></td><td>Open</td><td>Open</td><td>Open</td></tr><tr><td></td><td>Closed</td><td>Open</td><td>Closed</td></tr><tr><td></td><td>Closed</td><td>Closed</td><td>Open</td></tr><tr><td></td><td>Closed</td><td>Open</td><td>Open</td></tr></table>		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	Does PSTA need one front door, one curbside rear door and one street-side rear door in articulated bus? If not, please specify door number and door location.	See Response	Disregard all references to "streetside" doors for articulated bus in this RFP. The doors being specified will be curbside only, mounted in the standard manufacturer locations.
	Front	Curbside Rear	Street-Side Rear																																									
	Closed	Closed	Closed																																									
	Open	Closed	Closed																																									
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10	4	TS 5.9.1	78	<p>TS 5.9.1 Technical/Service Representatives</p> <p>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."</p> <p>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.</p>	<p>Proponent requests that requirement for full-time on-site technical support representatives for two years and beyond be removed as this will be cost prohibitive.</p> <p>Proponent has technical support staff for the bus that can provide solutions remotely or a technician in a service truck could be dispatched within 24-48 hours. Technical service for chargers also would be remote and an on-site representative could be provided within 24-48 hours.</p> <p>We request your approval.</p>	See Response	<p>PSTA approves of the request to delete the requirement of providing a full-time, on-site technical support representative for two years after bus delivery with annual renewal options for ten years.</p> <p>All other language in TS 5.9.1 Technical/Service Representatives still applies.</p> <p>Proposer shall provide sufficient information in their proposal detailing their field service support capabilities, including response times, staff levels, service centers (if applicable), for both the bus and charging equipment.</p>																																					
9	3	SP 2.4	51-53	<p>SP 2.4 Contract Deliverables</p> <p>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.</p>	<p>We request clarification regarding the quantities of manuals needed. Please clarify which section prevails between Table 1: Contract deliverables and SP 5.2 Documentation.</p>	See Addendum	<p>Revised Table 1—Contract Deliverables attached.</p> <p>B</p>																																					
8	3	SP 2.4	51	<p>SP 2.4 Contract Deliverables</p> <p>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.</p>	<p>As per item 18 of Table 1, we understand that the City requests 20 bus orientation video. We propose to offer PSTA the right to film the on-site orientation training which includes a tour of the bus for future internal use.</p>	Approved	NA																																					
7	3	SP 2.5	54	<p>SP 5.2 Documentation</p> <p>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 subcontractor Supplier will be provided.</p>	<p>There are inconsistencies between the two sections regarding the documentation specifications and Nova Bus would like to offer the best service according to the real needs of PSTA.</p>	See Response	<p>Revised SP 5.2 Documentation: The Contractor shall provide an electronic of current maintenance manual(s) to include preventative maintenance procedures, diagnostic procedures or troubleshooting guides and major component service manuals, an electronic copy of current parts manual(s), and an electronic copy of 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 manuals 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 subcontractor Supplier will be provided.</p>																																					
6	2	TS 84.1 Camera Surveillance System	179	<p>Provide all wiring and mounting locations for a multi-camera surveillance system, including the installation of cameras, recorder, microphone, etc..</p>	<p>Proposer requests information on whether or not a camera system should be included in the base bus price. Currently, various information pertinent to details of this system such as supplier, number of cameras, type of DVR and functionalities are missing from the technical specifications. Such information is essential to be able to provide accurate pricing and configuration. In light of this, proposer requests approval to provide price of such systems only through optional item included in CER 6: Pricing Schedule</p>	See Response	<p>DEFAULT</p> <p>No camera system.</p> <p>ALTERNATIVE</p> <p>A camera system shall be installed. Agency to select from list of available camera systems from OEM options list including installation locations.</p> <p>ALTERNATIVE</p> <p>Pre-wire only. Agency may select to have vehicle pre-wired only for a camera system.</p>																																					
5	2	CER 6: Pricing Schedule	NA	NA	<p>The specification of several systems such as Destination signs, Camera Systems, and Automatic Passenger Counters are missing configuration details that are essential for costing. Proposer understands that the base bus configuration will not have any of such systems, but optional pricing for those will be provided via CER 6: Pricing Schedule for interested agencies. Please confirm our understanding.</p>	See Addendum	Pricing Scheduled has be updated																																					

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Request #	Addendum	RFP Section	Page	RFP	Questions/Clarification or Approved Equal	Agency Action	Agency response:
4	2	TS 81 Destination Signs	177	<p>A destination sign system shall be furnished on the front, on the right side near the front door.</p> <p>Route sign on the rear of the vehicle.</p> <p>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.</p> <p>The destination sign shall be able to access the sign while seated.</p> <p>The destination sign compartments shall meet the following minimum requirements:</p> <ul style="list-style-type: none"> Compartments shall be designed to prevent condensation and entry of moisture and dirt. Compartments shall be designed to prevent tampering and vandalism. Access shall be provided to allow cleaning of inside compartment window and unit itself. <p>The front window shall have an exterior display area of no less than 8.5 in. high by 56 in. wide.</p> <p>Run number sign shall be installed.</p>	NA	RFP Update	<p>DEFAULT</p> <p>A destination sign shall be furnished on the front and on the right side (curbside) near the front door.</p> <p>The destination signs shall be luminator Smart Series II with white LED, or approved equal.</p> <p>ALTERNATIVE</p> <p>Agency to select from list of available destination sign systems from ODM provided options list.</p> <p>ALTERNATIVE</p> <p>A rear route sign, if available, shall be installed on the rear of the vehicle.</p> <p>ALTERNATIVE</p> <p>A run number sign, if available, shall be installed on the vehicle</p>
3	2	TS 84.3 Automatic Passenger Counters (APC)	179	<p>An infrared APC system shall be installed. Agency to provide details of APC system, including installation locations and number of buses to be equipped.</p>	NA	RFP Update	<p>DEFAULT</p> <p>No automatic passenger counter system.</p> <p>ALTERNATIVE</p> <p>An automatic passenger counter system shall be installed. Agency to select from list of available automatic passenger counter systems from ODM options list including installation</p>
2	2	TS 84.4.2 Handset	180	<p>Contractor will install a handset for driver use.</p>	NA	RFP Update	<p>ALTERNATIVE</p> <p>No handset.</p> <p>ALTERNATIVE</p> <p>A handset for driver use shall be installed. Agency to select from list of available handsets including installation location from ODM option list.</p>
1	2	TS 86 Computer Assisted Dispatching System (CAD/AVL)	181	<p>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.</p> <p>Each PSTA bus is equipped with various components provided by Clever Devices to include all necessary wiring and software installation. The on board computing processor unit- IVNA is the central processing unit for each revenue service vehicle in the PSTA fleet. Along with the IVNA 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.</p> <p>Clever Devices also provides to PSTA an Automatic Vehicle Monitoring System (AVM-3) for each individual bus controlled by a central computer system. This system reports vehicle location, speed, and other components and generates automatic reports through our Wireless Access Point (file dumping) and real-time monitoring, via a cellular network.</p>	NA	RFP Update	<p>DEFAULT</p> <p>No computer assisted dispatching system (CAD/AVL).</p> <p>ALTERNATIVE</p> <p>A computer assisted dispatching system (CAD/AVL) shall be installed. Agency to select from list of available CAD/AVL systems from ODM options list including installation requirements and configuration.</p> <p>ALTERNATIVE</p> <p>Pre-wire only. Agency may select to have vehicle pre-wired only for a CAD/AVL system.</p>

Revision # 2 Ordering Instructions

Each Procuring Agency will forward the executed purchase order for the buses being purchased to the OEM's and Florida Transit Association Finance Corporation (FTAFC) and cc: PSTA at purchasing@psta.net. Each purchase order will contain the pricing for any and all optional equipment and or accessories listed in the Contractor's proposal. Once the purchase order is received by the FTAFC, the FTAFC will invoice a transaction fee of \$500 per bus (not to exceed \$10,000 per calendar year per Procuring Agency) for an in-state Procuring Agency and a transaction fee of \$1,000 per bus for an out-of-state Procuring Agency (not to exceed \$10,000 per calendar year per Procuring Agency).

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



AGREEMENT FOR ELECTRIC TRANSIT BUSES WITH CHARGING AND ASSOCIATED EQUIPMENT

THIS AGREEMENT for ELECTRIC TRANSIT BUSES WITH CHARGING AND ASSOCIATED EQUIPMENT (“Agreement”) is made on _____, 2021, by and between the Pinellas Suncoast Transit Authority (“PSTA”), an independent special district with its principal place of business located at 3201 Scherer Drive, St. Petersburg, Florida, 33716 and _____ (“Contractor”), a _____ with its principal place of business located at _____ (collectively, the “Parties”).

WHEREAS, PSTA issued RFP 21-980369 for Electric Transit Buses with Charging and Associated Equipment on July 14, 2021 (the “RFP”); and

WHEREAS, Contractor timely submitted its response to the RFP on or before September 14, 2021 (“Contractor’s Response”); and

WHEREAS, PSTA’s Board of Directors awarded the contract to Contractor at its duly held Board of Directors meeting on _____, 2021 (the “Effective Date”).

NOW, THEREFORE, in consideration of the mutual promises and agreements set forth herein, and for other good and valuable consideration, the receipt and adequacy of which is hereby acknowledged, the Parties agree as follows:

1. RECITALS. The above recitals are true and correct and incorporated herein by reference.

2. CONTRACT DOCUMENTS. The “Contract Documents” shall mean and refer to this Agreement, the RFP including all exhibits attached thereto including any and all duly executed and issued addenda (attached hereto as **Exhibit 1**), any and all Purchase Orders (as defined below and attached as composite **Exhibit 2**), Contractor’s Best and Final Offer (BAFO), if any (attached hereto as **Exhibit 3**), and Contractor’s Response (attached hereto as **Exhibit 4**). All of the foregoing are incorporated herein by reference and are made a part of this Agreement. In interpreting this Agreement and resolving any ambiguities or conflicts between this Agreement and the exhibits, this Agreement takes precedence over the exhibits and any inconsistency between the exhibits will be resolved in the following order:

Exhibit 1	RFP
Exhibit 2	Purchase Order(s)
Exhibit 3	Contractor’s BAFO
Exhibit 4	Contractor’s Response

3. SCOPE OF SERVICES. Contractor, at the direction of PSTA, shall furnish to PSTA Electric Transit Buses with Charging and Associated Equipment as described in, and in accordance with the specifications, tasks, and scope of work set forth in the RFP (the “Services”), and in the amount set forth in the RFP. Contractor acknowledges that it has read the specifications and understands them. Contractor also agrees to provide electric transit buses with charging and associated equipment to all permissible assignees of PSTA. PSTA’s permissible assignees shall have the option to purchase electric transit buses and charging and associated equipment in accordance with the terms and conditions of the RFP, and specifically SP 3 of the RFP.

4. EFFECTIVE DATE AND TERM OF AGREEMENT. This Agreement shall become effective and commence on the Effective Date and shall remain in effect for two (2) years. This Agreement may be renewed upon written notice from PSTA for up to three (3) additional one (1) year terms (each a “Renewal Term”).



5. TERMS OF PERFORMANCE.

- 5.01. *Time for Completion/Purchase Orders.* PSTA will issue purchase orders for the electric buses with charging and associated equipment it needs provided under this Agreement (“Purchase Order(s)”). Upon issuance, the Purchase Order shall be appended to this Agreement and incorporated as an exhibit, Contractor shall immediately begin providing the Services pursuant to the Purchase Order, and all work and deliverables shall be completed by the date set forth in the Purchase Order, unless modified in writing by the Parties. In the event a Purchase Order approved during the term of the Contract Term has a completion date beyond the Contract Term, the terms and conditions of this Agreement shall be automatically extended through the completion of the Purchase Order to the full satisfaction of PSTA.
- 5.02. *Representatives.* Prior to the start of any ordering or supplying the Services under this Agreement, Contractor shall designate a primary and alternate representative, who will have management responsibility for the Services and who will have authority to act on technical matters and resolve problems with the Services, Purchase Order(s), and the Contract Documents, to PSTA in writing. Such designation shall include the contact information (including phone numbers) of Contractor’s representative. PSTA will advise Contractor in writing of the personnel who will represent PSTA in the administration of the Contract Documents. Such writing from PSTA may include the specific duties of each individual and each representative’s limits of authority.
- 5.03. *Non-exclusive Contract.* PSTA specifically reserves the right to contract with other entities for the Services described in the Contract Documents or for similar products if it deems, in its sole discretion, such action to be in PSTA’s best interest.
- 5.04. *Contractor Responsibility.* Contractor shall provide electric buses with charging and associated equipment of first quality, and the workmanship must be in accordance with customary standards of the various trades and industries involved in the manufacturing and furnishing of such products. The Services and the work associated therewith shall be of high-quality in all respects. No advantage will be taken by 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 manufacturing and furnishing of the electric buses and charging and associated equipment, whether the same is manufactured by Contractor or purchased readymade from a source outside Contractor’s company.
- 5.05. *Compliance with Laws.* Contractor shall comply with all federal, state, county, and local laws, rules and/or regulations, and lawful orders of public authorities including those set forth in this Agreement and that, in any manner, could bear on the provision of the Services under the Contract Documents. Omission of any applicable laws, ordinances, rules, regulations, standards or orders by PSTA in the Contract Documents shall be construed as an oversight and shall not relieve Contractor of its obligations to comply with such laws fully and completely. Upon request, Contractor shall furnish to PSTA certificates of compliance with all such laws, orders and regulations. Contractor shall be responsible for obtaining all necessary permits and licenses required for performance under this Agreement.

6. COMPENSATION. In consideration of Contractor’s faithful performance of the Contract Documents, PSTA agrees to pay Contractor pursuant to the rates and pricing set forth in Contractor’s Response or Contractor’s BAFO, if any. However, all payments to Contractor individually and in the aggregate shall not exceed the Contract Total. Payment shall be made in accordance with the RFP and the Florida Prompt Payment Act, section 218.70, *et seq.*, Florida Statutes.

- 6.01. *Invoices.* All invoices shall be submitted in accordance with the Florida Prompt Payment Act, section 218.72, *et seq.*, Florida Statutes, with all details prescribed by PSTA, and delivered to the following address:



Pinellas Suncoast Transit Authority
Attention: Finance Department/Accounts Payable
Purchase Order or Contract #: _____
3201 Scherer Drive
St. Petersburg, Florida 33716

or via electronic mail to:
AccountsPayable@psta.net

6.02. *Disputed Invoices.* In the event of a disputed invoice, only that portion so contested may be withheld from payment and the undisputed portion shall be due and payable on the terms set forth herein.

6.03. *Availability of Funds.* Contractor understands that the funds are not presently available under this Agreement beyond the current fiscal year. PSTA's obligation for performance under this Agreement beyond the current fiscal year is contingent upon the availability of funds from which payments can be made. PSTA is not legally liable for any payment that may arise under this Agreement beyond the current fiscal year, until the Contractor receives a written notice of availability of funds from the PSTA's Contracting Officer.

7. WARRANTIES AND COVENANTS.

7.01. *Patent, Trademark, Copyright, and Trade Secret.* Contractor warrants that the Services, and all goods and work associated therewith, do not infringe on any patent, trademark, copyright or trade secret of any third parties and agrees to defend, indemnify and hold PSTA, its officers, agents, employees, trustees and its successors and assigns, harmless 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 this Agreement. PSTA shall promptly notify Contractor of any such claim. PSTA makes no warranty that the production, sale or use of goods or services under this Agreement will not give rise to any such claim and PSTA shall not be liable to Contractor for any such claim brought against Contractor. If any invention, improvement, or discovery of the Contractor is conceived or first actually reduced to practice in the course of providing the Services under this Agreement, and that invention, improvement, or discovery is patentable under the laws of the United States of America or any foreign country, the Contractor agrees to notify the PSTA immediately and provide a detailed report. The rights and responsibilities of the Contractor and PSTA with respect to such invention, improvement, or discovery will be determined in accordance with applicable Federal laws, regulations, policies, and any waiver thereof.

7.02. *Covenants against Gratuities.* Contractor warrants that he or she 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 performance of this Agreement.

7.03. *E-Verify.* 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 Agreement; and (b) all persons, including subcontractors, retained or hired by Contractor, regardless of compensation, to perform work on the Services provided pursuant to the Contract Documents.

8. DELAY IN PERFORMANCE/FORCE MAJEURE.

8.01. *Time of the Essence.* The timely receipt of the Services and deliverables to PSTA is essential. If the Services and all deliverables under each Purchase Order are not received by PSTA within the date specified in each Purchase Order, PSTA may cancel the unfilled portion of the Purchase Order and this



Agreement for cause, purchase substitutes elsewhere, and recover from Contractor any increased costs and damages thereby incurred by PSTA.

8.02. Unavoidable Delay. If completion of the Services under any Purchase Order is unavoidably delayed, PSTA may, in its sole and absolute discretion, extend the time for completion for a determined number of days of excusable delay. A delay is unavoidable only if the delay was not reasonably expected to occur in connection with or during Contractor's performance; was not caused directly or substantially by negligent errors, omissions, or mistakes of Contractor, its subcontractors, or its suppliers or their agents; was substantial; and, in fact, caused Contractor to miss delivery dates and could not adequately have been guarded against by contractual or legal means.

8.03. No Damages for Delay. Contractor shall not be entitled to any claim for damages on account of hindrances or delays in the work from any cause whatsoever, including any delays or hindrances caused by PSTA. This paragraph shall include, but not be limited to, any actions which result in delays in scheduling, substantial changes in scope of the Services or deliverables or substantial increases in the costs of performing the work under the Contract Documents.

8.04. Notification. Contractor will notify PSTA as soon as Contractor has, or should have, knowledge that an event has occurred which will delay completion of the Services under a Purchase Order. Within five (5) working days, Contractor will confirm such notice in writing, furnishing as much detail as is available and including any request for extension of time. Contractor shall supply, as soon as such data is available, any reasonable proofs that are required by PSTA to make a decision on any request for extension. PSTA will examine the request and any documents supplied by Contractor and will determine if Contractor is entitled to an extension and the duration of such extension. PSTA will notify Contractor of its decision in writing. It is expressly understood and agreed that Contractor will not be entitled to any extension and the granting of such extension is in the sole discretion of PSTA. It is further expressly understood that Contractor shall not be entitled to any damages or compensation, and will not be reimbursed for any losses, on account of delays resulting from any cause.

9. DISPUTES, BREACHES, DEFAULTS, OR OTHER LITIGATION.

9.01. Rights and Remedies. The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by law. No action or failure to act by PSTA or Contractor shall constitute a waiver of any right or duty afforded any of them under this Agreement, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach thereunder, except as may be specifically agreed in writing.

9.02. Attorneys' Fees. In the event of legal action or other proceeding arising under this Agreement, PSTA shall be entitled to recover from Contractor all its reasonable attorneys' fees and cost incurred by PSTA in the prosecution or defense of such action, or in any post-judgment or collection proceedings and whether incurred before suit, at the trial level or at the appellate level. This shall include any bankruptcy proceedings filed by or against Contractor. PSTA also shall be entitled to recover any reasonable attorneys' fees and costs incurred in litigating the entitlement to attorneys' fees and costs, as well as in determining the amount of attorneys' fees and costs due to PSTA. The reasonable costs to which PSTA will be entitled include costs that are taxable under any applicable statute, rule, or guideline, as well as costs of investigation, copying costs, electronic discovery costs, mailing and delivery charges, costs of conducting legal research, consultant and expert witness fees, travel expenses, court reporter fees and mediator fees, regardless of whether such costs are taxable under any applicable statute, rule or guideline.

10. INDEMNIFICATION.

10.01 Indemnification. 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, or loss of use, arising out of the execution, performance, nonperformance, or enforcement of this Agreement, 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. 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. Contractor's liability hereunder shall include all attorneys' fees and costs incurred by PSTA in the enforcement of this indemnification provision. 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. The obligations contained in this provision shall survive termination of this Agreement, however terminated, and shall not be limited by the amount of any insurance required to be obtained or maintained under this Agreement.

10.02 Control of Defense. Subject to the limitations set forth in this provision, 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 Agreement 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 such records and information, and attend such conferences, discovery proceedings, hearings, trials, or appeals, as may be reasonably requested in connection therewith.

11. MISCELLANEOUS PROVISIONS.

11.01 Entire Agreement. The Contract Documents, including all exhibits, constitute the entire agreement between the parties with respect to the subject matter hereof and supersedes all previous written or oral negotiations, agreements, proposals and/or understandings. There are no representations or warranties unless set forth in the Contract Documents.

11.02 Notices. All notices required or made pursuant to this Agreement shall be made in writing and sent by certified U.S. mail, return receipt requested, addressed to the following:

To PSTA:

Pinellas Suncoast Transit Authority
Attn: Brad Miller, CEO
3201 Scherer Drive
St. Petersburg, FL 33716

To Contractor:



With required copy to:

Alan S. Zimmet, B.C.S.
Bryant Miller Olive
One Tampa City Center
Suite 2700
Tampa, FL. 33602

Either party may change its above noted address by giving written notice to the other party in accordance with the requirements of this section.

- 11.03 Waiver of Remedies for any Breach.** In the event that PSTA elects to waive its remedies for any breach by Contractor of any covenant, term or condition of this Agreement, such waiver by PSTA shall only be valid if set forth in writing and shall not limit PSTA's remedies for any succeeding breach of that or of any other term, covenant, or condition of this Agreement.
- 11.04 Modification.** The Contract Documents, including the scope, specification, and details of the Services may only be modified by written agreement of the Parties. No modification shall serve to increase the Contract Total unless such change has been approved by PSTA's Board of Directors prior to any work being performed that would serve to increase the Contract Total.
- 11.05 Headings and Section References.** The headings and section references in this Agreement are inserted only for the purpose of convenience and shall not be construed to expand or limit the provisions contained in such sections.
- 11.06 Authorization.** Both parties to this Agreement represent and warrant that they are authorized to enter into this Agreement without the consent and joinder of any other party and that the parties executing this Agreement have full power and authority to bind their respective parties to the terms hereof.
- 11.07 Assignment.** The terms and provisions of this Agreement shall be binding upon the Parties and their respective partners, successors, heirs, executors, administrators, assigns and legal representatives. Notwithstanding the foregoing, a party's rights and obligations under this Agreement may only be transferred, assigned, sublet, mortgaged, pledged or otherwise disposed of or encumbered in any way with the other party's prior written consent.
- 11.08 Severability.** If any one or more provisions of this Agreement shall be held to be invalid, illegal, or unenforceable in any respect by a court of competent jurisdiction, the validity, legality, and enforceability of the remaining provisions hereof shall not in any way be affected or impaired thereby and this Agreement shall be treated as though the invalidated portion(s) had never been a part hereof.
- 11.09 Electronic Signatures.** This Agreement may be executed by electronic signature technology and such electronic signature shall act as the Parties' legal signatures on this Agreement and shall be treated in all respects as an original handwritten signature.
- 11.10 Counterparts.** This Agreement may be executed in one or more counterparts, any one of which need not contain the signatures of more than one party, but all such counterparts taken together will constitute one and the same instrument.

(SIGNATURES ON FOLLOWING PAGE)



IN WITNESS WHEREOF the Parties hereto have caused this Agreement to be duly executed on the date first above written.

CONTRACTOR:

PSTA:

By: _____

By: _____

Print Name: _____

Brad Miller, CEO

Title:

Attest:

Rachael Cappolla, Executive Assistant

WITNESS/ATTEST:

Approved as to form:

By: _____

By: _____

Print Name: _____

Alan S. Zimmet, General Counsel

ADDENDUM OF SOLICITATION

1. SOLICITATION NO.:	2. ADDENDUM NO.:	3. EFFECTIVE DATE:	4. BRIEF SOLICITATION DESCRIPTION:
RFP 21-980369	8	September 20, 2021	FLORIDA ELECTRIC TRANSIT BUSES

5. REVISED OFFER SUBMISSION DUE DATE AND TIME:

(*Note: Unless identified below, this solicitation Addendum does not change the Offer Submission Date and Time.*)

The date and/or time specified for receipt of offers is changed as follows:

DATE: SEPTEMBER 23, 2021

TIME: 10:00AM EST

6. REVISED PRE-BID/PROPOSAL CONFERENCE:

(*Note: Unless identified below, this solicitation Addendum does not change the Pre-Bid/Proposal Conference, if a conference is scheduled.*)

The scheduled pre-bid/proposal conference is changed as follows:

DATE:

TIME: AM/PM Local

LOCATION:

7. ADDENDUM OF SOLICITATION:

The Solicitation identified in Block 1, above, is hereby amended as described in Block 11, below. Except as provided herein, all other provisions of the solicitation, or as heretofore amended, remain unchanged and in full force and effect.

8. REQUIREMENT TO ACKNOWLEDGE ADDENDUM:

Offerors must acknowledge receipt of this Addendum prior to the deadline specified in the solicitation for receipt of offers by one of the following methods:

- a. Shall acknowledge the receipt of each individual addendum in their Proposals on the form Acknowledgement of Addenda.

WARNING: Failure of an Offeror to acknowledge receipt of this Addendum, as described herein, may result in REJECTION OF THE OFFER.

NOTE: For Invitations for Bids the terms "Offer" and Offeror" shall mean "Bid" and "Bidder", respectively; and for Requests for Proposals or Quotation the terms "Bid" and "Bidder" shall mean "Offer" and "Offeror", respectively, in this solicitation and any associated exhibits.

9. FOR FURTHER INFORMATION CALL CONTRACTS SPECIALIST:

Name: Alvin Burns

Email: aburns@psta.net (cc: erandle@psta.net)

10. DESCRIPTION OF ADDENDUM:

Please reference Box #5 for Revised Offer Submission Due Date
PROPOSAL DUE DATE HAS CHANGED FROM SEPTEMBER 21, 2021, TO SEPTMEBER 23, 2021

Exhibit 2

Pinellas Suncoast Transit Authority



Florida Electric Transit Buses with Charging and
Associated Equipment

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Exhibit 3

Pinellas Suncoast Transit Authority



Florida Electric Transit Buses with Charging and
Associated Equipment

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Exhibit 4

Pinellas Suncoast Transit Authority



Florida Electric Transit Buses with Charging and
Associated Equipment



Pinellas Suncoast
Transit Authority



Technical Proposal

RFP 21-980369

September 21, 2021

2021



PROTERRA

Pinellas Suncoast Transit Authority

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8. Engineering Organization Chart, Engineering Change Control Procedure, and Field Modification Process
9. Manufacturing Facilities plant layout, Other Contracts, and Staffing
10. Production and Delivery Schedule and Other Contract Commitments
11. Management Plan
12. Quality Assurance Plan



PROTERRA

Pinellas Suncoast Transit Authority

1. Letter of Transmittal



September 20, 2021

Alvin R. Burns Jr.
Director of Procurement
Pinellas Suncoast Transit Authority (PSTA)
3201 Scherer Drive
St. Petersburg, FL 33716

Subject: Letter of Transmittal, RFP 21-980369 Florida Electric Transit Buses with Charging and Associated Equipment

Dear Mr. Burns:

Proterra Operating Company, Inc. (Proterra) is pleased to submit this proposal to Pinellas Suncoast Transit Authority (PSTA) and excited about the opportunity to establish Proterra Battery Electric Buses (BEBs) and charging equipment on the Florida contract for Electric Transit Buses with Charging and Associated Equipment. We're excited to continue to work with transit agencies across Florida as they deploy BEBs in their fleets.

As North America's leading manufacturer of BEBs, Proterra is the only Heavy-Duty Bus Manufacturer who focuses solely on the design and manufacturing of BEB technology. Because we aren't tied to legacy heavy-duty bus platforms, we started with a clean sheet to design the world's best performing and safest purpose-built BEBs rather than re-purposing a conventional diesel, CNG or hybrid platform.

The 35' and 40' ZX5 BEBs proposed herein are Proterra's fifth generation BEBs and feature a more streamlined body design and a lower vehicle height that enables greater route access, as well as new shocks and enhanced ergonomics to provide riders and drivers with a smoother riding experience. The ZX5 is also optimized to allow optional overhead pantograph charging, offering greater flexibility and optionality for our transit customers. Additionally, the Proterra ZX5 features Proterra's advanced high-voltage battery systems, which have been proven on the road through more than 22 million miles in service for mass transit. Our battery systems are unrivaled in the North American transit industry and are further detailed in Tab 2 of the Technical Proposal.

Key Points of the Proposal

Since delivering our first BEB to Foothill Transit more than 10 years ago, Proterra has a demonstrable and proven track record in manufacturing BEBs for transit agencies across the United States. We are supporting deployments with major US transit agencies like New York City Transit and Chicago Transit Authority as well as deployments with much smaller agencies like Port Arthur Transit in Texas or Greater Portland Metro in Maine. We've also delivered BEBs to StarMetro in Tallahassee, LYNX in Orlando, Miami-Dade County, and Broward County.



For this proposal, Proterra is offering our 35' and 40' Proterra ZX5+ with 450kWh along with optional pricing for our ZX5 Max for the 40' buses (not available on the 35' buses); which has an industry leading range due to the size of the Energy Storage System (ESS) with 675 kWh of on-board energy storage.

For delivery, we are proposing delivery within twelve (12) months from the issuance of executed contract documents (NTP) with subsequent buses to follow based on the guidance contained in the RFP document.

The proposal pricing is valid for one hundred and eighty (180) days from the date of submittal.

Point of Contact for this Proposal

If you have any questions or concerns regarding this proposal, please feel free to contact individual below who is responsible for managing proposal related activities for Proterra's PSTA proposal:

Devin Ikenberry
Sr. Business Engagement Manager
Proterra Inc
1815 Rollins Rd
Burlingame, CA 94010
Phone: 256.499.5696
Email: dikenberry@proterra.com

Summary

Our goal at Proterra is to design, build, and deliver the world's best performing heavy-duty transit vehicles (that also happen to be zero-emission BEBs). We welcome the opportunity to provide detailed technical information about those vehicles to PSTA in this proposal.

Sincerely,

Ethan Carbaugh
Director of Business Engagement
Proterra Inc
1 Whitlee Ct
Greenville, SC 29607



PROTERRA

Pinellas Suncoast Transit Authority

2. Technical Proposal





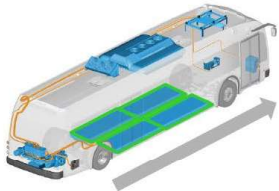
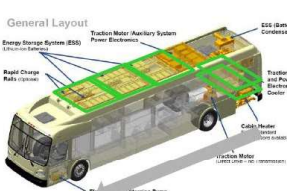
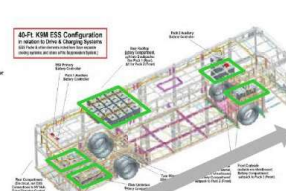
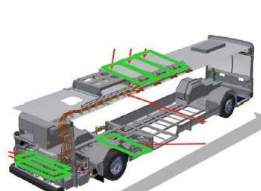
PROTERRA **Vehicle Technical Proposal**

Proterra is offering our fifth generation 35' and 40' ZX5+ Battery-Electric Powered Transit Buses (BEBs) with 450kWh of onboard energy storage as our base proposal; and we are also providing optional pricing for the industry's longest-range 40' BEB, the Proterra ZX5 Max with 675 kWh of on-board energy.

Proterra's electric buses are designed with industry standard SAE J1772 CCS charge ports; our proposal for PSTA includes one port at curb-side rear; and J3105 compliant overhead charge rails.

Purpose-Built EV Transit Vehicles Charging

Proterra's electric buses are unique when compared to other zero-emission battery-electric transit vehicles on the market as our buses have been designed from the ground up specifically to be the safest, most energy efficient, and best performing EV transit vehicle on the market. Other EV transit vehicle OEMs are forced work within the existing constraints of the originally purposed vehicle; often sacrificing safety by placing high-voltage batteries at multiple locations all over the vehicle both inside and outside of the passenger cabin (see below).

	 PROTERRA	 NEW FLYER	 BYD	 GILLIG
				
Battery locations	Under floor, roof (E2 max)	Roof, rear	Roof, rear, interior	Roof, rear, under floor
Max Energy	440 kWh (E2) 660 kWh (E2 Max)	466 kWh	324 kWh	444 kWh
Curb weight	30,050 lbs (E2)	33,842 lbs	31,890 lbs	33,970 lbs
Battery supplier	Proterra	XALT	BYD	Cummins
Proterra's bus body was designed from the ground up to be optimized for electric battery packaging				

In addition to reducing passenger room on board the vehicle, that approach also increases vehicle weight, and therefore often negatively impacts efficiency and operating range. Alternatively, Proterra buses are designed with a lightweight, carbon fiber-reinforced composite body that optimizes battery placement outside of the passenger compartment; allowing Proterra to build the world's best-performing battery-electric buses.



PROTERRA

Contents of this Technical Proposal

- Purpose-Built EV Transit Vehicle
- The Proterra Composite Body and Corrosion
- Energy Storage System
- Propulsion System / Drivetrain / Regenerative Braking
- Axles / Suspension
- Cooling System
- HVAC / Defroster
- Multiplex System
- Description of Base Fire Suppression System (FSS) and Equipment
- Base Door Systems
- Air Brakes & Air System
- Driver's Area Layout
- Driver's Window
- ITS Box
- Curb-Side Wheel Well Storage Box
- Seating Layouts
- Towing Procedures
- Route Simulation and Operating Range Data
- Warranty Documentation
- Altoona Testing
- Depot Charging Equipment
- On Route Charging Equipment
- Performance Reporting (TS 89.3)
- Exportable Power Supply (TS 90)

Introducing the Proterra ZX5

The Proterra 40' ZX5, Proterra's fifth generation BEB, features a more streamlined body design and a lower vehicle height that enables greater route access, as well as new shocks and enhanced ergonomics to provide riders and drivers with a smoother riding experience.

The ZX5 also offers faster acceleration and greater horsepower than earlier Proterra electric vehicle models and can be configured with Proterra's standard drivetrain or our industry-leading DuoPower drivetrain. For this proposal, we are offering pricing and technical information on our base offering (ProDrive).

Additionally, the Proterra ZX5 features Proterra's advanced high-voltage battery systems, which have been proven on the road through more than 21 million miles in service for mass transit. Our battery systems are unrivaled in the North American transit industry and are further detailed later in this Technical Proposal.

The presentation beginning on the following page includes additional details concerning the new ZX5 BEBs.

THE PROTERRA ZX5 ELECTRIC TRANSIT BUS



PROTERRA

WHAT SETS PROTERRA ELECTRIC BUSES APART



• UNMATCHED PERFORMANCE

- Best efficiency combined with the most energy storage for the **longest range**
- **Accelerates 1.5 times faster** than a standard diesel bus, with nearly twice the horsepower
- **Industry-leading hill climb** abilities, able to tackle steep hills with grades up to 27%

• PROVEN TECHNOLOGY PLATFORM

- Refined based on 10+ years of experience, **most delivered** in North America, >13 million miles driven
- **PURPOSE-BUILT**
 - Advanced composite body, **best design for battery safety & capacity**, lower center of gravity for stability, non-conductive



WHAT'S NEW WITH THE PROTERRA ZX5 ELECTRIC BUS



REFINED BODY

- Streamlined roof to accommodate additional battery packs
- Reduced height to cover even more routes
- Flexible charging with additional front port

BUILT FOR SCALE

- Enhanced manufacturability for scaled production
- More commonality across platforms
- More advanced automotive approach

SMOOTHER RIDE

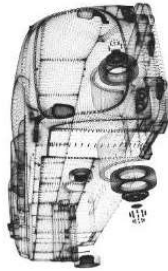
- New shocks and ride height system
- Improved maneuverability, faster kneeling
- Enhanced comfort and ergonomics of driver area

PROTERRA ZX5 —DIFFERENT BY DESIGN PURPOSE-BUILT, COMPREHENSIVE PLATFORM



Built from the ground-up as a battery-electric bus, the **Proterra ZX5** vehicle platform is designed to meet the needs of the most demanding transit routes.

Proterra ZX5



Highest Performance

Energy Systems



Ultimate Flexibility

Drivetrains



Best horsepower, acceleration and efficiency

Standardized Charging



Meet Every Route Need

THE PROTERRA ZX5 PLATFORM ADVANCED COMPOSITE BUS BODY



	COMPOSITE	ALUMINUM	STEEL
LIGHTWEIGHT	●	●	●
IMPACT-RESISTANT	●	●	●
CORROSION-FREE	●	●	●

Proterra's use of advanced composite materials makes the Proterra ZX5 not only the most **efficient** vehicle in its class, but extremely **durable and safe** as well.

- Advanced carbon-fiber-reinforced composite material
- Super strong, lightweight and impact-resistant
- Non-conductive and rust-resistant

SMARTER CHARGING

COMPATIBLE WITH INDUSTRY-STANDARD CHARGING SYSTEMS



OVERHEAD CHARGING

Keep your Proterra buses rolling with easy depot or on-the-road charging, made simple by industry-standard SAE J3105 overhead systems.

- Charge on the road for longer routes or enable 24/7 circulator operations
- Low maintenance costs and high availability
- Compatible with inverted pantograph systems, offered by Schunk and other suppliers



PLUG IN CHARGING

Regardless of your fleet size, powering up your Proterra buses at the depot is as easy as plugging in a standard J1772-CCS Type 1 charger.

- Universal chargers are offered by Proterra and other suppliers
- ZX5 vehicles can be configured with two charge ports for flexibility at the depot
- Electric buses, utility vehicles and cars can share the same standardized chargers



ADOPTED BY MAJOR OEMS



ADOPTED BY MAJOR OEMS

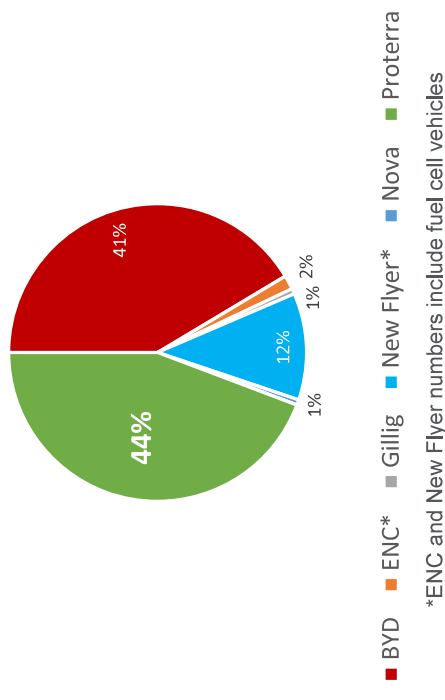


NORTH AMERICAN ELECTRIC BUS DELIVERIES MARKET SHARE BY MANUFACTURER



- Proterra has delivered more battery-electric transit buses in North America than any other manufacturer to date
- **Proterra has delivered almost half of all** the battery-electric buses on the roads in North America

North American Electric Bus Deliveries
2017, 2018, & 2019



UNDERSTANDING RANGE

- With vehicles carrying up to **675 kWh** of battery capacity, the Proterra ZX5 has the flexibility to serve everything from local circulator routes to higher mileage routes.
- Proterra conducts a sophisticated **route analysis** before matching the on-board energy storage to your route requirements, total daily mileage and layover options.

- Operating range =

$$\frac{\text{Usable energy in battery pack (kWh)}}{\text{Operating efficiency (kWh/mile)}}$$

FACTORS THAT IMPACT RANGE

MAX RANGE

OPTIMAL CONDITIONS

Temperate weather conditions, less stops, optimal driver behavior, minimal HVAC usage, express routes, flatter terrain

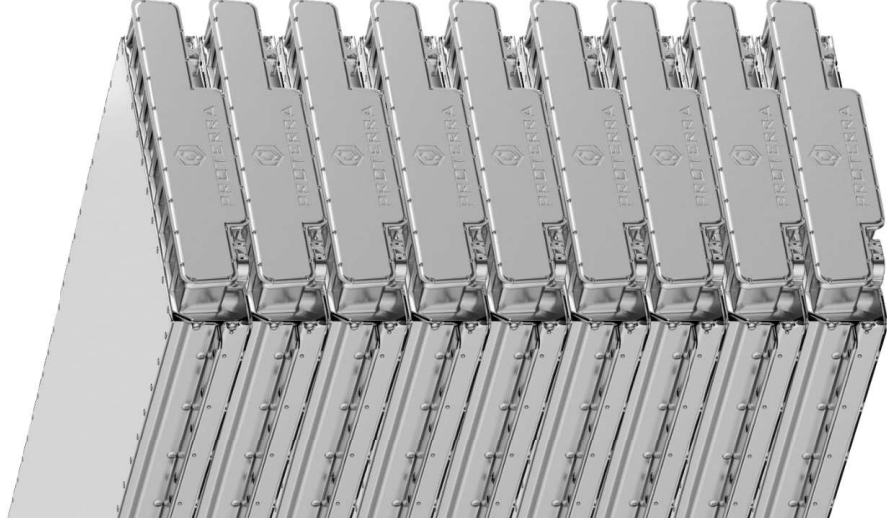
AVERAGE CONDITIONS

Average frequency of stops, terrain, driver behavior, some use of HVAC, variable weather conditions

DEMANDING CONDITIONS

Harsh weather conditions such as extreme temperatures, high HVAC usage, high frequency of stops, inefficient driving

PROTERRA BATTERIES DESIGNED FOR REUSE AND RECYCLING



- Batteries will retain significant energy storage capability long after their first life in a transit bus
- Stackable design, retaining interface and safety features
- Hardware designed to exist >12 years in outdoor environmental conditions
- Capable of serving multiple storage requirements for renewable energy, grid services, demand management and emergency backup

~1 MWh shown

PROTERRA BATTERIES DESIGNED FOR REUSE AND RECYCLING



- **Proterra battery packs are designed with recycling in mind**

- Battery pack and module architecture allows for easy separation of components
- Aluminum used in pack is 100% recyclable

- **Practicing responsible disposal and recycling**

- Instead of sending batteries to a hazardous waste incinerator, Proterra works with top-tier recycling companies that specialize in extracting and repurposing materials inside lithium-ion automotive batteries
- Proterra's recycling partners can recover 99% of precious metals used in Proterra batteries



PROTERRA BATTERY SAFETY & QUALITY ADVANTAGES OF CYLINDRICAL CELLS



• Quality

- Manufactured by Tier 1 cell supplier, LG Chem, the top lithium-ion battery producer by capacity
- Tier 1 cell suppliers have higher quality requirements, more stringent spec tolerances, larger qualification sample requirements, higher bar for sub-supplier audits, more team members involved, greater documentation needs
- Manufacturing in a cylindrical form factor has been optimized and mastered over more than a century.

• Safety

- With thousands of cylindrical cells in each battery pack, if a single cell stops working it can have a minor impact on the whole pack and does not necessarily mean that pack replacement is required. A single cell failure does not have a significant impact on energy capacity or range
- If a single cell has a thermal event, it's easier to contain with a small cell than with larger pouch cells.
- Cylindrical cells are used widely in consumer goods and many applications; they are well standardized and produced by every Tier 1 battery manufacturer in the world



Cylindrical cell

• Energy Density

- Proterra has the most energy dense cells out of battery-electric bus manufacturers in North America



Purpose-Built EV Transit Vehicle

With a clean-sheet design, Proterra developed a light weight, safe, and durable bus body structure to achieve industry leading electric vehicle performance. This structure has contributed to Proterra's achievement of best in class efficiency, gradeability performance, weight, and acceleration. Additionally, the body passed an accelerated year life equivalent structural durability test at a third-party four-post test facility. This test simulated 750,000 miles of heavy service (equivalent to six consecutive Altoona tests at all three load configurations – CW, SLW, GVW) in less than a year, highlighting the exceptional robust and durable design of the composite body.

The Proterra Composite Body

Proterra worked with our suppliers to develop an all-composite, monocoque body design manufactured from a fiberglass laminate. Balsa is used as a core material to minimize weight while enhancing cross-sectional thickness and compressibility properties. Carbon fiber is also selectively applied in areas where high strength- to-weight and stiffness is required.

We selected fiberglass materials due to their favorable mechanical properties and wide range of availability and application in the wind, transportation and automotive industries. Utilizing commonly available materials supports serviceability, minimizes the body and repair costs, and standardizes repair work to across parallel industries. Finally, we selected the resin system for its mechanical properties and shrink rates that support the body's dimensional strategy.

The manufacturing process uses an open mold vacuum resin infusion. This process has a proven record of reliability and cost effectiveness over decades of use in various industries, including wind turbine blades, aerospace and marine. Machined male plugs are used to manufacture female molds from which the body components are produced using the open mold lay-up and resin infusion process.

Proterra's design philosophy results in a composite body vehicle with repeatable features and tolerances that allow for consistent installation of suspension, sub-assemblies and components. This disciplined and robust approach ensures that components and systems will consistently and correctly fit to the body.

Proterra incorporates the iterative series of Finite Element Analysis (FEA) studies and empirical testing to validate the body inputs and simulation assumptions. Physical test results supersede and supplement analyses and demonstrate the true physical performance of the design. Proterra tests on three levels -- component, sub-system, and vehicle -- to validate simulation results, and subjects the components and bodies to a regimen of static, quasi-static, dynamic and fatigue load conditions. The FEA analyses incorporate different load cases derived from various sources (e.g., the APTA white book). Notably, we use an explicit load case for side impact and crash based on a 4,000 lbs. vehicle crashing into the side of a Proterra vehicle at a speed of 25 mph. In this



example, the Proterra body showed less than 2 inches of elastic deformation which significantly exceeds the specification requirements. Such results, in addition to our sixteen years of real-world crash incident data, demonstrates that this architecture is among the safest in the industry.

In addition to Proterra's experience with using an advanced composite bus body, the Los Angeles County Metropolitan Transportation Authority (LA Metro) has been operating hundreds of composite body buses for over 12 years. Below is an excerpt from LA Metro's statement regarding their experience with composite buses; as noted on their Advanced Transit Vehicle Consortium (ATVC) website <https://www.metro.net/projects/atvc/>

Following ATVC recommendations, in 2002 LA Metro took steps to develop a bus fleet that used advanced, lightweight, all-composite vehicle structures. Since that time, LA Metro has become the world's leading operator of advanced all-composite transit buses, and over 300 composite transit buses are currently in operation at LA Metro.

*Metro has plans to procure several hundred more composite buses in the coming year. **These composite buses have already proven to be highly durable and more cost effective than conventional transit buses.***

In addition to the reference on their website, the ATVC also published a report on their experience with composite bodies that highlights the data in greater detail to support their claim. LA Metro's report is available at the following link (starting on page 9): http://media.metro.net/board/items/2015/07_july/20150715atvcitem5.pdf

In addition to safety, the composite bus body has numerous advantages over traditional metallic bodies. For example, the composite body functions in the most corrosive environments without issue, or the requirement of special coatings or post processes. There is also a safety benefit in the electric vehicle application based on the non-conductive materials that isolate and separate the batteries from the passengers and impact zones.

The body also has effective inherent thermal properties due to the superior u-factors of the composite construction compared to metallic body structures. This property enables the vehicle HVAC and thermal management systems to maintain heating capacity and temperatures in the winter, and cooling capacity in the summer.

The body performs favorably with Noise Vibration and Harshness (NVH) because the structure is monocoque and, therefore, there is no relative movement between structural and decorative body panels as a one-piece design. This approach minimizes body squeaks and rattles and eliminates the potential for frame and structural mount/weld issues. The body structure is also very thick in most areas (>1") which



provides good thermal and sound insulative properties as evidenced by external noise tests.

Finally, our clean sheet design builds around the batteries and vehicle systems to achieve a simple, efficient and manufacturable design. The batteries can be packaged neatly between the wheelbase, underneath the structural floor away from the passengers. This contributes to a low center of gravity that improves ride stability and handling, as well as minimizing body roll. The weight distribution also protects city roads and infrastructure by more evenly distributing the weight between front and rear axle and minimizing global weight on the road.

In sum, Proterra's holistically integrated composite bus body design integrates efficiency and performance for our battery electric vehicles. It is a marriage of innovative design with proven materials and processes, resulting in an industry leading fully electric vehicle.

Corrosion Resistant Body

Proterra's all-composite, corrosion- proof monocoque body is manufactured from high strength materials such as carbon fiber and molded fiberglass with a balsa wood core. The composite body design has numerous advantages over traditional metallic body structures in addition to safety.

Corrosion is a challenge to the transit and automotive industries and the composite body can function in the most corrosive environments without issue, or the requirement of special coatings or post processes. Thus, the preventative maintenance typically needed for a steel frame is not necessary for the Proterra composite body.

Steel components are uniquely integrated with the structural body to serve as mounting provisions for the bus suspension systems and drivetrain. A steel frame serves as a mounting support for the drivetrain components and some of the electronic components including DC-DC converters, VFD's, the motor controller and cooling pumps. In addition, steel torque plates are bonded to the interior of the structural body and incorporate threaded bosses to which exterior suspension bracketry mounts.

The Proterra design utilizes high-strength, low-alloy (HSLA) steels for all of the drivetrain, torque plate, and suspension mounting brackets throughout the vehicle. HSLA is utilized for its superior mechanical properties over regular alloy steels and stainless steels. Proterra utilizes HSLA's with a minimum yield strength of 50,000 psi ranging up to 80,000 psi depending on component application. Some advantages of HSLA include high strength to weight ratio, which allows for smaller cross-sections than conventional steels, and also increased toughness and higher resistance to corrosion compared un-treated to other plain carbon steels. These properties of HSLA also result in better performance than stainless steels in structural applications. Specifically, HSLA has better low and high cycle fatigue properties than stainless steel due to its tensile



strength properties and resulting endurance limits. Fatigue cracking and failure that is more common in stainless steel structural components will not occur in properly designed HSLA structures. Finally, HSLA also offers better performance than stainless steels with respect to thermal fatigue. Austenitic stainless steels (300 series) are sensitive to thermal fatigue due to their high thermal expansion rate and low thermal conductivity.

Coatings: Stainless Steels are primarily chosen in applications for their resistance to corrosion, however, modern coatings and surface treatments can be utilized today to effectively achieve equivalent or better corrosion performance with the HSLA steels. Proterra utilizes both e-coating and powder coating to achieve corrosion resistance with HSLA steels. Depending on the component application, one of these processes can be chosen, or they can be used collectively. E-coating is an electrophoretic process in which colloidal particles suspended in a medium are deposited onto the electrically conductive substrate or component via an anodic or cathodic process. The e-coating process results in a consistent coating with a minimum thickness of 12.5 microns, that can adhere to non-line of site areas, crevices and welds. This coating provides corrosion protection which can exceed 1,000 hours of ASTM B-117 salt spray testing and chip and scratch protection. E-coating is also impervious to fluids including oil, hydraulic, acids, alkali's, and ethylene glycols.

To add even more protection on exposed structural and under-body HSLA components, Proterra utilizes powder-coating on top of the e-coat layer.

Powder coating adds up to an additional 152 microns in coating thickness via a dry powder that is applied electrostatically to the part and is then cured in heated ovens to allow it to flow and form a protective layer over the part. Powder coating can also be used as a stand-alone corrosion resistant and protective coating, and in this case is an additive layer and additional layer of protection for the HSLA parts. The powder coat can also provide UV protection for parts exposed in these applications.

This dual coating methodology of HSLA components results in a very desirable combination of properties which will allow for better performance than stainless and regular alloy steels. Used in conjunction with the composite body design philosophy, these components contribute to a stronger, lighter vehicle and structure that will maintain their performance throughout the demanding life cycle of the transit vehicle.

Energy Storage System

The Energy Storage System (ESS) is an integrated system that was designed with safety as top priority. The ESS will be described by the four main sections to this system: 1) the battery chemistry, 2) the mechanical design, 3) the electrical design, and 4) the control system interacting with the battery system.



Battery Chemistry

The ZX5 vehicles utilize a proprietary high energy density battery chemistry that falls into the broader category of lithium-ion batteries. Proterra and LG Chem, a global leader in lithium-ion batteries for automotive, stationery and consumer applications, co-developed a battery cell that has been optimized to meet the unique performance and safety demands of the heavy-duty vehicle market. The cell chemistry has been optimized for exceptional energy throughput capability, high charge rate acceptance, and industry leading energy density.

The use of these cells and purpose-built vehicle design allow for the ZX5 vehicles to carry more on-board energy storage without impacting the passenger cabin.

Mechanical Design

The mechanical design starts with the battery packs themselves and the carbon-fiber reinforced body structure, then continues through to the structure encasing the battery modules and the actual module designs. The bus body incorporates four primary composite stringers that run the length of the body, surrounding the underbody-mounted battery packs between the front and rear axles. Each of these four stringers incorporates full-length, pultruded carbon fiber stringers that maximize strength to weight ratio and add stiffness and rigidity to the battery box surround. It should also be noted that the body serves as a natural electric insulator due to its composite construction vs. a metal chassis normally associated with a transit bus. The vertical location of the battery boxes behind these beams is also located below bumper height of most vehicles which provides additional protection from a direct side impact. This location also provides for an extremely low center of gravity as well as an ideal weight distribution.

Each pack is contained in an aluminum enclosure that is reinforced with 3mm of a heavy-duty polyurethane spray-on covering that lends individual protection to its sub-components. The pack is designed to be sealed to IP66/7 and ANSI/ISE 60529-2004 standards. The pack also fully contains any electrolyte should a cell leak (pursuant to SAE J1766) and meets the 1,000 hours salt spray per ASTM B 117 testing. The packs are designed to handle 5g half-sine peak shock accelerations. The modules within the battery packs are actively cooled to keep the batteries in the ideal temperature range to maximize battery life and comply with the requirements from the battery cell manufacturer. The battery cooling system includes a chiller integrated with the HVAC system that runs if the ambient environment is too warm for the module manufacturer's desired system set points. The battery management system monitors cell voltage, temperature and current to ensure safe performance. Should the cooling system fail, the controls monitor and limit operation as a function of temperature, so that the vehicle will function and de-rate performance safely while indicating a fault to the operator. In this way, a cooling system failure will not result in a hard or immediate stop in operation.

Electrical Design

The wiring from each pack is insulated and shielded to industry standards and passes into the center cavity formed between the stringers under the vehicle, referred to as "Broadway". Broadway provides a protected route the length of the bus back to the high voltage junction box in the rear compartment of the vehicle. This is where the individual batteries are bussed together to provide for one high voltage electrical system. The high voltage interlock circuit and control wires for the battery system run along this route with the high voltage cables for maximum safety.



Each battery pack is internally fused and contains a set of contactors. The contactors are located near the pack outputs. Each pack also contains an individual pack controller which serves as a central hub to gather and report information specific to that pack. Each battery module has a monitoring board that measures voltage of each cell and performs cell balancing. This information is communicated to the pack controller via serial communication.

Control System

The battery control system is a hierarchical control with the energy storage module (ESM) acting as the interface and lead controller to the rest of the battery system. This module communicates on the main vehicle CAN bus to interface with the cooling, powertrain, charge and other systems. This module can also communicate on the separate battery CAN bus with all of the individual packs. The main controller exchanges information about battery input and output capability as well as cooling needs and diagnostic information.

The pack controllers control the contactors internal to the pack. They also gather the current information as well as pack voltage, cell voltage, and temperature information. Pertinent data is provided back to the master controller which uses this information to compute system limits, determine overall health status, and apply system-wide boundaries on use. The system uses algorithms and feedback to know the position of all contactors. The temperature measurements in the pack are redundant. There are also additional sensors that perform miscellaneous items like moisture detection in each pack. The battery system algorithms coordinate all activities related to the safety and performance of the system.

The battery control system provides system discharge limits to ensure that the lowest cell never goes below its minimum and that the highest cell never goes above its maximum allowable state. The system is also designed to monitor current imbalances between the packs, temperatures throughout all of the packs, moisture, and isolation detection. Should loss of communication occur with a pack or module; the system will gracefully handle this with independent fault actions.

Additional Battery Pack Information

More information about the Proterra battery packs is included on the subsequent pages, including a 3rd party confirmation of the battery pack design and safety considerations, our extensive battery testing, and examples of the validation testing we perform on our battery packs.



E X T E R N A L M E M O R A N D U M

TO: Brian Pevear
FROM: Exponent, Inc.
DATE: February 5, 2018
PROJECT: 1702336.000
SUBJECT: Review Summary of Proterra High Voltage Battery (part number 022300)

Exponent was retained to perform a review of the high voltage battery pack (internally referenced as the “Colibri” battery) being developed by Proterra for use in electric buses. As part of the review, Exponent met with design/manufacturing/test engineers at Proterra, reviewed detailed design documentation and test data, inspected physical samples of the high voltage battery packs, inspected the battery production facility and was also given access to Proterra’s test labs where some of the battery abuse testing was performed. Exponent held numerous meetings with Proterra engineers during the course of the review that lasted several months. The goal of Exponent’s review was to:

- Review the configuration and safety requirements for the battery pack.
- Review the battery pack design and understand the response of the battery to electrical, mechanical and environmental abuse conditions.
- Review the detailed requirements and electrical design documents for the electrical/electronic protection circuits incorporated in the battery pack (the battery management system) to identify potential fault conditions that could lead to a battery failure.
- Review the design failure modes and effects analysis (DFMEA) performed by Proterra for the battery pack to determine what corrective actions/controls/validation tests were performed for identified failure modes.
- Review the construction of the battery pack to evaluate the overall battery assembly.
- Review the testing performed by Proterra on the battery pack.

Exponent was provided the following documents for review:

- UN Transportation Test report (UN DOT 38.3) for the Li-ion cells used in the battery pack.
- Battery Management System (BMS) requirements and safety manual.
- Battery mechanical, thermal, environmental, electrical and SAE J2929 test reports.
- Battery contactor test reports.
- Passive propagation resistance test report.

- Modal analysis for the battery pack (The battery pack contains fifteen battery modules. A number of the validation tests were performed by Proterra on batteries with five battery modules. The modal analysis was performed to justify testing batteries with five modules).
- DFMEA for the battery pack.
- Automotive Safety Integrity Level (ASIL) derivation worksheet for the battery pack.
- BMS test plan, validation matrix and test reports.
- BMS electromagnetic compatibility (EMC) test report.
- Electrical design documents (schematics, bill of materials and printed circuit board layout files) for the BMS.

The following high-level observations were made by Exponent during the review:

- Proterra has performed tests to characterize the mechanical durability, thermal durability, thermal endurance and environmental durability of the batteries. The abuse conditions simulated by Proterra during some of these tests are above and beyond the abuse conditions specified in test standards such as the FreedomCAR Electrical Energy Storage System Abuse Test Manual for Electric and Hybrid Electric Vehicles and SAE J2464 (Electric Vehicle Battery Abuse Testing). None of these tests resulted in battery thermal runaway.¹
- Exponent's review of the DFMEA created by Proterra did not identify any gaps in the identification of failure modes. In addition, Exponent has reviewed the results of testing performed by Proterra on identified failure conditions with relatively higher risk priority numbers (RPNs). The failure conditions with relatively high RPNs were tested. None of the tests resulted in thermal runaway. The testing and analysis performed by Proterra indicates that failure modes with relatively higher RPNs are unlikely to lead to a thermal runaway of the battery.
- The BMS was reviewed. Exponent's review of the ASIL derivation worksheet indicated that all failure modes identified during the DFMEA were addressed in the ASIL derivation process.
- Exponent's visual inspection of a battery pack (focused on cell/module and bus bar layout in the battery) did not identify any construction related issues that increase the probability of a battery failure in the field.

Exponent's review of the design documentation and overall construction of the battery pack did not identify a fault condition that would result in a battery thermal runaway event.

Limitations

Exponent's observations are based on the design documents and test reports provided to Exponent by Proterra. Exponent did not perform a tear down of battery modules or any testing on the battery pack, its module or its cells. In addition, the scope of Exponent's work did not include an evaluation of the manufacturing/assembly process for the battery pack. The observations and comments formulated during this review are based on information available at

¹ Except where thermal runaway was purposely induced by test engineers as a means to assess enclosure integrity.

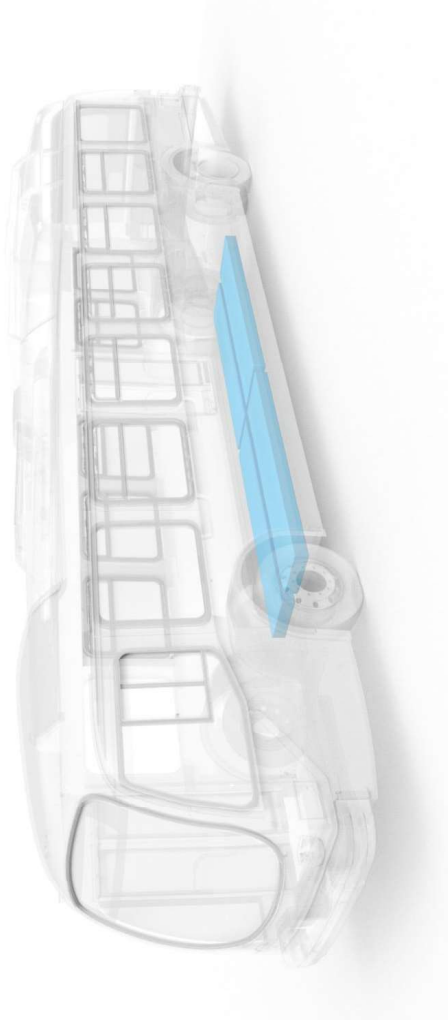
THE PROTERRA ZX5 BATTERY SAFETY



PROTERRA

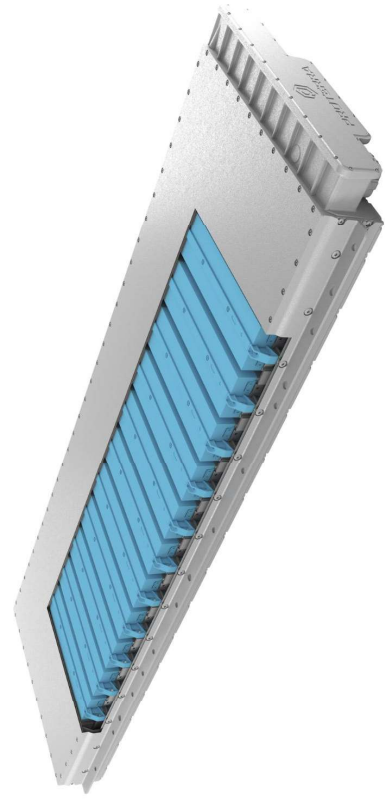


Proterra buses are purpose-built from the ground up to be electric, enabling the safest placement of batteries



- Underneath and outside of passenger compartment
- Separated by a sealed bulkhead below the floor of the bus
- Avoids placing batteries in the rear of bus, which is a common crash zone
- Battery placement creates a lower center of gravity for greatest vehicle stability

Proterra battery packs are designed specifically for safe operation in heavy-duty transportation.

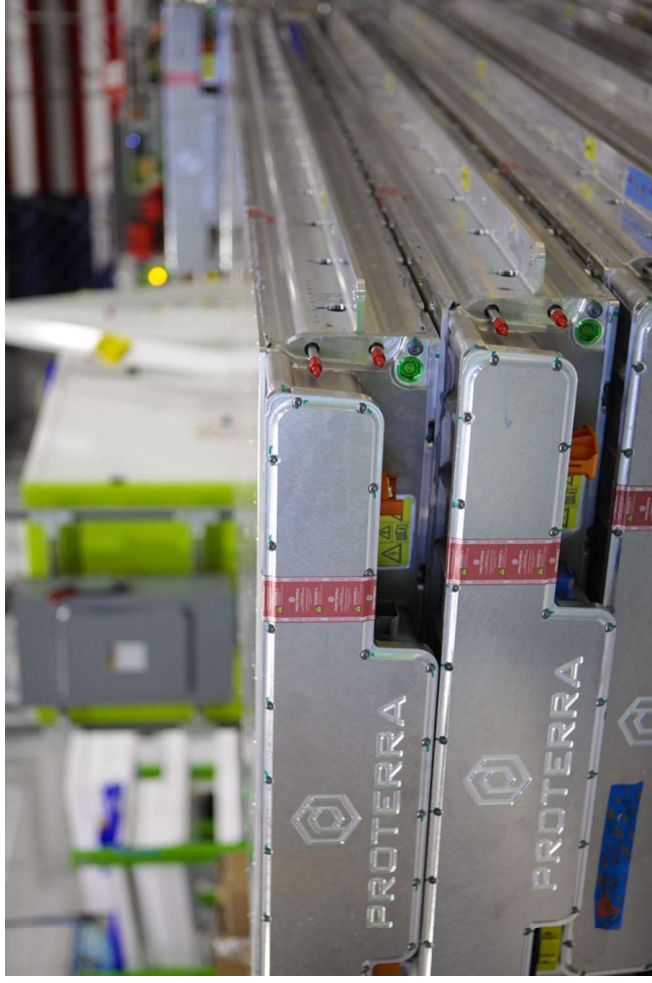


- Protective, **ruggedized enclosure** made with ballistic-grade materials that can withstand the toughest conditions
- Pack design ensures service technicians and operators are protected from high voltage components
- Liquid cooling for **active thermal management** to ensure optimal operation in any climate
- More than **70 sensors** throughout each pack delivers continuous monitoring and diagnostics, enabling faster service
- If a single cell within the battery fails, the pack is designed such that the defective cell will be isolated to a small region of the pack and not cause complications throughout the entire pack.
- Rigorously tested and 3rd party validated

EXTENSIVE BATTERY TESTING TO HIGHEST SAFETY STANDARDS



Proterra battery packs have undergone extensive testing to meet the highest safety standards.



Tests performed to account for possible incidents such as:

- Vehicle crash
- Road debris striking the battery pack
- Street manhole cover explosion
- Defective or failed cell within pack
- Overcharge of high voltage system
- Coolant flood internal to battery pack
- Fuel fire external to the vehicle (collision with a combustion engine vehicle)

BATTERY SAFETY BEST PRACTICES PASSIVE PROPAGATION RESISTANCE (PPR)



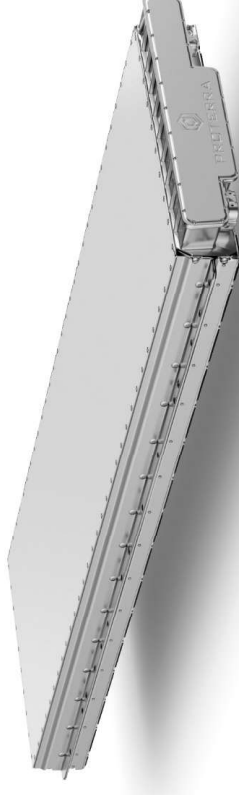
Proterra® batteries feature state-of-the-art safety features, including cell-level passive propagation resistance

- **Robust design and rigorous testing reduce the risk of a thermal event**

- Pack architecture allows for proper venting, away from occupant cabin and doorways
- Passive safety elements enable the release of energy over a longer period of time instead of all at once
- Active safety elements extend time for occupant clearance and emergency response intervention

- **Industry experts agree the risk of a single cell failure cannot be completely eliminated**

- Proterra has integrated safety mechanisms to stop a thermal event from spreading in the unlikely event of a single cell failure

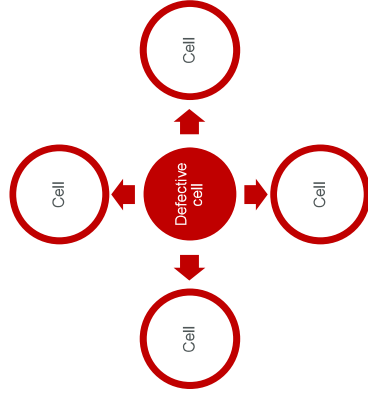


BATTERY SAFETY BEST PRACTICES PASSIVE PROPAGATION RESISTANCE (PPR)



WITHOUT PPR

Defective cell can cause cascading failure of adjacent cells



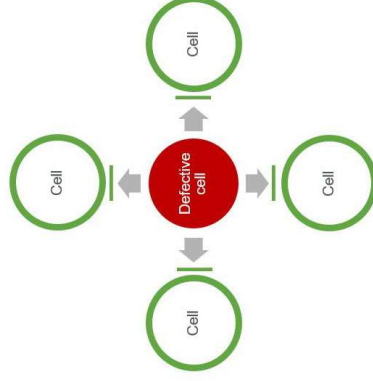
UNSAFE BATTERY DESIGN

Competitor battery design



WITH PPR

Adjacent cells are unaffected by defective cell



SAFE BATTERY DESIGN

Proterra battery design

PROTERRA BATTERY DESIGN ENABLES PPR

- Small format, cylindrical cells
- Pack is designed such that a defective cell will be isolated and will not cause complications throughout the entire pack

EXTENSIVE BATTERY TESTING TO HIGHEST QUALITY STANDARDS



Safety/Abuse Tests	Conditions	Reference	Performed
Mechanical Shock - Crash	10G, 100ms, X and Y axis	ECE R80	Yes
Impact/Underside Abuse	Manhole Cover, Pyramid, Ballistics	Proterra Internal	Yes
Drop	2m drop, concrete floor	SAE J2464 Sec 4.3.2	Yes
Battery Enclosure Integrity - Crush	100kN of force	SAE J2929 Sec 4.6 UL 2580 Sec 38 ECE R100 Annex 8D	Yes
Passive Propagation Resistance	Max Temp, Max SOC	SAE J2464 Sec 4.4.5 UL 2580 Sec 43	Yes
Forced Thermal Runaway	Confidential	Proterra Internal	Yes
Simulated Vehicle Fire	3 min exposure to fire underneath pack	SAE J2929 Sec 4.7 ECE R100 Annex 8E	Yes
Short Circuit	5mΩ hard short, 20mΩ soft short	ECE R100 Annex 8F SAE J2929 Sec 4.8 SAE J2464 Sec 4.5.1 UN 38.3	Yes
Coolant Flood	Forced cooling system leak internal of pack enclosure	Proterra Internal	Yes
UN/DOT Transportation	T.1, T.2, T.3, T.4, T.5	UN 38.3	Yes
Single-point and Multi-point Over Charge	Uncontrolled charge	SAE J2929 Sec 4.9 SAE J2464 Sec 4.5.2 ECE R100 Annex 8G	Yes
Single-point and Multi-point Over Discharge	Uncontrolled discharge	SAE J2929 Sec 4.10 SAE J2464 Sec 4.5.3 ECE R100 Annex 8H	Yes
Single-point and Multi-point Thermal Control Failure	Charge and Discharge without thermal management	SAE J2929 Sec 4.11 SAE J2464 Sec 4.4.3 ECE R100 Annex 8I	Yes
Fault Analysis	Fault analysis of battery system	SAE J2929 Sec 4.12	Yes
Protection Against High Voltage Exposure	IP2xB	SAE J2929 Sec 4.13	Yes

Note: Proterra Internal Reliability Requirements have been developed using specifications for from standards bodies such as SAE, ISO, and IEC and meet or exceed external standards.

POWERTRAIN RESEARCH & DEVELOPMENT LAB



PROTERRA

POWERTRAIN RESEARCH & DEVELOPMENT LAB THERMAL CHAMBERS



The environmental test station is used to perform accelerated life durability testing on electric vehicle components. Each component is operated under extreme conditions to ensure the highest level of reliability in our vehicles.

POWERTRAIN RESEARCH & DEVELOPMENT LAB THERMAL CHAMBERS

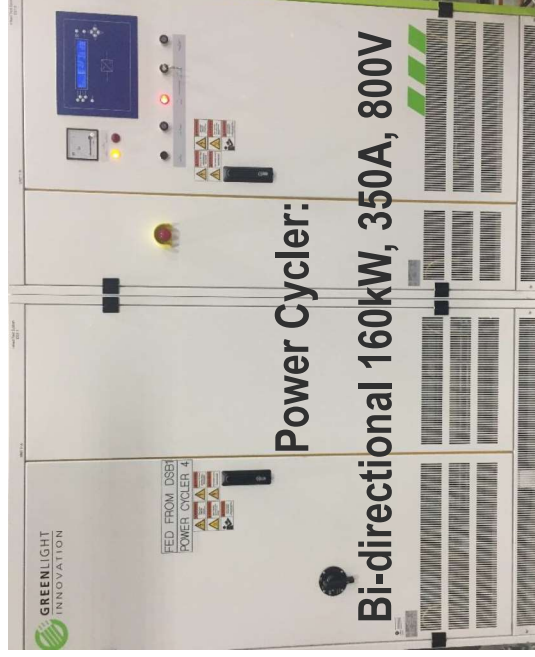
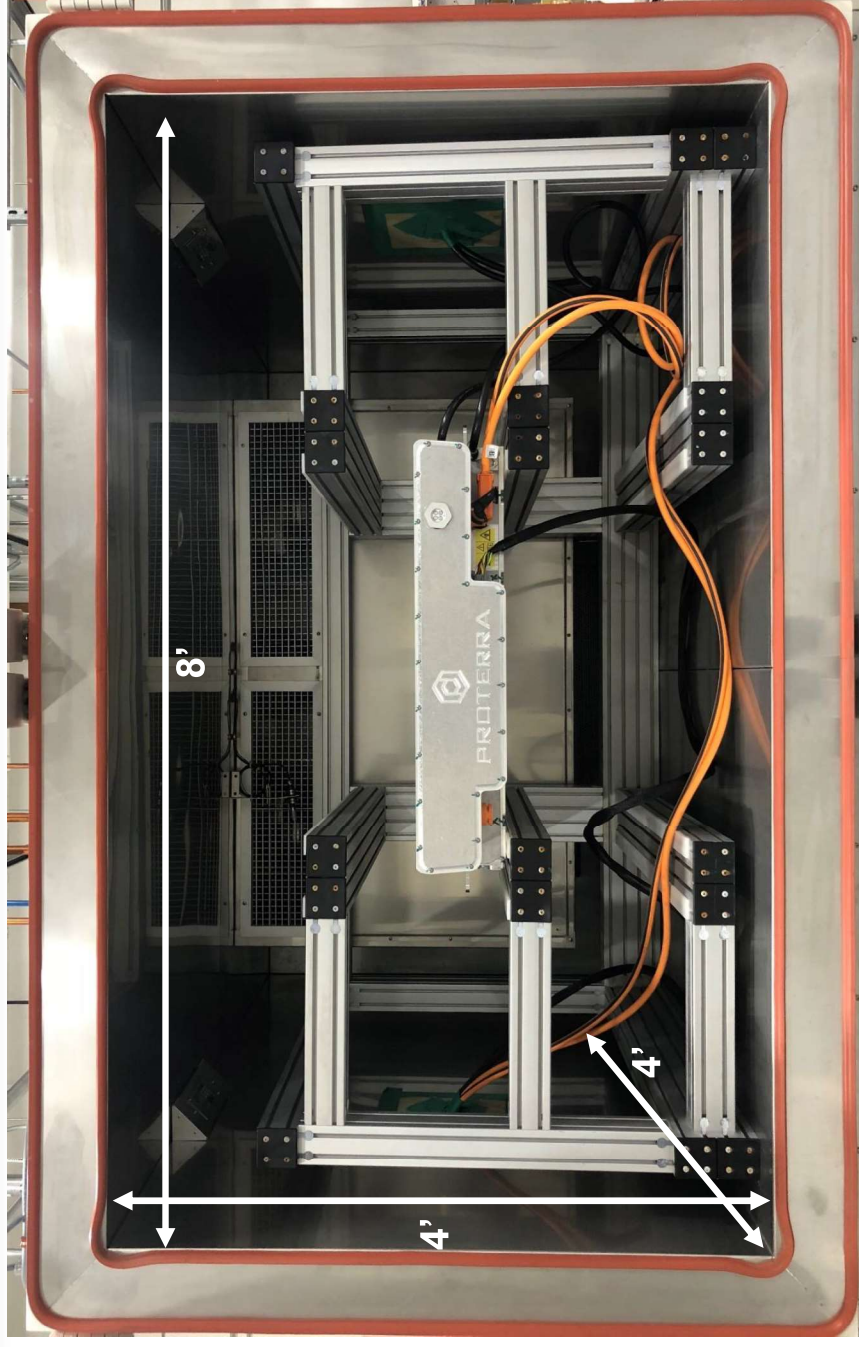


3x Reach-in Thermal Chamber:

-70°C to 100°C up to 90% RH

Recirculating Chiller:

-30°C to 80°C 75 LPM Flow Rate



POWERTRAIN RESEARCH & DEVELOPMENT LAB THERMAL CHAMBERS

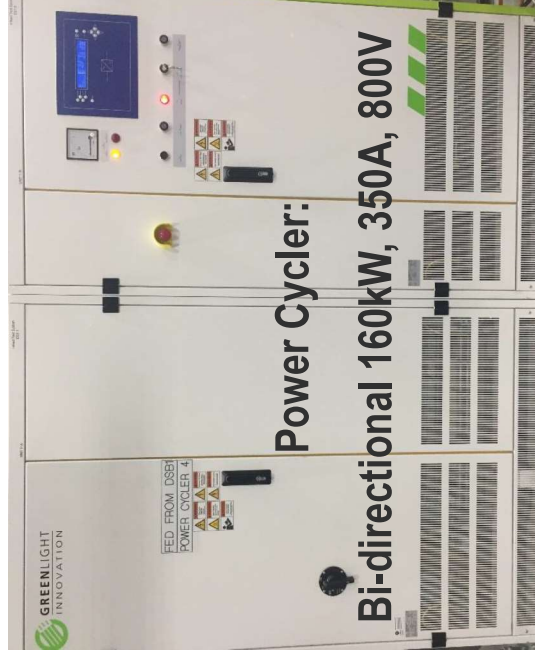


1x Walk-in Thermal Chamber:

-70°C to 80°C up to 90% RH

Recirculating Chiller:

-30°C to 80°C 75 LPM Flow Rate

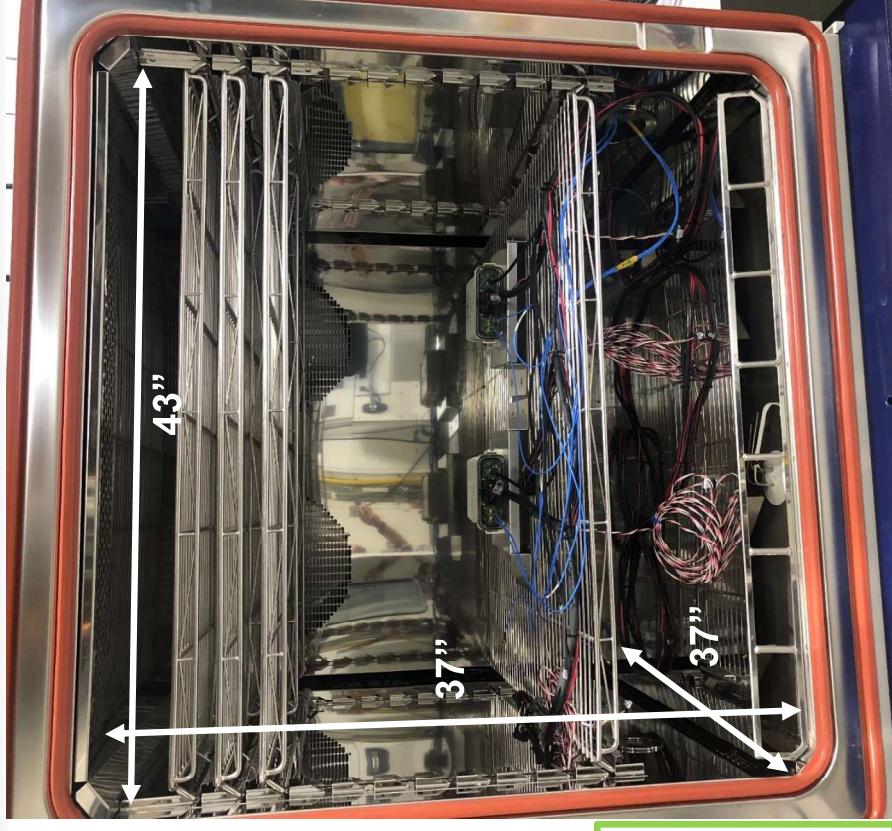


POWERTRAIN RESEARCH & DEVELOPMENT LAB COMPONENT CHAMBERS



2x Component Thermal Chamber:

-40°C to 180°C up to 95% RH



1x Thermal Shock Chamber:

Cold Zone -80°C to 70°C

Hot Zone 50°C to 220°C

20kG Load Limit

POWERTRAIN RESEARCH & DEVELOPMENT LAB WATER INGRESS TESTING



IPx6k Water Spray Test Rig: 145 PSI, 75 LPM



IPx9k Steam Jet Test Rig: 2000 PSI, 85°C



IPx7 Immersion Pool

POWERTRAIN RESEARCH & DEVELOPMENT LAB MECHANICAL TESTING

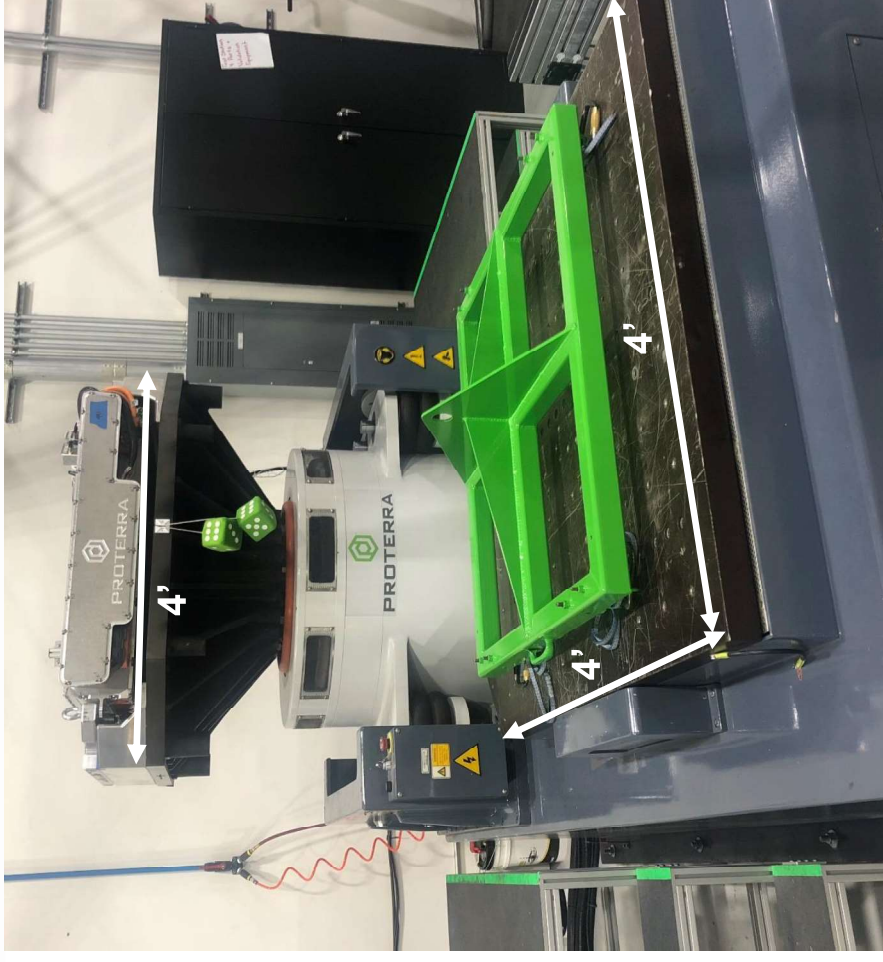


The Electro-Dynamic Shaker system uses real world vibration profiles to induce the structural damage that a component will experience over the course of its life. Components are tested for more than 1,000,000 simulated miles to ensure the highest level of mechanical performance.

Footprint available to DUT is 1200mm x 1200mm

Available Mass for DUT and fixture 700kg

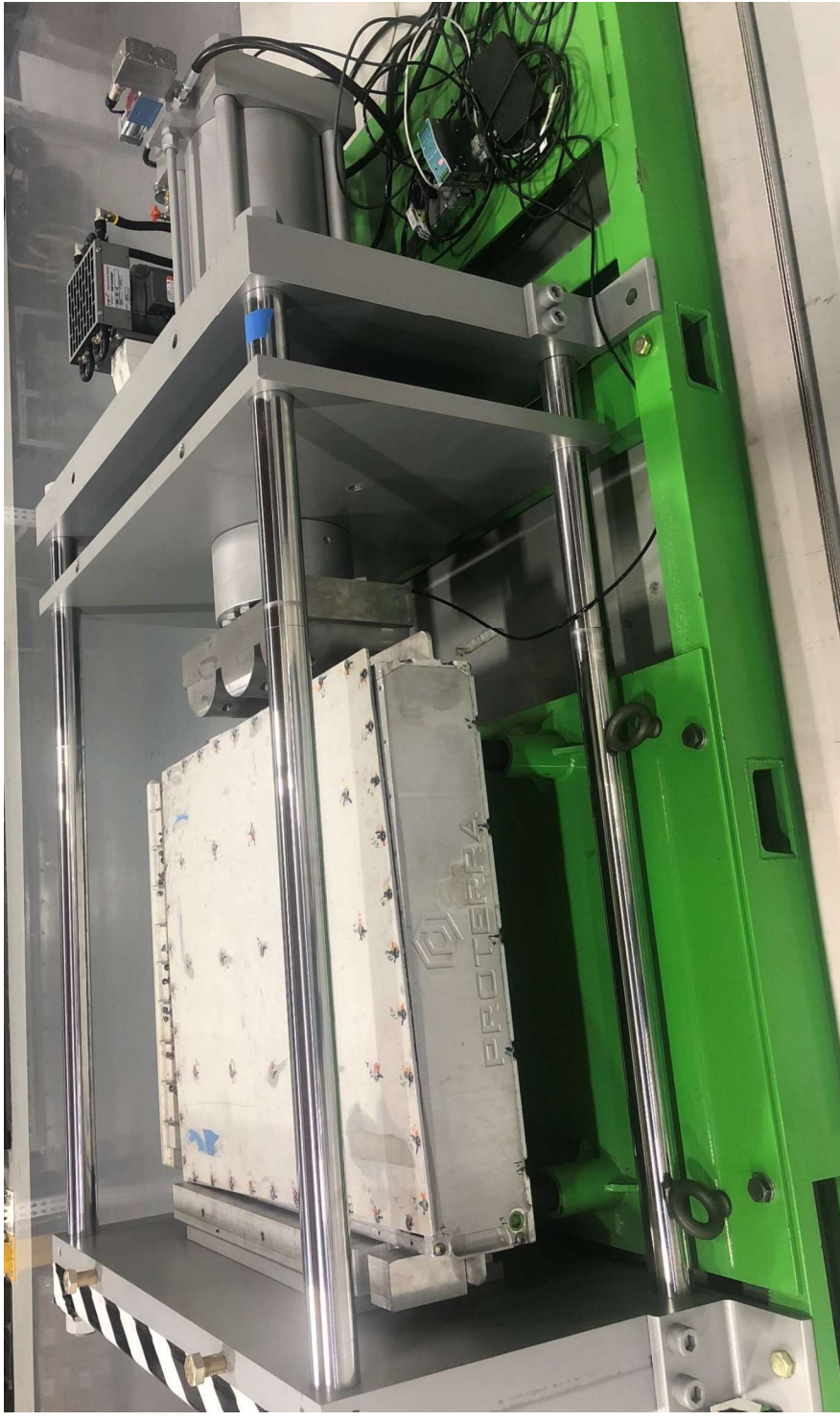
Max acceleration fully loaded 6G



POWERTRAIN RESEARCH & DEVELOPMENT LAB MECHANICAL ABUSE TESTING



The Hydraulic Crush Test Stand simulates the forces experienced during a vehicle collision. Over 150,000 pounds of force are applied to our battery enclosure to test its mechanical integrity and meets Proterra's stringent safety standards.



PROTERRA RESEARCH & DEVELOPMENT LAB MECHANICAL ABUSE TESTING



Mechanical Drop
test fixtures
include manhole
cover and pyramid
strike.



POWERTRAIN RESEARCH & DEVELOPMENT LAB CELL CHARACTERIZATION



192x Cell Cycling Channels: $\pm 5A$, 5V
Cylindrical Cell Chambers 10°C to 60°C



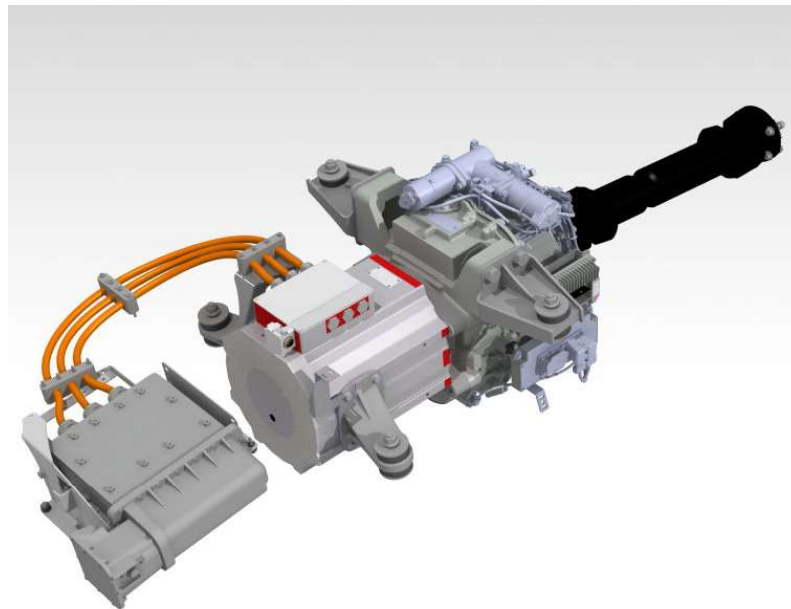


Propulsion System / Drivetrain

Included herein are technical overviews of our next-generation ProDrive propulsion system.

The ZX5 standard ProDrive propulsion system consists of three major components; the traction motor, the power inverter, and the transmission.

Proterra uses a permanent magnet synchronous motor with a multi-speed automated manual transmission. The traction motor is capable of 240kW peak power and is controlled via an inverter which receives direct current power from the high voltage battery system. Both the motor and inverter are liquid cooled.



1. ZX5 ProDrive Propulsion System

The unique Proterra multi-speed transmission contains a planetary gear set with a pneumatically driven shift mechanism. The transmission is oil-cooled and contains an additional oil cooler to ensure that the transmission remain at ideal temperatures under the most difficult driving cycles. The output of the transmission supplies power to the ZF drop center rear axle.

All actuators and sensors for the transmission are connected to the Proterra powertrain controller which controls both the torque/speed commands of the traction motor as well as the transmission shift actuation. These controls have been optimized for transit bus service for best drivability and maximized efficiency. These controls are designed and calibrated using real world data from customer vehicles, engineering tests utilizing proprietary drive cycles and standard FTA drive cycles (CBD, Arterial, Commuter), and using our high-fidelity simulation tool similar to the model used for this fuel economy analysis.



With the multi-speed transmission Proterra is able to utilize a smaller, lighter traction motor to meet the needed performance requirements while still offering excellent efficiency. This transmission also allows the powertrain system the flexibility to provide the needed torque while also operating at more efficient traction motor operating points.

The combination of the traction motor, the power inverter, and the transmission are a primary reason why Proterra BEBs were able to break the Altoona records for acceleration, efficiency, and gradeability.

ProDrive Specifications	
Parameter	Specification
Peak Power	240 kW
Continuous Power	205 kW
Peak Torque	850 Nm
Continuous Torque	560 Nm
Max Speed	6000 RPM

Regenerative Braking

The Proterra bus utilizes two main systems to slow down or decelerate the vehicle, a standard pneumatic friction brake system and regenerative braking. Regenerative braking uses the traction motors to generate electricity which slows the vehicle. The ability to capture energy while braking results in a large improvement in energy efficiency of the vehicle. On a traditional vehicle, the energy created during braking is lost to heat through the friction brakes or the retarder.

When the driver lifts off the accelerator pedal (zero pedal) up to 50% of available regenerative braking torque is automatically applied. The remaining 50% of available regenerative braking is then applied linearly when the driver begins to press on the brake pedal. The pneumatic brakes begin to work linearly with increased brake pedal travel. The feel of the regenerative braking system is similar to a traditional retarder.

Regenerative braking is reduced below 3 mph to make low speed bus movement smoother. In the event of an ABS or Traction Control event, regenerative braking is automatically disabled until the vehicle comes to a complete stop. It is automatically re-enabled upon continuation. This is done to ensure vehicle stability in slippery conditions.

The Proterra regenerative-braking system will ultimately enable an efficient driver to drive almost entirely without the brake pedal. Drivers that anticipate stops and allow regenerative braking to slow the vehicle for maximum energy recapture maximize efficiency.

**Advantages of the Proterra Regenerative Braking System:**

- Substantially reduced brake pad wear
- Regenerative braking while coasting improves driver ergonomics due to the reduced need to apply brake pedal (aka: one foot driving)
- Regenerative braking improves vehicle range and efficiency by at least 25-40% depending on drive profile and driver skill.

Regenerating Performance

Proterra will offer 2 distinct regenerative braking levels. These levels will be driver selectable through the gear selector module located in the driver's area. These levels will predominantly affect the amount of regenerative motor torque during a coasting scenario (no brake or accelerator pedal application).

- While in D (Drive): the vehicle will have a nominal amount of regenerative torque application while coasting. As the brake pedal is applied, regenerative torque will increase proportionally with the pedal to smoothly decelerate the vehicle. Friction brakes will start to add additional braking force in coordination with the regenerative torque of the drivetrain.
- While in L (Low): the vehicle will have a more aggressive level of regenerative torque application while coasting compared to D (drive mode). This level of coasting regen will be similar to a conventional vehicle retarder. It will allow the vehicle to decelerate at a faster rate without application of the brake pedal. Similar to D, as the brake pedal is applied, regenerative torque will increase proportionally with the pedal to smoothly decelerate the vehicle. Additionally, friction brakes will start to add braking force in coordination with the regenerative torque of the drivetrain.



PROTERRA POWERTRAIN CONFIGURATION OVERVIEW



1. Objective

To describe the different acceleration performance modes and regenerative braking configurations for the Proterra ZX5 bus platform ProDrive and DuoPower powertrain. To provide an understanding of how these configuration options impact range and energy economy.

2. Discussion

The Proterra powertrain system comes with the ability to configure the vehicle acceleration and deceleration drive feel to meet the customers' needs. These settings can be changed through the Proterra diagnostic tool when connected to a vehicle. There are two main drive feel settings:

- **Performance Mode:** This mode will change the maximum allowed vehicle acceleration rate
- **Regenerative Braking Configuration:** This selection will adjust the aggressiveness of regenerative braking when not accelerating (drivetrain-based braking)

2.1 Performance Mode

Proterra offers 3 distinct acceleration performance modes to tailor maximum vehicle acceleration to the customers' requirements. The three modes are called: Eco, Nominal and Max performance. These modes can be configured through the Proterra diagnostic tool variable **EP_usi_ZR32_PerformanceMode_x** (ECO= 0, Nominal= 1, Max= 2). The driver cannot change these modes real time through a button or switch.

Table 1 below shows the maximum achievable acceleration for each performance mode under peak motor conditions (no thermal derates). Proterra utilizes different acceleration limits to vary the performance of the vehicle. These acceleration limits will modulate torque to the drivetrain by monitoring the actual acceleration rate. If the acceleration rate of the vehicle approaches the limit, the traction inverter will reduce torque to ensure the limit is adhered to.

Acceleration limits primarily influence the vehicle speed below 30 MPH. Above 30 MPH, the vehicle speed is dictated by the power capability of the drivetrain. It is important to note that regardless of the performance mode, the powertrain will allow full power under scenarios where the acceleration limit is not being achieved. This is most critical under hill climb conditions. Therefore, the acceleration limit and performance mode will not impact vehicle gradeability performance.

Proterra recommends using the ECO Performance Mode (**EP_usi_ZR32_PerformanceMode_x = 0**) to maximize the efficiency of the vehicle.

Speed	APTA Whitebook	Eco Mode ProDrive	Eco Mode DP	Normal Mode ProDrive	Normal Mode DP	Max Performance Mode ProDrive	Max Performance Mode DP
(MPH)	time (s)	time (s)	time (s)	time (s)	time (s)	time (s)	time (s)
0	0	0	0	0	0	0	0
10	5	4.3	3.8	3.6	3.4	3.2	2.8
20	10	8.5	8.3	7.1	6.9	6.2	5.5
30	18	13.7	12.9	12.5	10.7	11.6	8.5
40	30	26.2	19.3	24.4	16.8	23.3	14.3
50	60	38.8	24.3	36.7	21.6	35.8	19.0
60	-	54.8	30.6	52.5	28.0	52.0	25.1

Table 1: Vehicle acceleration times for each performance mode, 0% grade, seated load weight

PROTERRA POWERTRAIN CONFIGURATION OVERVIEW

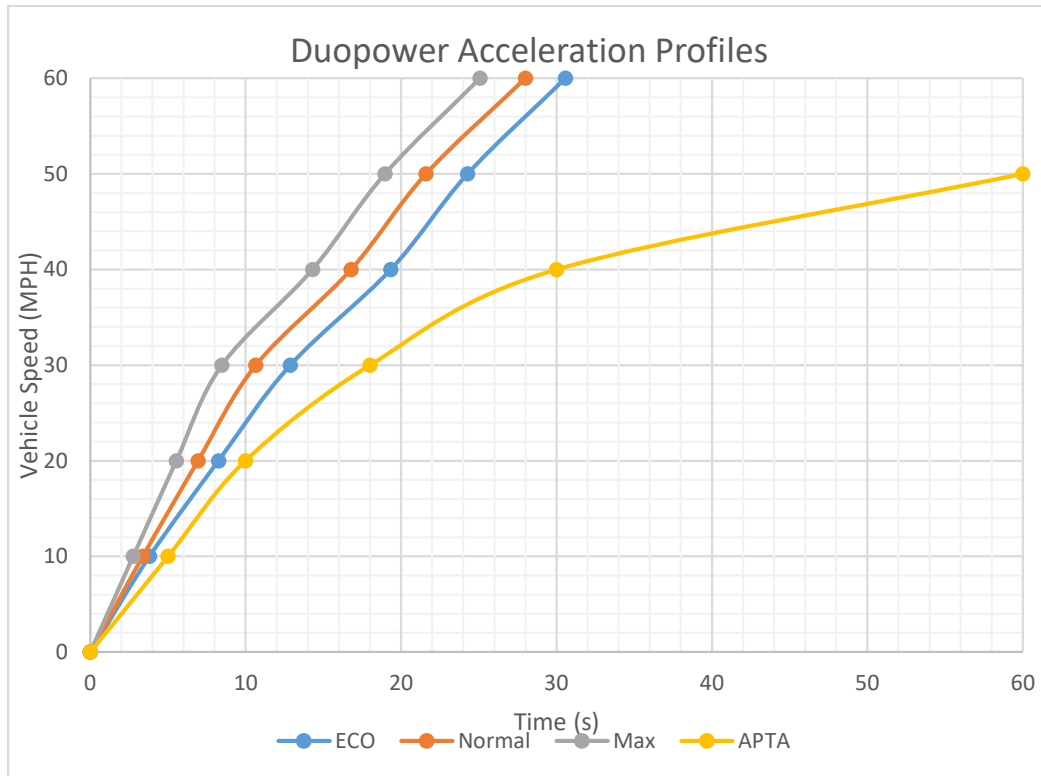


Figure 1: Vehicle acceleration chart for each Duopower performance mode, 0% grade, seated load weight

PROTERRA POWERTRAIN CONFIGURATION OVERVIEW

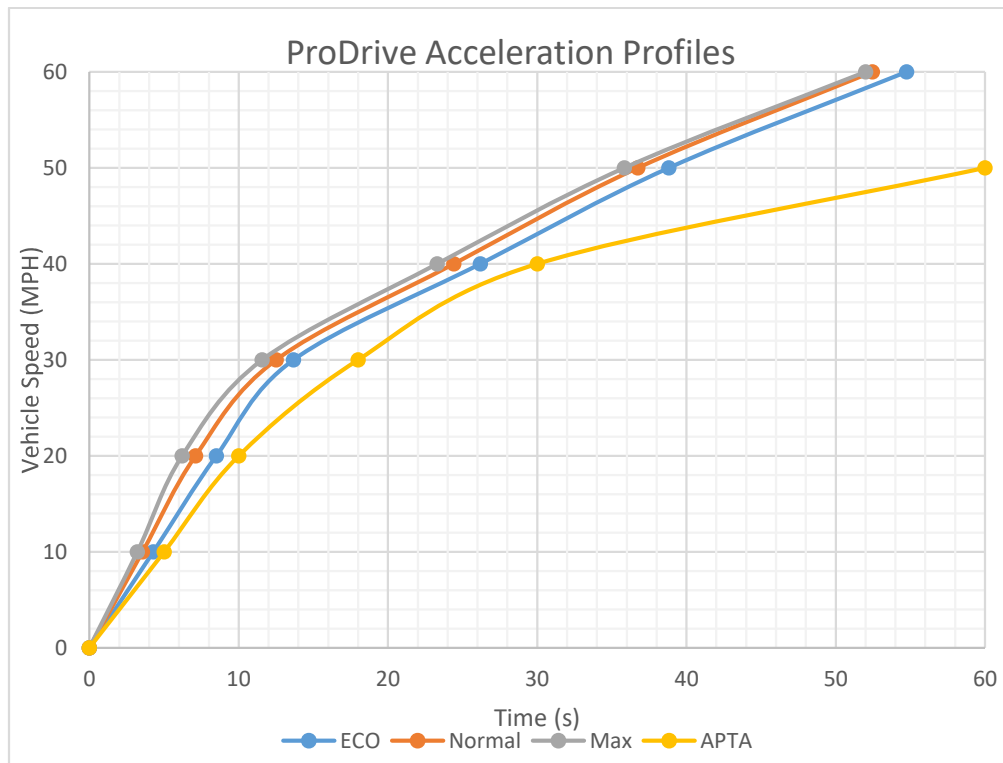


Figure 2: E2 vehicle acceleration chart for each ProDrive performance mode, 0% grade, seated load weight

2.2 Regenerative Braking Options with Gear Selector

Proterra offers two distinct driver selectable regenerative braking options through the gear selector module located in the driver's area. These levels will predominantly affect the amount of regenerative braking torque during a coasting scenario (no brake or accelerator pedal application).



Figure 2: Gear selector layout with D and L buttons

PROTERRA POWERTRAIN CONFIGURATION OVERVIEW



- While in D (Drive): the vehicle will have a nominal amount of regenerative torque application while coasting. As the brake pedal is applied, regenerative torque will increase proportionally with the pedal to smoothly decelerate the vehicle. Friction brakes will start to add additional braking force in coordination with the regenerative torque of the drivetrain.
- While in L (Low): the vehicle will have a more aggressive level of regenerative torque application while coasting compared to D (drive mode). It will allow the vehicle to decelerate at a faster rate without application of the brake pedal. Similar to D, as the brake pedal is applied, regenerative torque will increase proportionally with the pedal to smoothly decelerate the vehicle. Additionally, friction brakes will start to add braking force in coordination with the regenerative torque of the drivetrain.

2.3 Regenerative Braking Configuration

Proterra also offers the ability to configure the regenerative brake level and selection options through the diagnostic tool variable **EP_usi_ZR32_AllowedRNDLConfiguration_xx**. The driver cannot change these modes real time through a button or switch. This configuration setting will alter what the driver is able to select at the gear selector.

At a high level, this EEPROM setting allows different combinations of 3 distinct regen levels. It also enables the ability to "lock out" a driver selectable option. Meaning, regardless if the driver pushes the D or L push button on the gear selector, he/she will only get a single regen braking level. This enables the customer to better control how the vehicle is operated in the field.

Proterra recommends using the most aggressive regen level (**EP_usi_ZR32_AllowedRNDLConfiguration_xx = 3**) to maximize the efficiency of the vehicle.

EEPROM Value	Drive (D)	Low (L)	Notes
0	Moderate	Heavy	Driver selectable regen levels, moderate DRIVE regen and aggressive LOW regen.
1	Minimal	Disabled	Driver selectable regen level disabled, minimal regenerative braking.
2	Moderate	Disabled	Driver selectable regen level disabled, moderate regenerative braking.
3	Heavy	Disabled	Driver selectable regen level disabled, most aggressive regenerative braking.
9	Minimal	Moderate	Driver selectable regen levels, least amount of regenerative braking options.
13	Minimal	Heavy	Driver selectable regen levels, minimal DRIVE regen and aggressive LOW regen.
14	Moderate	Heavy	Driver selectable regen levels, moderate DRIVE regen and aggressive LOW regen. This is the same config as EEPROM 0

Table 2: Regenerative Braking Configuration EEPROM Settings

PROTERRA POWERTRAIN CONFIGURATION OVERVIEW



2.4 Impact on Range and Vehicle Efficiency

It is difficult to simulate how the vehicle efficiency and range will be impacted by the varying performance modes and regenerative braking configurations. However, through real world tests we have found a few key themes:

1. **MORE aggressive acceleration yields LOWER vehicle efficiency and range-** higher acceleration rates lead to higher vehicle speeds and road loads. This ultimately reduces vehicle efficiency and range. Proterra has observed efficiency impacts up to 10% based on different acceleration rates in real world operation.
2. **MORE aggressive regenerative braking yields HIGHER vehicle efficiency and range-** for a transit vehicle with lots of stop and go driving and lower average speeds, maximizing regenerative braking leads to higher efficiency. Proterra has observed efficiency impacts up to 7% based on different regenerative braking levels in real world operation.

Powertrain related items that will directionally improve vehicle efficiency and range:

- Lower average vehicle speeds
- Lower vehicle acceleration
 - o Proterra's acceleration control algorithm helps in this category. It minimizes a "heavy footed" driver's influence on range by only allowing the prescribed acceleration defined in Table 1. This also improves the consistency of the vehicle acceleration across load conditions.
 - o Setting the Performance Mode variable `EP_usi_ZR32_PerformanceMode_x` to ECO "0" mode will **maximize vehicle range and efficiency**.
- Gradual braking
 - o It is important to minimize the use of pneumatic friction brakes to improve range and efficiency. This method to slow down the vehicle is wasted energy that turns into heat.
 - o Proterra's more aggressive regen options will improve efficiency under low speed driving by reducing the need to apply the brake pedal. Therefore, a larger percentage of energy can be recaptured by the battery system as regenerative braking operates.
 - o Setting the Regeneration Configuration variable `EP_usi_ZR32_AllowedRNDLConfiguration_xx` to "3" will **maximize vehicle range and efficiency**.

Other benefits to consider:

- "Low mode" can be used on steep downhill descents to emulate a driveline retarder in a conventional vehicle. This will improve brake pad life.
- "Drive mode" does have its advantages that should be considered:
 - o There may be ergonomic benefits to the driver's right foot. Less coasting regen will require less accelerator input to achieve similar torque output while maintaining the same speed. This may be more desirable on higher speed routes.
 - o Less coasting regen may be more desirable under slippery scenarios such as snow or ice. Regenerative braking can induce wheel slip events in these conditions and Drive Mode may reduce the probability of wheel slip from occurring.
 - o Certain drivers may prefer a more conventional feeling bus based on what they are used to. Drive Mode gives them that option.

PROTERRA POWERTRAIN CONFIGURATION OVERVIEW



2.5 Software and Hardware Compatibility

DuoPower Drivetrain

- The Performance Mode and Regenerative Braking Configuration features defined above are fully released and validated for DuoPower software v1.3.0 (SC-20-115) and body software v6.3.0 (SC-20-91).
 - o Proterra recommends using the ECO Performance Mode (**EP_usi_ZR32_PerformanceMode_x = 0**) to maximize the efficiency of the vehicle.
 - o Proterra recommends using the most aggressive regen level (**EP_usi_ZR32_AllowedRNDLConfiguration_xx = 3**) to maximize the efficiency of the vehicle.

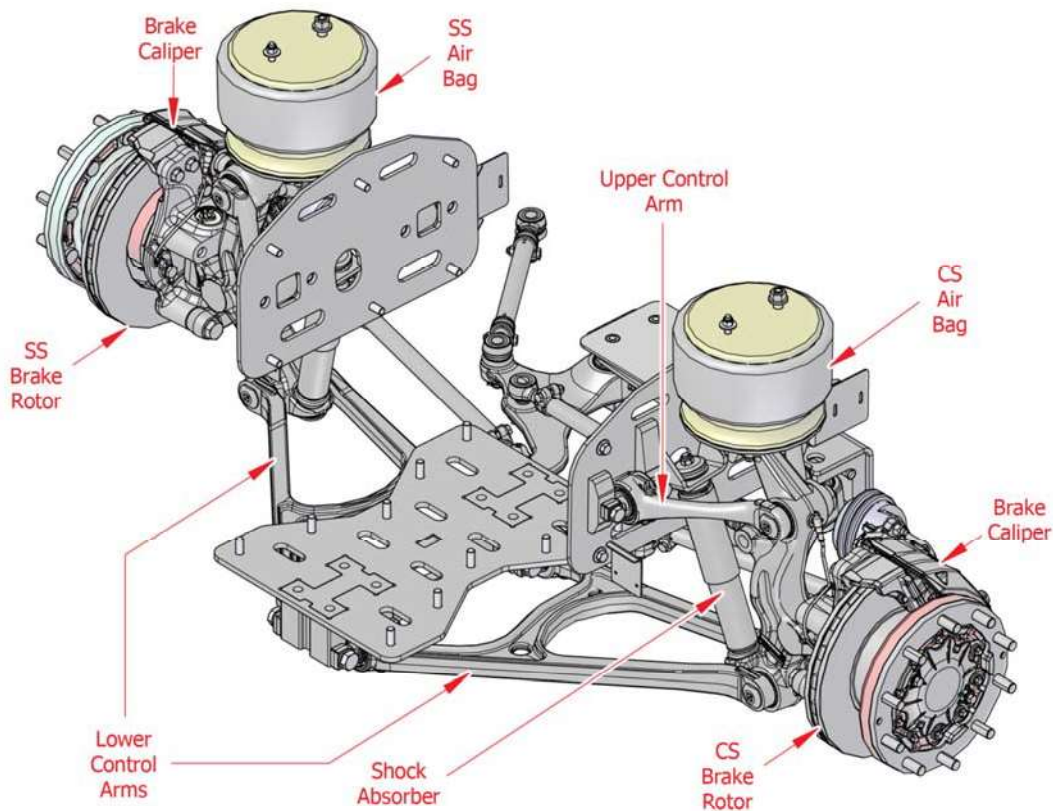
ProDrive Drivetrain

- The Performance Mode and Regenerative Braking Configuration features defined above are fully released and validated for ProDrive software v4.2.0 (SC-20-163) and body software v6.3.0 (SC-20-91).
 - o Proterra recommends using the ECO Performance Mode (**EP_usi_ZR32_PerformanceMode_x = 0**) to maximize the efficiency of the vehicle.
 - o Proterra recommends using the most aggressive regen level (**EP_usi_ZR32_AllowedRNDLConfiguration_xx = 3**) to maximize the efficiency of the vehicle.



Front Axle & Suspension

The ZX5 vehicle proposed for PSTA will have a heavy-duty independent front suspension, model RL-82EC, manufactured by ZF. The axle weight rating is 18,078 lbs. The design of this front axle and suspension system allows for improved steering, a tight turning radius, increased maneuverability, and excellent stability.



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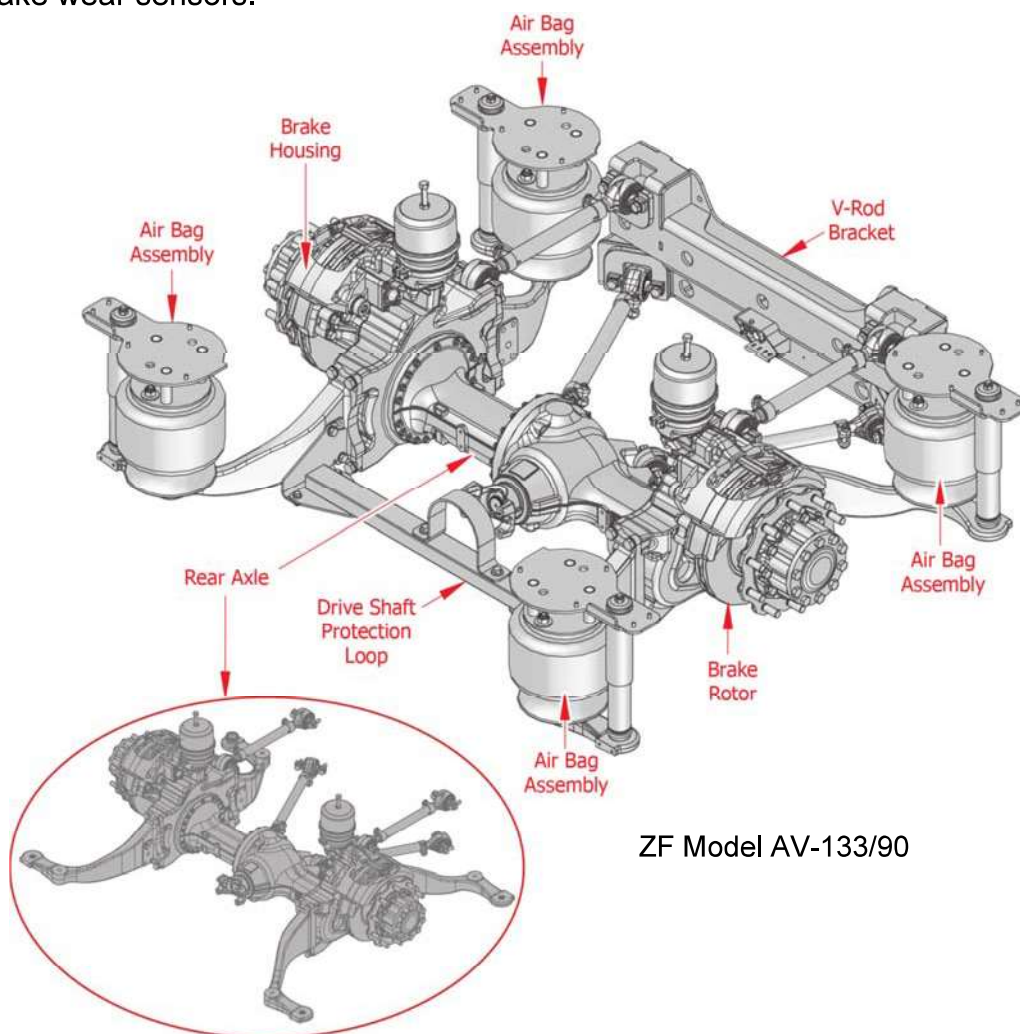
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Rear Axle & Suspension

The rear axle and suspension system used in the Proterra ZX5 bus is a model AV-133/90 manufactured by ZF. The design of this rear axle allows a lower floor level inside the bus making it easier and faster to enter and exit the bus. This can reduce the overall time spent at each stop boarding and deboarding passengers. This rear axle is also very quiet, which is an asset to any city bus which has limited sound-proofing materials.

The AV-133/90 rear axle and suspension system includes the axle with disc brakes and all components needed for suspension, springs and damping, including the ABS/ ASR and brake wear sensors.



ZF Model AV-133/90

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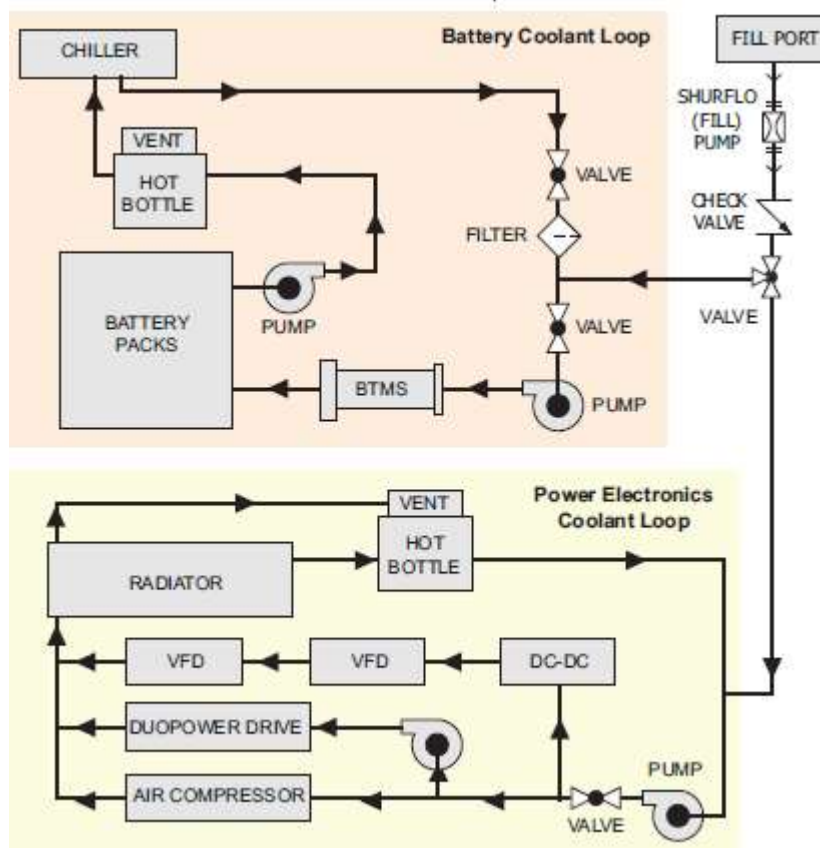
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Cooling System

The ZX5 utilizes two independent cooling loops to cool the high-voltage batteries and the power electronics on the vehicle. The battery coolant loop has two dedicated coolant pumps that circulate coolant through the Battery Thermal Management System (for heating if needed), through the battery packs, an expansion tank, into the HVAC system (for cooling, if needed) and then through a filter to repeat the loop. The power electronics loop also has a dedicated coolant pump that circulates coolant through the power electronic units that require cooling, through a three-fan radiator and then through a filter to repeat the loop.



Battery Coolant Loop

The battery coolant loop provides liquid cooling/heating to each individual high-voltage energy storage battery pack. A rear cage mounted Battery Thermal Management System controls the temperature of the coolant. Coolant flow is provided by two CAN-controlled, variable speed pumps mounted in the rear cage frame. The pump speed is controlled by the vehicle controller via CAN messages. Speed is increased or decreased as required based on temperature readings. When the batteries require heating or cooling, the pump speed is increased to provide additional coolant flow. When increased coolant flow is no longer needed the pump speed is reduced to maximize energy efficiency.

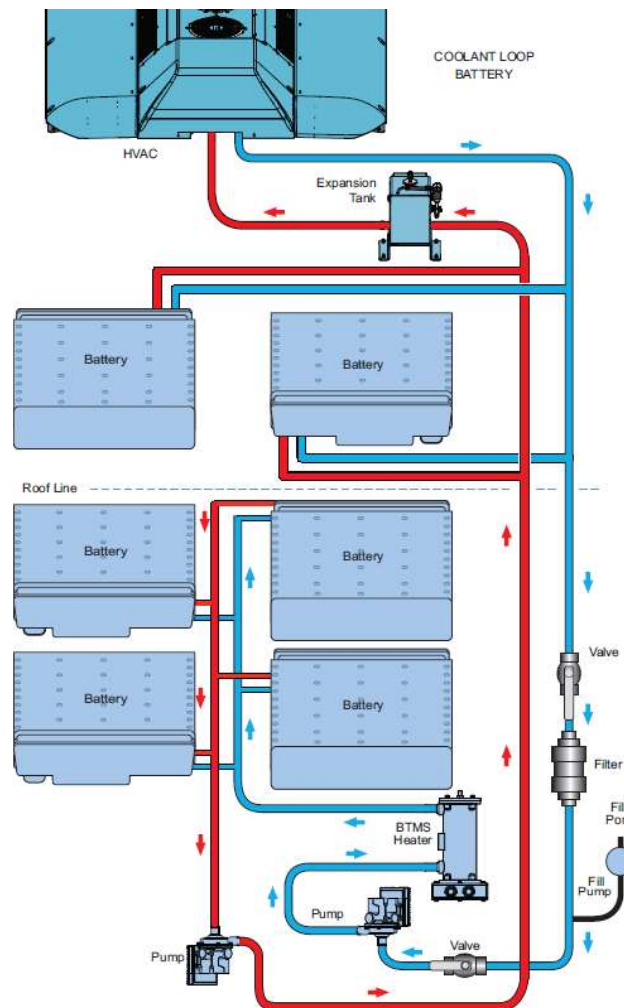


The battery coolant loop also passes through a chiller mounted within the HVAC unit on the roof. This chiller, when activated by the main vehicle controller, can further reduce the temperature of the coolant to provide additional cooling to the batteries when needed.

Diagnostics monitor the performance of the Battery Thermal Management System, pumps, fan and chiller and will set faults in the event a problem is detected. The batteries will automatically derate (reduce their power output) if they become too hot so that cooling system failures will not damage the batteries.

The following diagram shows the battery cooling system flow on a Proterra ZX5:

- The **RED** lines indicate warmed coolant flow
- The **BLUE** lines indicate the cooled coolant flow





Power Electronics Coolant Loop

The power electronics cooling loop provides liquid cooling to the following components:

- Traction Motors
- Traction Motor Inverter
- DC to DC Converter
- Air Compressor
- Dual-Output Variable Frequency Drive (VFD) - Rear Cage
- Single-Output Variable Frequency Drive (VFD) - Rear Cage

These components are liquid-cooled to increase their power density, efficiency and reliability. Coolant flow is provided by a CAN-controlled, variable speed pump mounted in the rear cage.

The pump speed is controlled by the vehicle controller via CAN messages. Speed is increased or decreased, as required, based on temperature readings of each of the components being cooled. When a component begins to heat up, the pump speed is increased to provide additional cooling. When increased cooling is no longer needed, the pump speed is reduced to maximize energy efficiency.

A rooftop mounted radiator reduces the temperature of the coolant. Warm coolant flows through the radiator, is cooled, and is then pumped through the power electronics devices. Three CAN-controlled, variable speed fans are mounted on the radiator and can be activated by the main vehicle controller to provide additional airflow through the radiator, thereby reducing the coolant temperature further.

Diagnostics monitor the performance of the pump and radiator fans and will set faults in the event a problem is detected. All of the devices in the power electronics cooling loop will automatically de-rate (reduce their power output) if they become too hot, so that cooling system failures will not damage these devices.

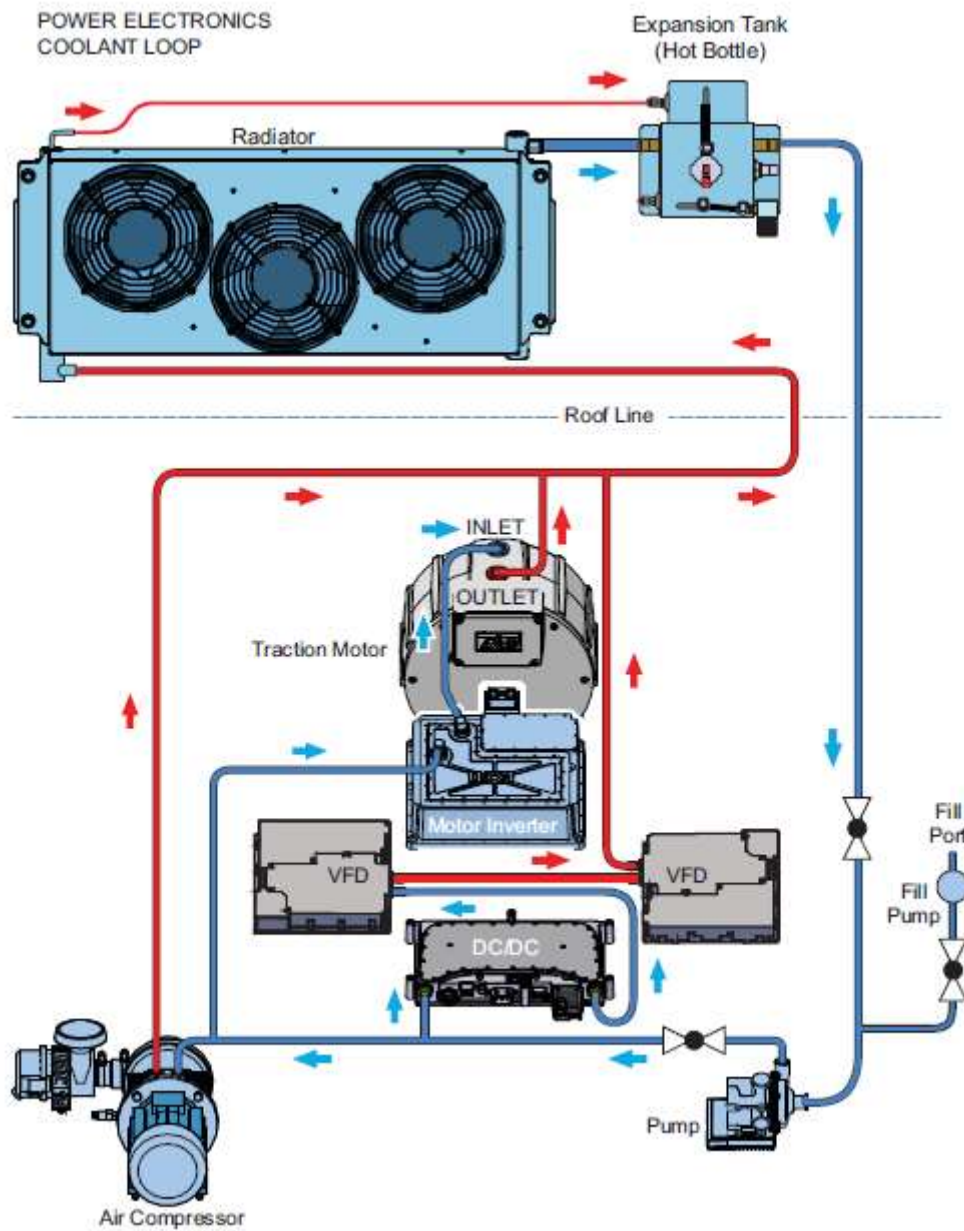
The power electronics cooling loop includes an expansion tank with a level sensor. The cooling system can be filled from ground level using a built-in fill pump inlet located near the low-voltage batteries.

The following diagram (next page) shows the power electronics cooling system flow on a Proterra ZX5 bus:

- The **RED** lines indicate warmed coolant flow
- The **BLUE** lines indicate the cooled coolant flow



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Valeo Revo-E Global Overview

The Proterra HVAC system included in this proposal is manufactured by Valeo, formerly Spheros. The Valeo HVAC is our second HVAC offering for Proterra's fifth generation ZX5 model BEB. The Valeo unit comes with improved vehicle efficiency as it employs a heat pump which reduces power draw of the HVAC from 1/2 to 1/3 of power required using electric resistive heat only. The heat pump is used in conditions just below freezing and higher. In lower ambient temperatures a Positive Temperature Coefficient resistive heating element system which is the state of the art in electric heating which is inherently safer than metallic heating elements.. The driving philosophy around adding Valeo as an option is based on the principle that state-of-the-art BEBs should have the smartest, most efficient HVAC solutions.



Valeo Revo-E Global HVAC

The HVAC system controls the bus interior temperature and humidity levels within prescribed limits of comfortable conditions. This HVAC unit is specifically designed for use on an all-electric, heavy-duty, city transit bus. The HVAC unit receives high-voltage DC power from the vehicle for all high-power operation. A battery cooling system connection (conditioned water for a battery cooling loop servicing battery packs) is also contained in the HVAC System. The HVAC system is roof mounted HVAC unit.

Benefits of the Valeo HVAC

Low life-cycle costs

- Low consumption of energy due to efficient heating and low unit weight
- Dimensions allow space for battery system on the roof
- Long duration due to brushless EC blowers and hermetically sealed AC compressor
- Nearly maintenance-free

Environmentally friendly

- Safety against leakage due to the hermetically sealed refrigerant circuit
- Noise emissions optimized



Comfort

- Cooling capacity of up to 30 kW
- Heating with PTC heater and heat pump included
- Tested and Validated for use on Proterra BEBs up to 120 deg F

Operating Range

- Maximization of the range due to the efficiency of the heat pump and low unit weight
- Optimized power consumption
- PTC heater used in cold ambient conditions where required

Others

- Integrated compressor, no installation of refrigerant lines necessary
- Designed for R 407C

Description

The Valeo HVAC is designed to keep the driver and passengers comfortable under all weather conditions from very hot to very cold. The system is mounted on the roof and is powered by High Voltage (HV) DC electricity directly from the vehicle main energy storage battery system. The system consists of the following major components:

- Electrically driven, hermetically sealed scroll-type compressor
- Evaporator and condenser heat exchangers
- HV Variable Frequency Drive (VFD) to provide the HV electricity to the variable speed compressor
- DC to DC converter to convert HV dc to 24v dc. The DC to DC converter is combined into one device along with the VFD
- 24v brushless DC evaporator fans
- Heat pump cycle and PTC heating elements provide the main cabin heat
- Parallel Loop battery chiller heat exchanger cools the coolant for the batteries
- Heat Pump and Battery Chiller allows heat scavenging operation between batteries and Cabin for maximum efficiency under certain operating conditions.

The Valeo unit has an integral chiller for battery cooling. The control system allows the unit to supply refrigerant for stand-alone cooling capacity or cooling capacity in concert with HVAC operation.

Capacities:

- AC: 30 kW (102364 BTU/Hr)
- Heat Pump: 30 kW (102364 BTU/Hr)
- PTC Heat: 20 kW (68243 BTU/Hr)
- Battery Thermal Management Coolant Chiller: Min 10 kW under any operating conditions

Refrigerant:

- R407c



Cabin Heating

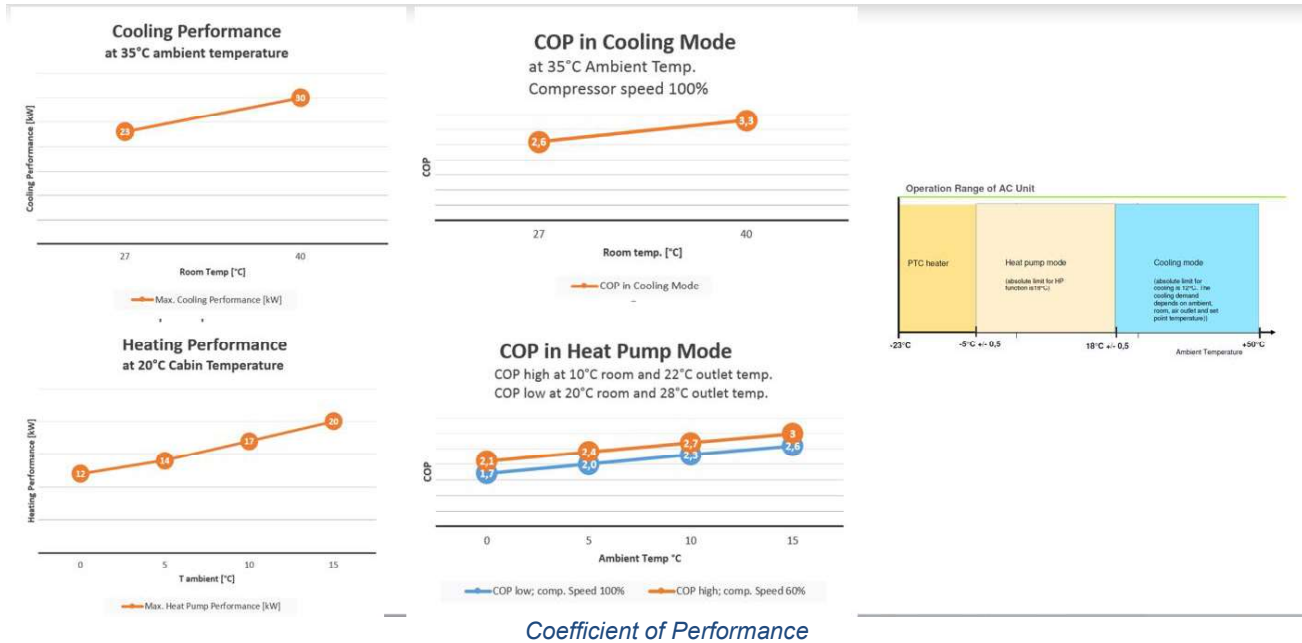
The Valeo HVAC heats the bus in one of two ways, though its electric resistive Positive Temperature Coefficient (PTC) heating elements or the refrigerant system. The PTC elements provide an inherent safety not included in the Eberspaecher system, the PTC elements draw lower current as they get warmer, thus helping to prevent overheat conditions that can occur on electric heating elements. The PTC elements do have a limitation per specification to only start heating when cold soaked to -25 deg C (-13 deg F) or higher. This does not preclude operating in colder conditions as after warm-up, the system can run to colder conditions. Proterra tested the Valeo HVAC system in a cold chamber down to -20 deg F without issue. The AC refrigerant system is able to provide cooling in warm conditions and heating in cold conditions. This “heat pump” system is able to provide cabin heat down to an ambient temperature of -5 deg C (23 deg F) and up to 18 deg C (64 deg F). This heat pump operation allows for significant improvement in efficiency over the electric heat. The heat pump can use as low as 1/3 to 1/2 of the power of electric heat, depending on ambient and cabin conditions. Like the cooling operation the total power used by the heat during heat pump operation is less than the equivalent heat supplied to the cabin. (Electric Heat is a one to one relationship between power draw and heat supplied). As heating is a major source of power draw this improvement will result in an improvement in range during cold conditions. The Valeo system performs well in APTA testing conducted by Proterra and provides as much and more heat as the Eberspaecher unit. More detail information on performance of the Valeo HVAC in heating can be provided as required.

The Valeo system integrates fully with the optional Auxiliary heat system provided by Proterra and has been tested by Proterra to confirm operation with both heating systems.

Cabin Cooling

The Cabin cooling provided by the Valeo system is very similar to the Eberspaecher HVAC system used on previous Catalyst BEB models. The Valeo system uses a hermetically sealed scroll compressor as compared to the semi-hermetically sealed compressor used in the Eberspaecher unit. This hermetically sealed unit offers some leak reliability improvement some customers will desire per their specifications. The Valeo system is designed to work for both heating and cooling and the design constraints based on this make sizing the condenser smaller than the Eberspaecher unit. This results in a system that cannot dump as much heat out of the cabin into the very hot ambient conditions. However, based on testing results that Proterra has completed the Valeo system does perform well relative to APTA testing specification. More detail information on performance of the Valeo HVAC in cooling can be provided as required.

Vendor cooling and heating performance is shown in the below image COP (Coefficient of Performance) is the ratio of heat out/power in for both heating and cooling performance.



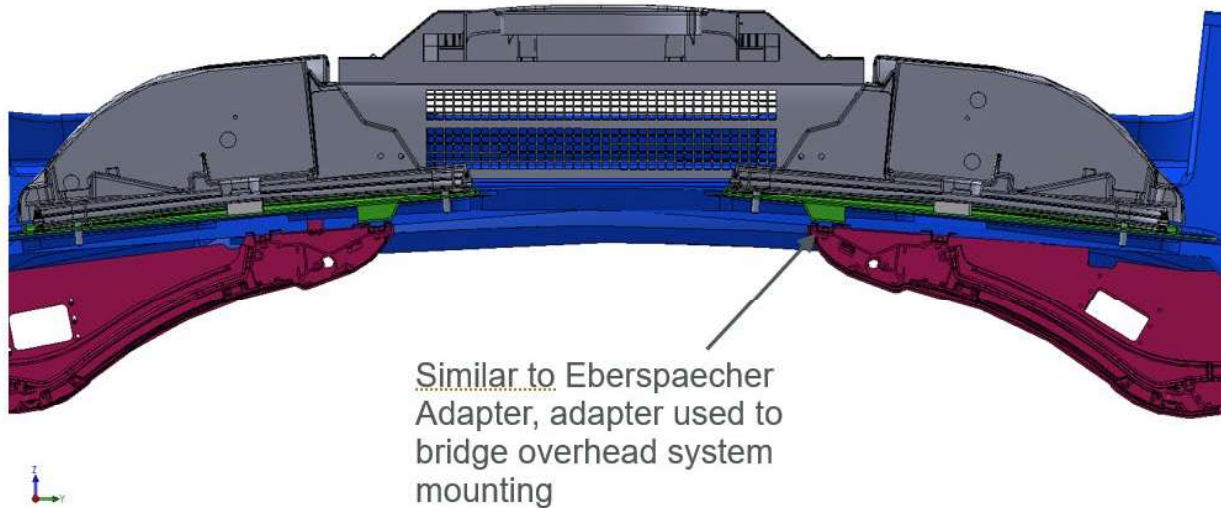
Electrical

The Valeo HVAC for Proterra has been designed such that it uses the same electrical interfaces as the Eberspaecher as required. The electrical integration has been confirmed on multiple buses. The connection with Low Voltage and High Voltage DC are the same as the Eberspaecher in connector type, definition and location. The Eberspaecher unit uses a remotely mounted (rear) water cooled Variable Frequency Drive (VFD) that provides electrical power to the HVAC fans, blowers and compressor. The Valeo unit differs from the Eberspaecher in that it uses an integrated air cooled VFD. This integrated VFD removes the need Low voltage power and HV power to (the VFD from the HVJB) and from (the VFD to the HVAC) the external VFD requires; simplifying the overall design. The air cooled VFD of the Valeo has been tested with the unit at ambient temperatures up to 115 deg F with no issues.



Mechanical

The integration of the Valeo HVAC has been accounted for in the latest Proterra ZX5 bus body design and will work with any of the ZX5 buses mechanically. The HVAC has been through install and rigorous thermal and durability testing on the Proterra bus with exceptional results. The mechanical integration of the Valeo unit (gray) its mounting plate designed for Valeo (green) the bus body (blue) and overhead system (maroon) is shown below.





Controls

The Valeo unit has the same operational control capabilities as the Eberspaecher unit. Controls integration has been done to ensure that the Valeo unit can work with base vehicle controls. This has been confirmed through testing with a base design control system. Can control of the unit has been confirmed including all modes and options and the BTMS (Battery Thermal Management System) chiller operation. The driver interface will change with the Valeo HVAC and an image of the driver interface for Valeo is shown on the next page.

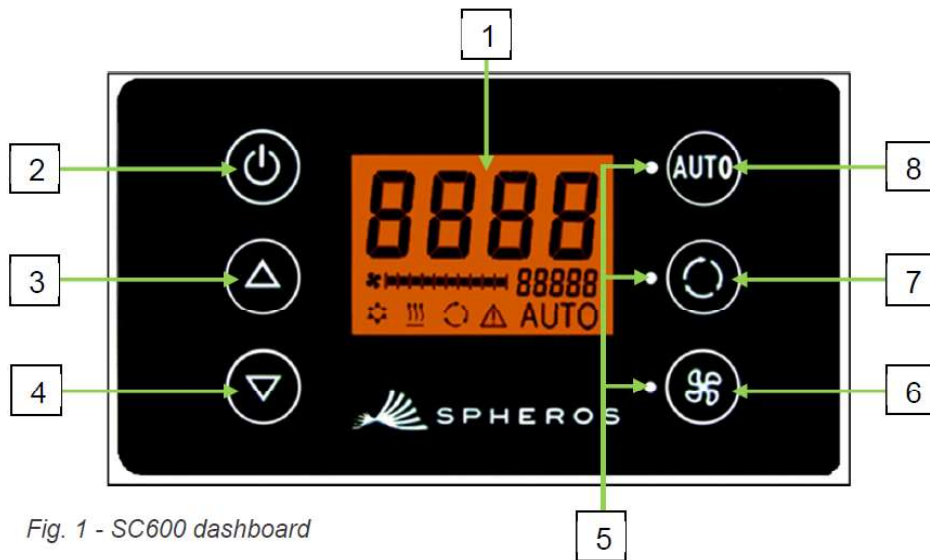


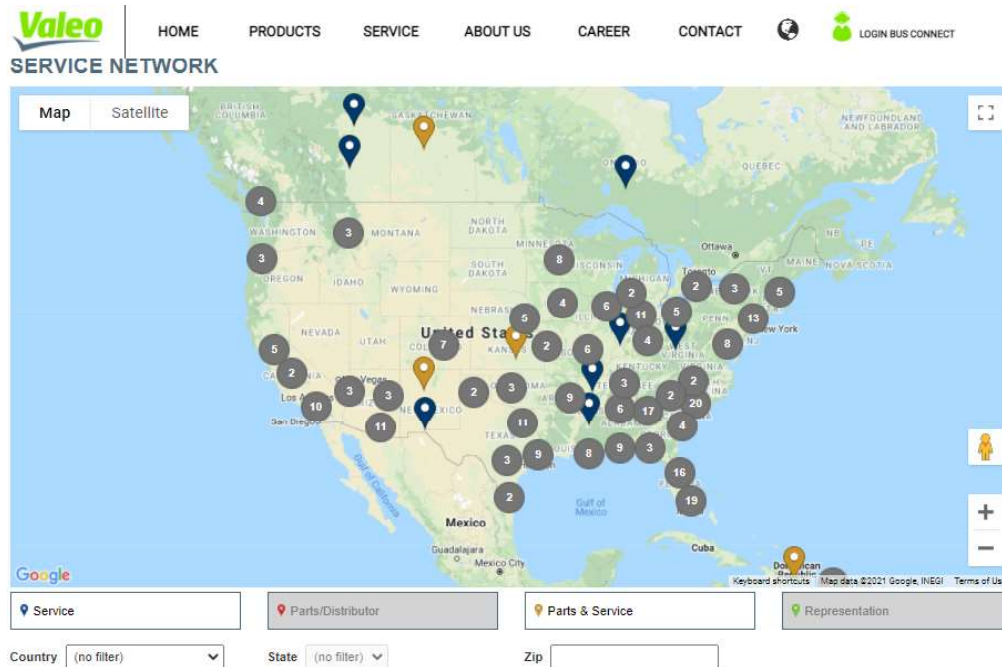
Fig. 1 - SC600 dashboard

- | | |
|-------------------------|-------------------------------------|
| 1. Display | 5. Function status light |
| 2. On/off button | 6. Blower button |
| 3. Scroll UP menu key | 7. Fresh air/circulation air button |
| 4. Scroll DOWN menu key | 8. Auto button |



Valeo Service Network

Valeo has an extensive, global service network to service its products. There are over 250 US locations providing service to its existing US customers. For this RFP, Valeo has six (6) Denver-area shops that will be able to provide service for the Valeo Revo-E Global HVACs.



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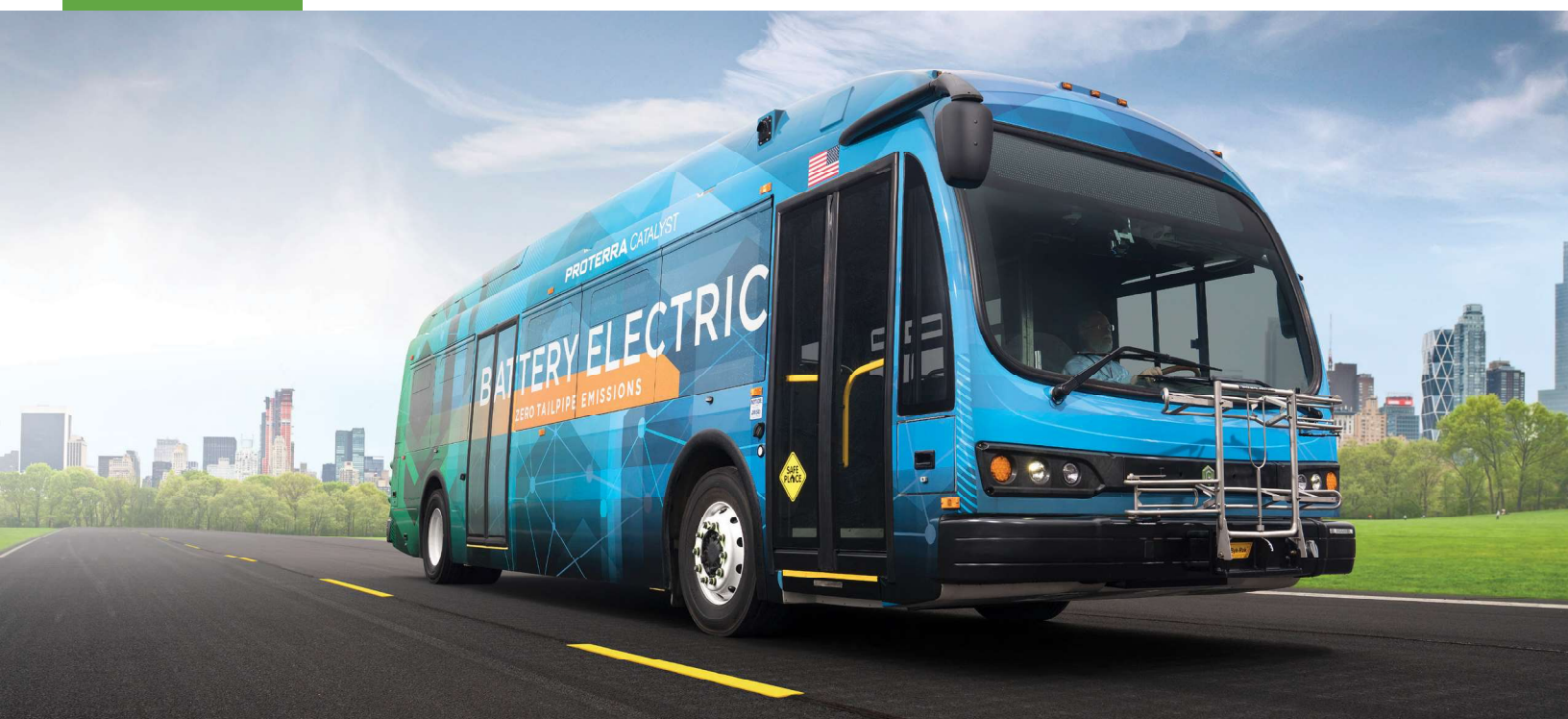
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PROTERRA

HVAC SYSTEMS

IN PROTERRA® ELECTRIC BUSES



The HVAC systems used in Proterra battery-electric buses are designed to keep the vehicle operator and passengers comfortable in all climates and weather conditions. Proterra selects HVAC systems that are lightweight, energy efficient, easy to maintain, and most suitable for Proterra's purpose-built electric vehicle architecture. The system is mounted on the roof and is powered by High Voltage (HV) DC electricity from the main energy storage system that powers the vehicle drivetrain.

Key Product Considerations for HVAC Systems in Proterra Electric Buses:

- 800V system voltage
- Auxiliary evaporator heat exchanger: active battery cooling function
- Side discharge, center return air: compatible with our interior and other HVACs
- Full CAN control and integral aux heat control option – for common interface
- Packaging envelope on 35-foot and 40-foot platforms
- Efficiency and power supply
- Heating performance and element technology (PTC vs resistive)
- Cooling performance
- Heat pump option
- NVH
- Buy America compliant



PROTERRA

HVAC SYSTEMS

IN PROTERRA® ELECTRIC BUSES

As a base platform element, HVAC systems in Proterra buses undergo:

- **Full vehicle thermal characterization**
 - Cabin temps, gradients, pull-up, pull-down testing
 - Battery coolant loop testing
- **Mechanical durability validation**
 - Vendor sub-system shaker testing to Altoona profile
 - Follow-up vehicle durability testing
 - NVH measurements and tuning
- **Base vehicle controls integration**
 - High voltage supply or inverter pairing
 - Driver controls, including aux heat sub-control
 - Body controller CAN integration
- **Alpha/Beta/Pilot unit launch tests and BOM releases**
 - Base vehicle BOM release finished ~10 months before first customer delivery
 - All development and validation testing must be done before this release
 - Cannot switch in between customer pilot and ramp-up



40 FT



35 FT

ALL-ELECTRIC ROOFTOP AIR CONDITIONING UNIT FOR ELECTRO- AND HYBRID BUSES

REVO[®]-E GLOBAL



STRONG LIGHTWEIGHT ELECTRIFIES THE WORLD

The REVO[®]-E Global is supplementing our range of all-electric rooftop air conditioning units and is specifically oriented to the demands of the global markets. A special emphasis was placed on lightweight construction, performance and simple installation. In addition to heat pump technology, customers also have the option of PTC heating.

BEST-BUS-CLIMATE.COM



HIGHLIGHTS



Low life-cycle costs

- Low consumption of energy due to low unit weight
- Short dimensions allow space for battery system on the roof
- Long duration due to brushless EC blowers
- Nearly maintenance-free



Environmentally friendly

- Safety against leakage due to the hermetically sealed refrigerant circuit
- Noise emissions optimized



Comfort

- Cooling capacity from 23 to 33 kW
- Heating with PTC heater or heat pump possible as an option
- Tropical version: deployment up to 55°C outside temperature



Range of driving

- Maximization of the range due to the low unit weight
- Optimized power consumption
- Variable regulation of the PTC heater



Others

- Integrated compressor, no installation of refrigerant lines necessary
- Designed for R 134a & R 407C



Optionally with PTC heating, available in 20 kW versions.

PTC HEATER

The new high-voltage PTC heaters complement our heating systems. They are intended for use whenever there is simply an additional need for heating. In operation the PTC heaters can be infinitely adjusted by means of an electronic control unit developed by Valeo.

TECHNICAL DATA

REVO®-E Global REVO®-E Global T	Version 1 Cooling	Version 1 Trobe Cooling (application up to 55 °C)	Version 2 Cooling + PTC heater	Version 3 Cooling + heat pump	Version 4 Cooling + heat pump + PTC heater
Cooling capacity (kW) Refrigerant R 134a Refrigerant R 407c	25 33	- 33	25 33	23 30	23 30
Heating pump capacity (kW) Refrigerant R 134a Refrigerant R 407c	- -	- -	- -	13 19	13 19
Current consumption (A) (26V DC)	nominal 70 ¹⁾	nominal 70 ¹⁾	nominal 70 ¹⁾	nominal 70 ¹⁾	nominal 70 ¹⁾
Current consumption (A) (600V DC) Refrigerant R 134a Refrigerant R 407c	Cooling max.12 ²⁾ /regulated 7 ³⁾ Cooling max.18/regulated 11	- Cooling max.18/regulated 11	Cooling max.12 ²⁾ /regulated 7 ³⁾ Cooling max.18/regulated 11	Cooling max.12/Heat pump max.10 ⁴⁾ Cooling max.15/Heat pump max.14	Cooling max.12/Heat pump max.10 ⁴⁾ Cooling max.15/Heat pump max.14
PTC heater (optional) (kW)	-	-	0 - 20	-	0 - 20
Fresh air	optional	-	optional	optional	optional
Weight (kg)	230	238	250	250	270
Dimensions L x W X H (mm)	3,100 x 1,900 x 295	3,550 x 1,900 x 295	3,100 x 1,900 x 295	3,100 x 1,900 x 295	3,100 x 1,900 x 295

1) Nominal (condenser 80%) (evaporator 70%)

3) regulated (temperature passenger compartment at set-point 27 °C and ambient 35 °C)

2) Cooling maximum (compressor speed 90 Hz)

4) Heat pump maximum (compressor speed 90 Hz)



Multiplex System

The Continental VDO hardware was selected as the backbone for the vehicle MUX system due to its integrated design, I/O count, cost, superb support, and reliability. The system is easy to program, utilizing a hybrid of ladder logic as well as text and graphical programming. It consists of a centralized master controller, 7 multiplex nodes distributed throughout the vehicle, and the drivers display system.

The centralized master controller is the Continental ZR32A. This controller operates 2x32-bit RISC processor, has 2x512kByte internal flash, 2Mbytes of external flash, 6 CAN ports, and supports SAE J1939-73 DM1 messaging. The controller is programmed utilizing KWP2000 over K-line. The ZR32A controller maintains the configuration for the multiplex system and acts as the master logic controller. If it ever needs to be replaced, the controller will need to be programmed and configured. This task is simplified with the use of the Proterra Service Tool which allows the controller to be programmed and configured without the use of third-party software. The same service tool provides diagnostic support, troubleshooting, and calibration of other vehicle systems.

The multiplex units provide a dense I/O count per unit, 30 inputs and 32 outputs. This makes the system very adaptable to deployment throughout the vehicle. Each multiplex node can provide up to 30 amps of power at a time and each output includes short circuit detection and protection as well as open circuit detection. The multiplex nodes can be replaced while in the field without requiring programming as the communications addressing is all handled through wiring connections and the master controller retains the configuration.

The drivers display system consists of a MOKI3 and DMUX. These units combine to provide visual and audible feedback to the driver. This system also provides additional I/O for the control system. The MOKI3 allows for the customization and personalization of the analog style gauges and indicator lamps. It is a fully integrated Continental solution allowing for a simple and clean presentation of vehicle data in a timely and accurate manner. The DMUX provides the graphical based screen and additional I/O count. It operates on the same 24V nominal range as the rest of the control system. Graphics are powered by a 32-bit RISC processor and the logical I/O is powered with an 8-bit RISC processor. The logical section provides an additional 60 inputs and 28 outputs which greatly expand the configurability of the driver's workplace.

Wiring Pass Through Documentation

Proterra's battery electric buses do not have engines with combustible material in the rear powertrain compartment. The cables that pass through the rear bulkhead are Roxtec and Icotec products which provide a very rugged and water proof pass-through.

Jump Start Connector

Proterra's battery electric buses come standard with an Anderson 350A red jump start connector which is installed in the low-voltage battery compartment.



TS 40.5 High Voltage Disconnect System

Please submit further explanation as part of your proposal for review by the evaluation committee:

The contactors are required to be located as close to the energy source as possible, preferably within the motor controller. The contactors on a Proterra vehicle are located within the high voltage batteries, making them extremely close to the energy source. This design meets the requirement and Proterra just wants to clarify they are within the batteries, not the motor controller. The contactors within the batteries are the primary means to disconnect energy from the vehicle. If a safety system is activated, these contacts are opened and are fully rated to interrupt the power. Both the BMS and vehicle controller are monitoring safety systems and either one can disrupt the energy. Additional contactors are contained with the HV junction box and can interrupt power to some HV loads. This is the redundancy we spoke of. When the HV system is disabled, these contactors, downstream of the HV batteries, will also open.

Proterra has a number of manual HV disconnects available depending on the Service situation. Each battery has a manual disconnect that will physically remove HV negative and prevent it from leaving the battery. The HV junction box also has a physical disconnect switch that will interrupt HV negative and prevent it from leaving the box.

TS 41.1.2 Shielding

Please submit further explanation as part of your proposal for review by the evaluation committee:

Our 3 phase motor cables are grounded at both the motor and inverter. This design is proven to provide the best protection to mitigate radiated energy from the powertrain.

Proterra Proprietary and Confidential



Fire Suppression System

The Amerex automatic fire suppression system provided in the base vehicles consist of the following components:

1. 25lb ABC Dry Chemical Suppressant Bottle
2. (4) 350F Detection Sensors
3. (4) Dispersion Nozzles
4. Control Panel
5. Manual Activation Switch
6. Distribution Network



1. FIRE SUPPRESSION BOTTLE

An Amerex fire suppression bottle containing 25lb of ABC dry chemical fire suppressant is mounted on the roof of the vehicle. Mounting location can be seen in Figure 1.

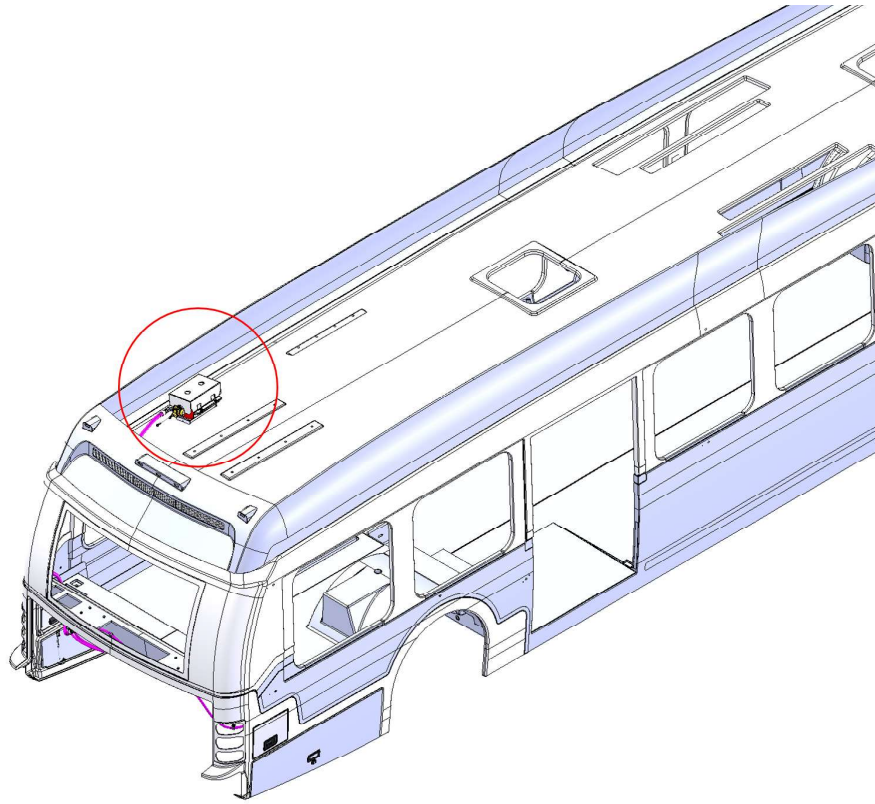


Figure 1: FIRE SUPPRESSION BOTTLE LOCATION

The bottle is mounted using threaded inserts which are installed into the body of the vehicle. The bracket is secured using (4) M12 fasteners.



2. DETECTION SENSORS

(4) 350F spot detection sensors provide detection capability for the following areas on the vehicle.

1. Auxiliary heat fuel tank
2. Auxiliary heater
3. Powertrain/high voltage junction box area
4. Low voltage battery box

Locations of sensors can be seen in Figure 2. Note that the view is referenced from the rear underside of the vehicle.

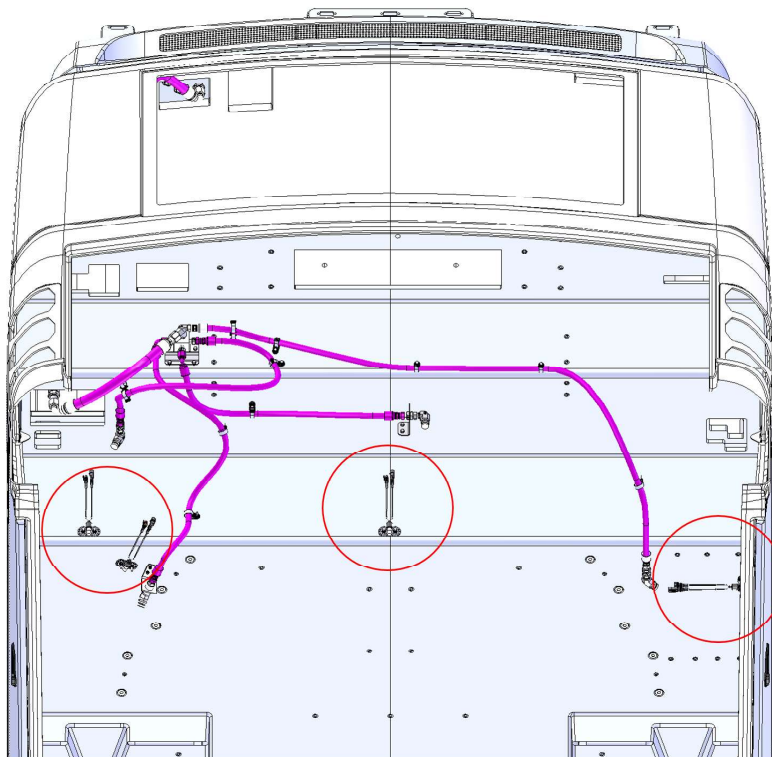


Figure 2: SENSOR LOCATIONS

Upon activation of one of the sensors vehicle will enter a 15 second countdown before dispersion of the fire suppressant.

3. NOZZLES

4 brass nozzles with dust caps are located in the general area of each detection sensor. Nozzle locations can be seen in Figure 3. Note that the view is referenced from the rear underside of the vehicle.

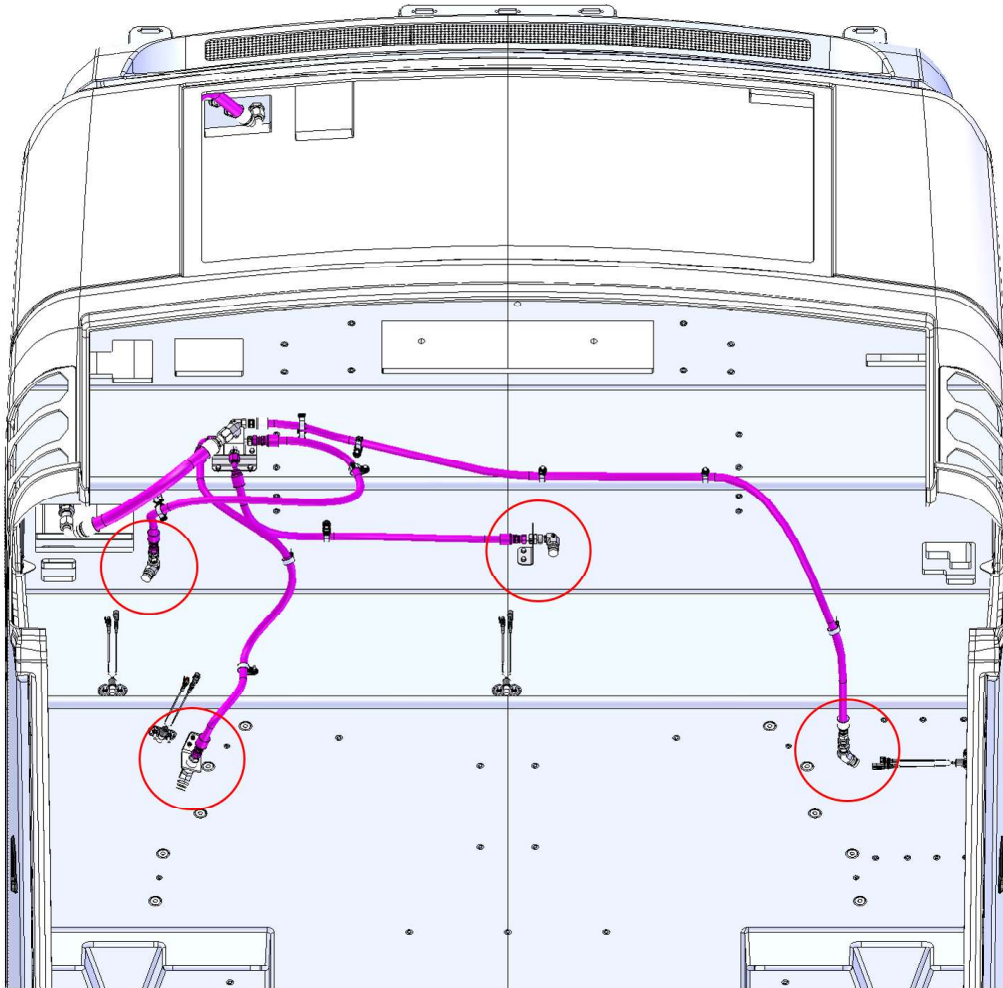


Figure 3: NOZZLE LOCATIONS



4/5. CONTROL PANEL AND MANUAL ACTIVATION SWITCH

The fire suppression control panel and manual activation switch are both located in the driver's area on the driver's overhead panel. Figure 4 shows the location of the control panel and manual activation switch.

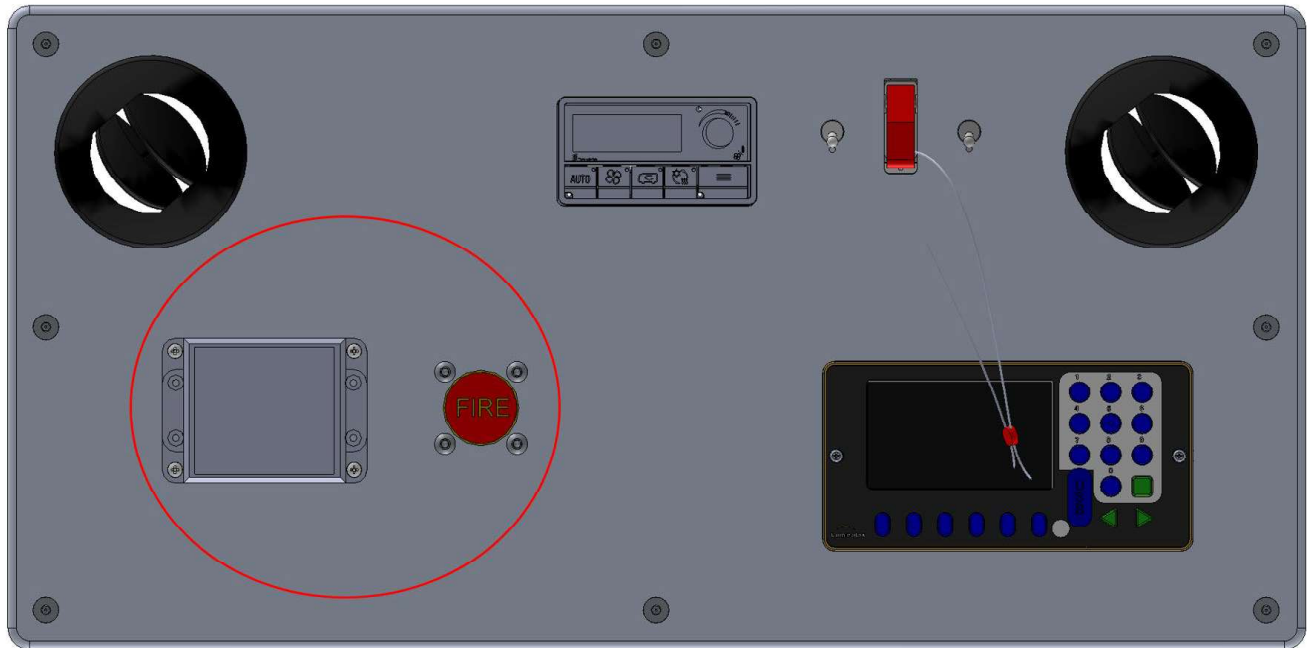


Figure 4: CONTROL PANEL AND MANUAL ACTIVATION SWITCH

The control panel displays system status as well as any faults or fire events. The manual activation switch allows the operator to activate the suppression system by removing a pin and pressing the “fire” button.



6. DISTRIBUTION NETWORK

The distribution network is composed of multiple $\frac{1}{2}$ " and $\frac{3}{4}$ " SAE100R16 hydraulic hose and fittings. The distribution network routes the fire suppressant to the nozzles in the event of a fire. The bottle is connected to a distribution manifold which branches off to each nozzle. An overview of the distribution network is seen in Figure 5.

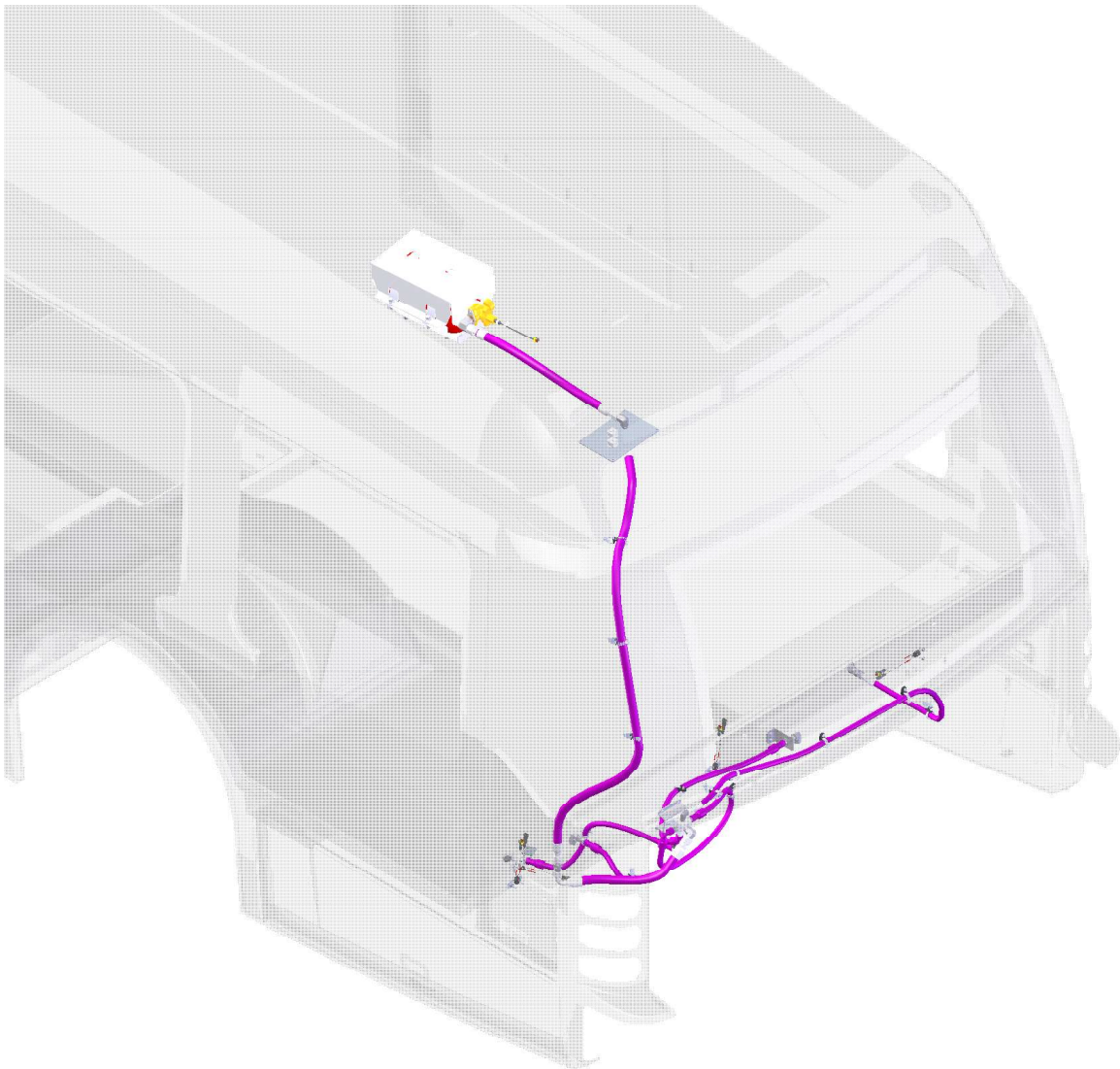


Figure 5: DISTRIBUTION NETWORK



Entrance Door

The entrance door is a Ventura Systems (Ventura) pneumatic in-swinging door. Two pneumatic actuators are used to rotate the door shafts. The actuators are connected to the lever at the top of the door shafts. When the actuators extend, it creates an inward gliding movement of the door panels.

Two guiding brackets at the top of the door leafs are moving in the guiding rail of the door mechanism. These guiding brackets are needed to position the door leafs perpendicular with the step edge of the vehicle in the open position and stabilize the door leafs in open and closed positions. The potentiometers are connected to the door shafts by a tie rod and they track the position of the door panels.

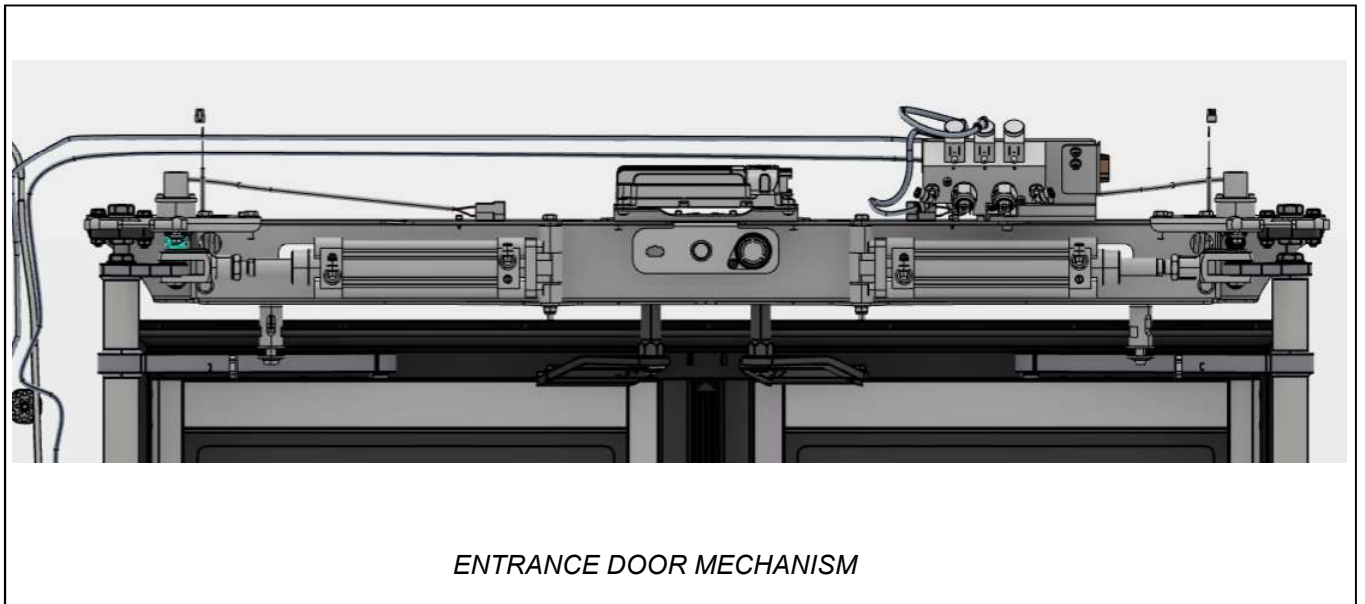
Each door panel has an electric sensitive edge. The controller also tracks speed of the door panels in the opening and closing direction. If the sensitive edges were to fail for any reason and the door panels hit an object, the controller senses the loss of door speed and will reverse the door panels.



Figure 17-1. Front and Rear Passenger Doors



ENTRANCE DOOR



ENTRANCE DOOR MECHANISM



Rear Door

The rear door is a Ventura Systems (Ventura) pneumatic in-swinging door. Two pneumatic actuators are used to rotate the door shafts. The actuators are connected to the lever at the top of the door shafts. When the actuators extend, it creates an inward gliding movement of the door panels.

Two guiding brackets at the top of the door leafs are moving in the guiding rail of the door mechanism. These guiding brackets are needed to position the door leafs perpendicular with the step edge of the vehicle in the open position and stabilize the door leafs in open and closed positions. The potentiometers are connected to the door shafts by a tie rod and they track the position of the door panels.

Each door panel has an electric sensitive edge. The controller also tracks speed of the door panels in the opening and closing direction. If the sensitive edges were to fail for any reason and the door panels hit an object, the controller senses the loss of door speed and will reverse the door panels.

Both doors are Ventura off the shelf designs that were slightly modified to fit our bus. These doors have extensive use in transit buses especially in the European market.



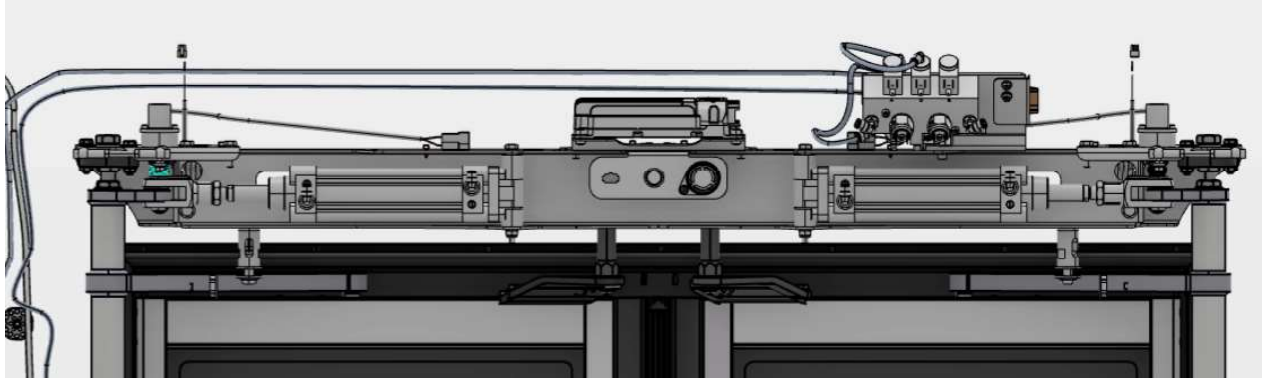
Proterra Confidential Information
East Coast Manufacturing

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West Coast Manufacturing
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REAR/EXIT DOOR MECHANISM

Past Performance with Ventura Systems

Ventura is based out of the Netherlands and sells doors into the European, Asian, African, & North American markets. They have thousands of transit bus doors in service. They report having a 15x higher MDBF (mean distance between failures) than any other door supplier in North America. Proterra has installed the Ventura door systems (both electric & pneumatic) on all of our 40' Catalyst buses. When we first started using their doors for the 40' Catalyst bus, we experienced some issues with the doors coming out of adjustment. We brought Ventura back in for additional, more extensive training with our production installers and the issues have since been mitigated. We have not installed any other door OEM products installed on our 40' Catalyst buses, although our original 35' BE35 EcoRide buses were originally outfitted with Vapor doors, before we switched over to the Ventura doors. Based on the field service data, the Ventura doors have performed much better in service. Additionally, some of our 35' BE35 EcoRide customers demanded that their buses be retrofitted to the Ventura doors as the previous OEM couldn't successfully address the issues in the field. Ventura has provided great service support to all of our fleet customers.

Working procedure:

1. Clean the door frame with help of primer and a piece of cloth.
2. Clean the ceramic screening of the glass with "Simson Cleaner I".
3. Apply sealing tape and two-sided tape to the outside of the door frame. See figure 1 / 2.
4. Apply glue (Simson STR 360) to the whole door frame (step 5-9 within 15 min due to drying period of glue). See figure 2.
5. Remove the protection from the two-sided tape.
6. Position glass, Ventura logo according figure, DO NOT PRESS THE GLASS. See figure 3.
7. SINGLE GLASS, position the glass (2mm) from the top (decisive), as shown figure 3 / 4.
8. DOUBLE GLASS, position the glass (2mm) from the bottom (decisive, e.g. lock), as show in figure 3 / 4.
9. Press the glass to the sealing tape.

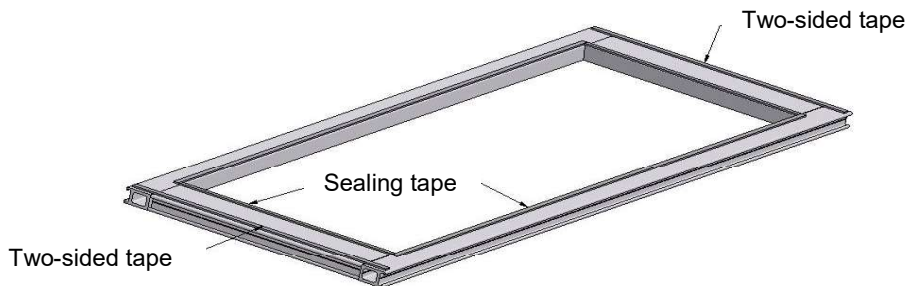


Figure 1: Applying sealing tape and two-sided tape to the door frame

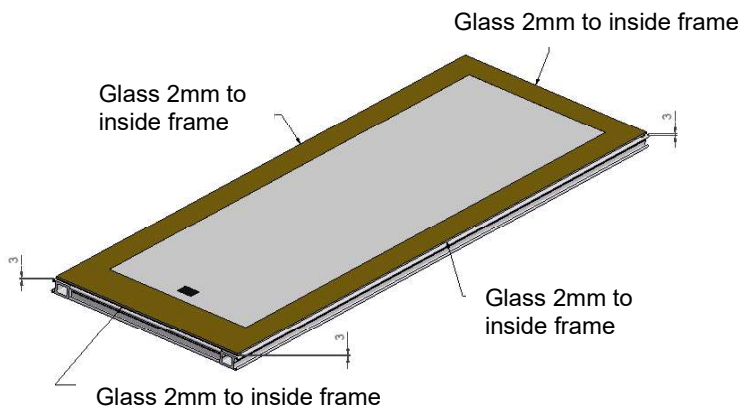


Figure 4: Glass positioning

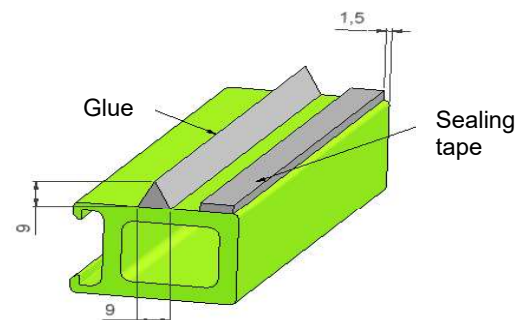


Figure 2: Applying sealing tape

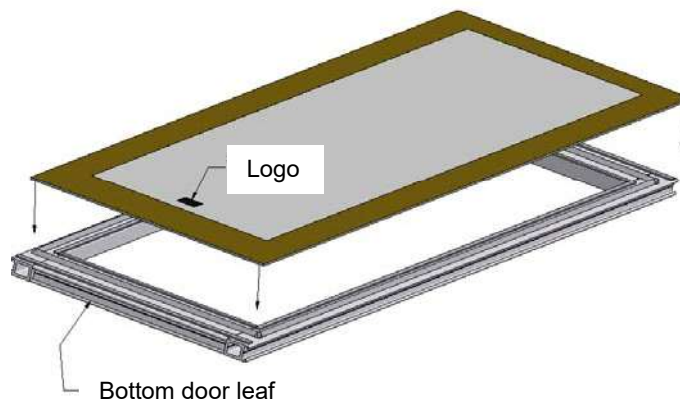


Figure 3: Applying glass to door leaf



Air Brakes and Air System

The pneumatic (air) system on the vehicle consists of the following components:

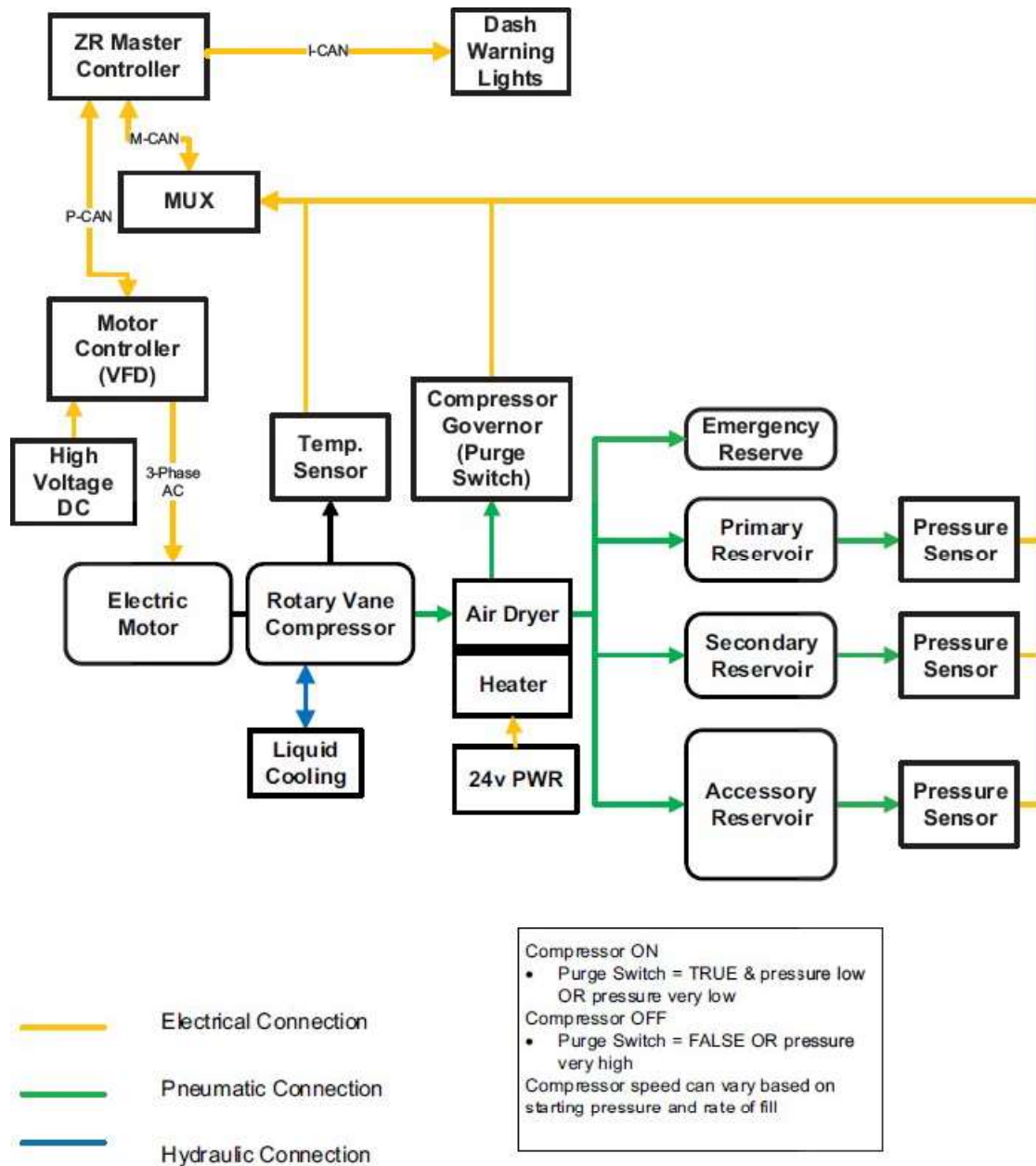
- Rotary, oiled, vane-style air compressor
- AC induction motor directly coupled to the compressor
- High-Voltage Variable Frequency Drive (VFD) to provide the HV electricity to the variable speed compressor. This VFD is a dual output device that also power the power steering motor.
- Air dryer
- Air tank and distribution system (Primary, Secondary, Auxiliary, Override)
- Pressure sensors and controls needed to operate the system

The pneumatic system feeds the following components:

- Foundation air disk brake
- Parking brake (spring safety brake)
- Air ride system (air bags)
- Doors - Pneumatic doors utilize air for all operation, electric doors utilize air for safety/air dump functions
- Driver's seat adjustment
- Gearbox shifters

When the vehicle master controller detects low air pressure from either pressure sensors located in the air tanks or from the purge switch located on the air dryer, it commands the VFD to enable and provide the necessary power to spin the air compressor. The compressor speed is variable and will change based on the current air pressure and rate of fill. The compressor will stop when the tanks indicate full based on the pressure sensors or the purge switch.

The high-pressure air from the compressor passes through an air dryer and then to the appropriate tank via manifolds. The tank fill sequence is governed by a series of check valves located in the air dryer manifold. The dryer contains a heating element that will activate automatically in cold weather to ensure the moisture relief does not freeze. Diagnostics monitor the performance of the VFD, compressor, air dryer, and sensors and will set faults in the event a problem is detected.



Air Compressor System Diagram

Air Dryer

The function of the Air Dryer system is to collect and removes air system contaminants in solid, liquid and vapor form before they enter the brake system. It provides clean, dry air to the components of the brake system which increases the life of the system and reduces maintenance costs. The necessity for daily manual draining of the reservoirs is eliminated. Additional detail is provided on the following pages.

AD-IS® AIR DRYER MODULE

INTEGRATED SOLUTION AIR DRYER

Enhance Performance, Reduce Maintenance Time

Evolutionary Charging System and Integrated Design

Bendix elevates air treatment to a new level with the Bendix® AD-IS® air dryer module, an integrated solution air dryer for removing liquid, vapor and solid contaminants from the air system. With a new concept in system charging and a modular design that combines a variety of air system components, the AD-IS® air dryer module enhances performance, simplifies maintenance, decreases the total number of parts, minimizes potential leak points and reduces system weight. The spin-on cartridge design makes replacement quick and easy.

Enhanced Performance

The AD-IS® air dryer module raises the bar over current industry standard air drying systems with its innovative system design. With four pressure protection valves located directly on the air dryer module, accessories can be plumbed straight from the air dryer as opposed to connecting through either of two air system reservoirs. This design feature reduces complexity and minimizes possible leak points.

The AD-IS® air dryer module purge cycle uses air from a self-contained reservoir instead of accessing either of two available air system reservoirs. As a result, the air system reservoirs maintain consistent pressure during the purge cycle and are fully dedicated to air system operations.

Simplified Maintenance, Reduced System Weight

The modular design of AD-IS® air dryer module combines the vehicle supply reservoir, governor and a number of charging system components, eliminating many maintenance trouble spots. Fewer components means lower system weight, fewer maintenance requirements and less opportunity for leaks. It also means service centers can inventory fewer parts.

The integrated design also extends the life span of some components. For example, because the governor is mounted directly to the air dryer – away from the heat and vibration of the compressor – it experiences less wear and tear. The majority of the sub-components of the air dryer module can be maintained individually and are easily accessed from one central location.



AD-IS® AIR DRYER MODULE

Spin-On Cartridge

Due to its spin-on design, the desiccant cartridge can be changed in less than 10 minutes, saving fleets maintenance and downtime. With the air dryer's integral purge volume, this spin-on cartridge meets today's highest performance standards, making the AD-IS® air dryer module an ideal solution for a wide range of applications.

Genuine Bendix Quality and Total Air Guarantee

With the Bendix® AD-IS® air dryer module, you can rely on Genuine Bendix quality backed by our Total Air Guarantee (T.A.G.) limited warranty. We're so certain of the Bendix® AD-IS® air dryer module performance abilities that, under normal usage, it's warranted for three years or 350,000 miles. And if it's installed as original equipment on a vehicle, you're eligible for our T.A.G. program. T.A.G. extends the warranty of other Bendix air and antilock brake system components also installed as original equipment on the same vehicle to three years or 350,000 miles.

Specifications

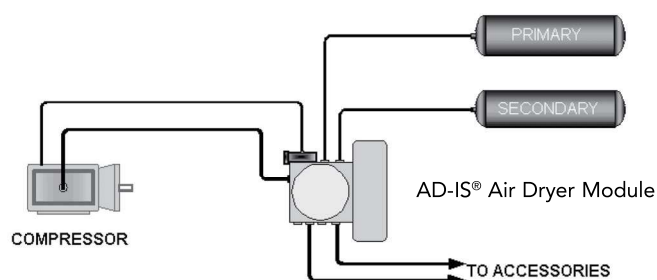
Height:	11.5 inches
Width:	9 inches
*Projection:	10 inches
**Weight:	27 pounds
Heater:	12V and 24V
Purge Source:	Integral
Mounting:	SAE 4-hole thread pattern
Governor:	110 to 130 psi, integral to dryer
Models:	Standard and Extended Purge
Warranty:	T.A.G. limited warranty; 3 years/350,000 miles (for complete details on the T.A.G. warranty, refer to Bendix publication BW1716)

* Extended purge projection 12 inches

** Extended purge weight 31 pounds

BENDIX® AD-IS® AIR DRYER MODULE PART REDUCTION VS. TYPICAL CHARGING SYSTEM

Category	Typical Reduction
Major Components	56%
Pneumatic Lines	44%
Pneumatic Connections	50%



Bendix® AD-IS® air dryer module system schematic

Bendix® AD-IS® Air Dryer Module System Benefits At-A-Glance

- Simpler charging system design reduces the number of possible leak points.
- Higher system air pressure (up to 135 psi) provides extra braking reserve.
- Number of components is reduced, resulting in weight savings.
- Reduced maintenance requirements.
- Spin-on cartridge design provides quick and easy servicing.
- PuraGuard® oil coalescing dryer cartridge available.

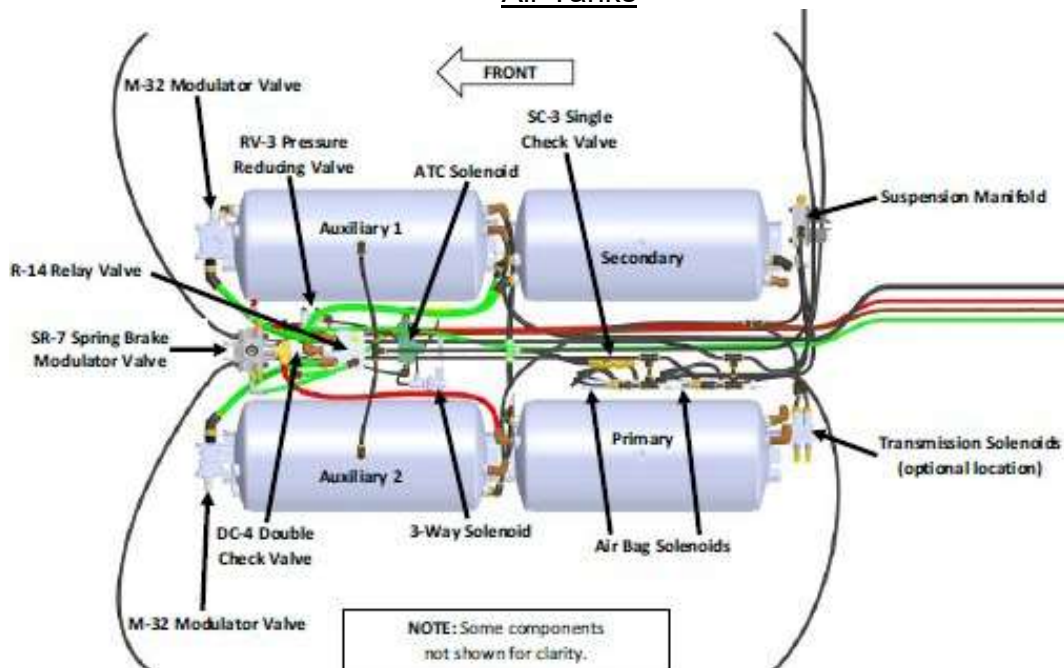
Get Ahead Of The Performance Curve With The Bendix® AD-IS® Air Dryer Module

Integrated design, enhanced performance and reduced maintenance time. Discover how the Bendix® AD-IS® air dryer module can enhance your commercial vehicle. Talk to your Bendix Account Manager, call 1-800-AIR-BRAKE, or visit bendix.com today.



PROTERRA

Air Tanks



Air Compressor Technical Specifications

Parameter	Specification
Compressor Type	Hydrovane Transit 0009-0010 Water-Cooled Air End Compressor
Frame Foot and Flange Mount Type	LSMV 100L
Nominal Power	3kW
Rated Power	3.2kW @ 3200 RPM
Nominal Supply Voltage	230VAC 3-Phase, D Connection
Air Delivery	285 NI/m (10 CFM) @ 9 Bar (130 PSI), 3200 RPM
Rated Speed	1000 to 3200 RPM, stepped speed operation
Max Operating Pressure	10.3 Bar (150 PSI)
Motor	Winding Squirrel Cage Induction Motor
Lubrication	VAFFHPO2000-4
Protection	IP 55 (IP 65 Terminal Box)
Water Cooling	20 l/min / 55°C Max Inlet Temperature
Coolant Connections	15L (M22 x 1.5)
Duty	S1 in 40°C Ambient, External Air Cooling
Weight	27 kg (60 lb), Aluminum Frame
Other	<ul style="list-style-type: none"> - Transit Inlet Adapter and End Cap - Compressor/Motor sub-assembly fully supported on AV Mounts - Internal thermostatic valve to oil cooler - Dual Over Temperature Switch fitted (110°C and 120°C) - Coolant to have suitable antifreeze and corrosion inhibitor Motor



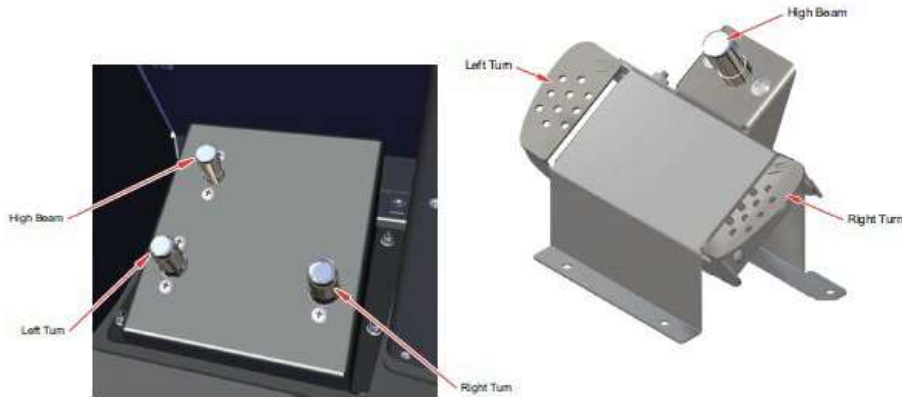
Driver's Area Layout

All controls for safe bus operation are in the driver's area.



The right foot controls (either adjustable or non-adjustable) include the accelerator (far right) and the brakes. The left foot controls include the high beam (on/off) and the left and right turn signals. Optionally, the left foot controls may include a microphone switch.

The left turn signal and right turn signal foot controls are momentary switches and must be continuously pressed for them to operate through the turns.



The high beam is activated by pushing the foot control once; push again to return to the low beam. The blue indicator will be illuminated on the dash. The high beam can only be activated during night mode.

NOTICE: Pedals and Left Foot Controls may differ based on customer requirements.

The dashboard contains the windshield wiper and mirror controls, switches, monitors, and warning or operating condition lamps for the bus.

Dashboard Indicator Lamps

The dashboard indicator lamps are used to show the status of the various standard bus systems such as the headlight high beams, turn signals, and parking brakes. There are also RED and AMBER warning indicators which will illuminate in the event of a fault in one of the bus operating systems. Some of these status or fault indications will also be shown on the driver's display. The driver should always be aware of any indication provided by these dashboard indicator lamps and the driver's display.

Digital Dash

Proterra is launching a new Digital Dash which will become our standard offering. The following page provides an overview of our new dash.



Technical Specifications

- > Super wide-view 12,3 inch color **TFT**-display with resolution of 1440 x 540 px in 8:3 format
- > Programming and control of graphics, texts and animations via CGI Studio
- > Functional programming and control of instrument and Human Machine Interface via **KIBES® 32**
- > Software based on OSEK and Linux operating systems
- > Several interfaces available: high-speed CAN, video, LIN, I/Os, Audio, Ethernet

Driver's Side Window



Rev A
1/21/2021
Michelle Benson



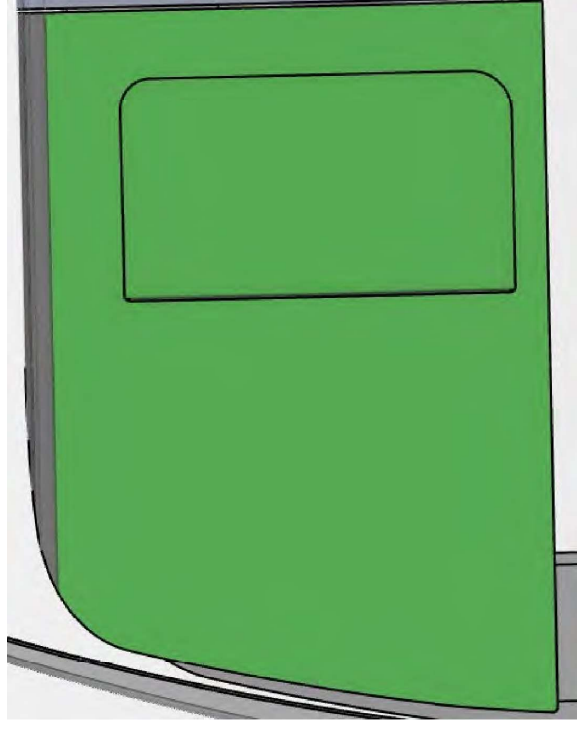
PROTERRA

Base Driver's Window



Driver's Window:

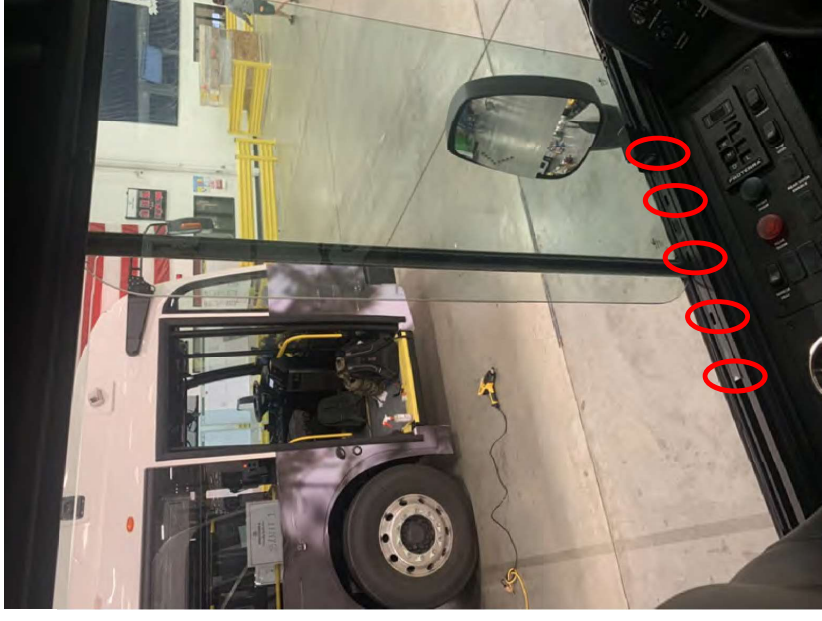
- Tinted green
- 75% light transmittance
- Tempered glass
- Hidden fasteners
- Single opening slider window with a rocker latch handle



Rocker Latch



- Rocker Latch will lock into 5 different positions. (shown in red)
- Window can be opened to in between locations, but it will not lock in



ITS & Customer Electronics



Rev A
1/21/2021
Michelle Benson



PROTERRA

Electronic Cabinet Location

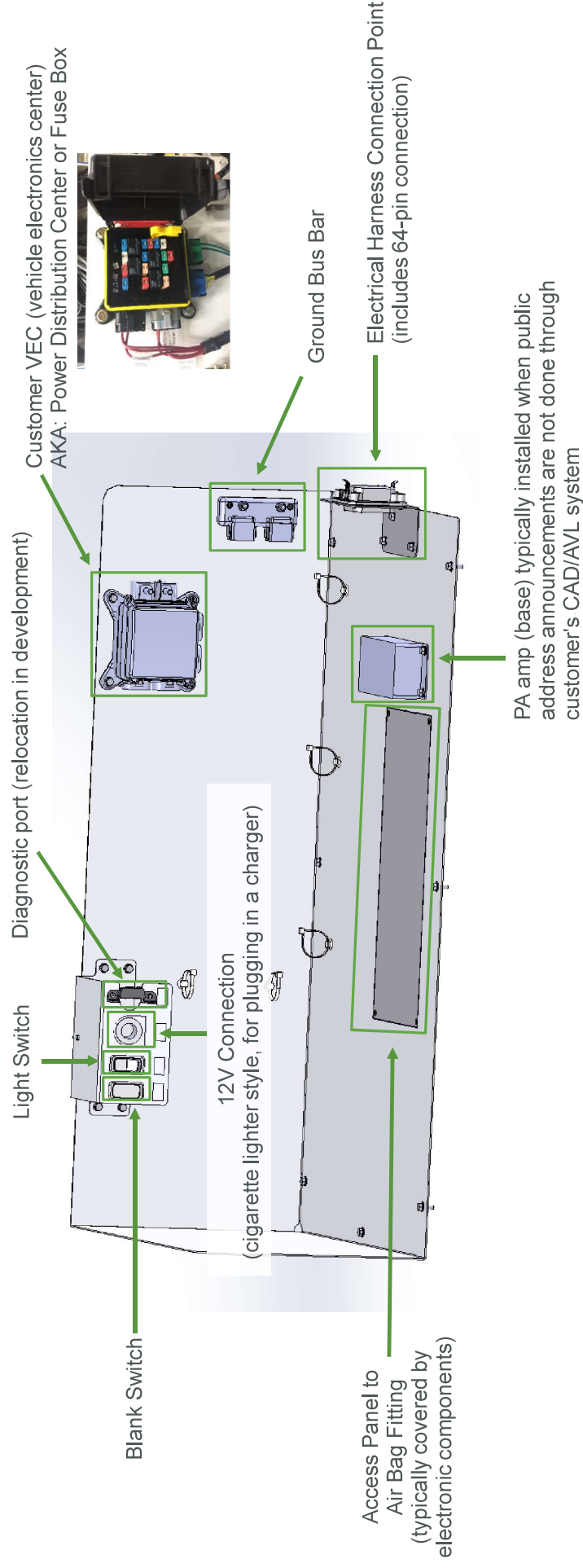


- ITS components, radios, WIFI, DVRs etc. Are installed in the street side wheel well box located behind the driver.

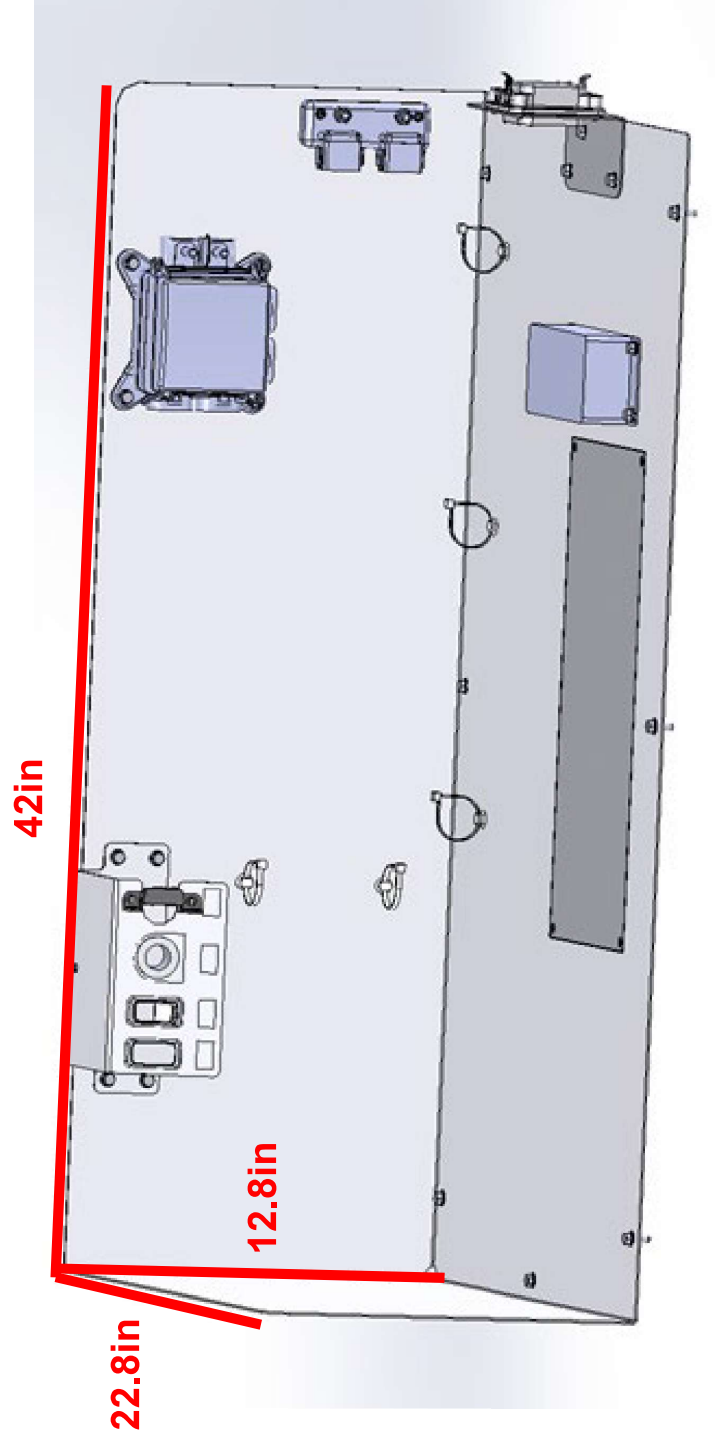


Typical Layout

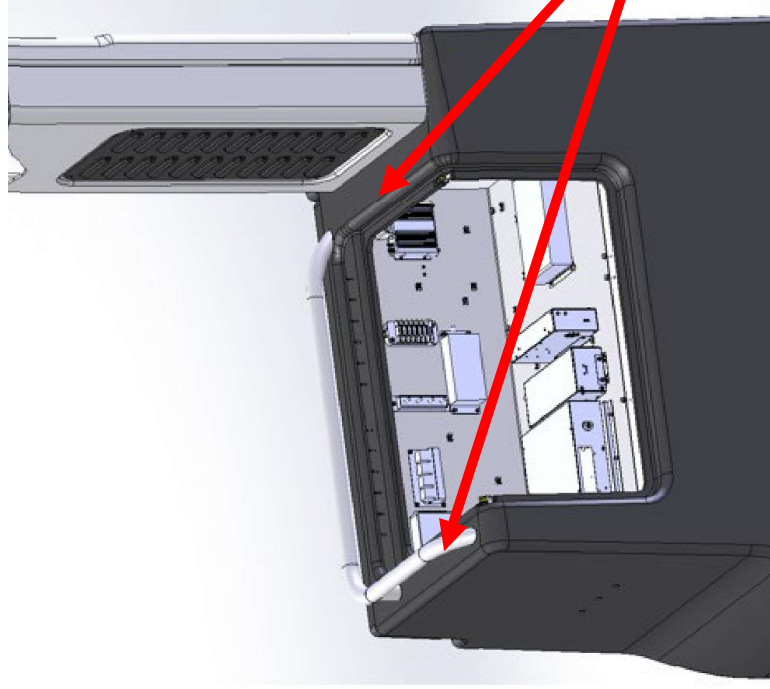
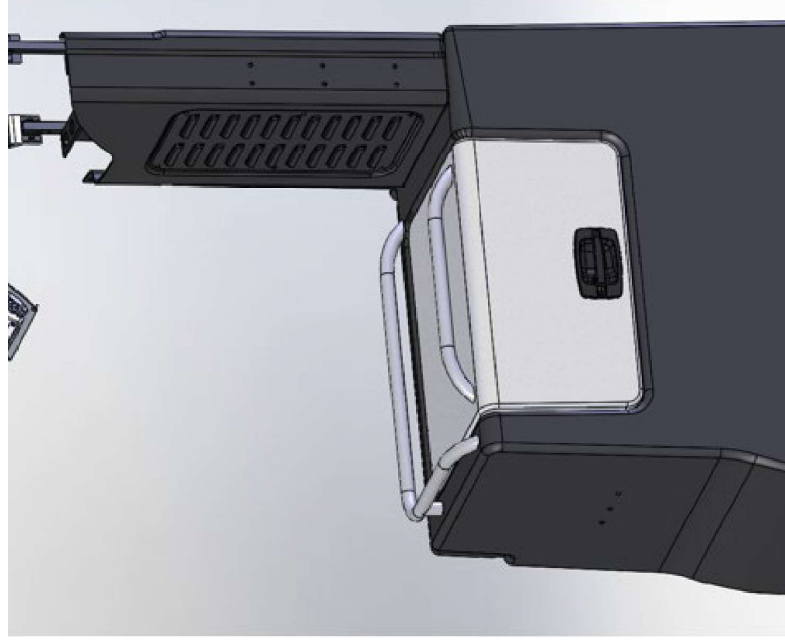
Base Customer Electronics Cabinet Configuration



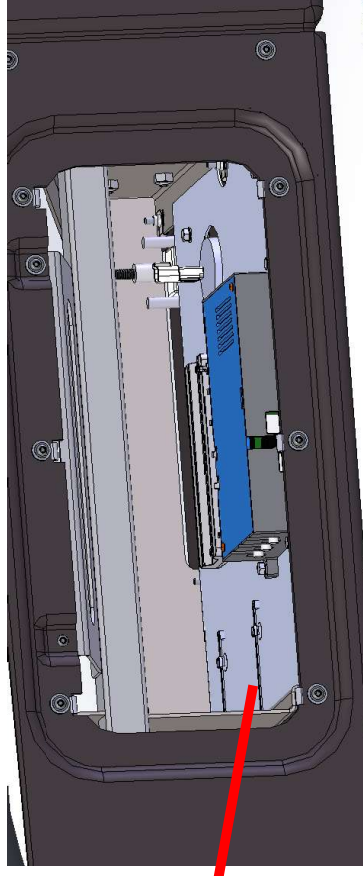
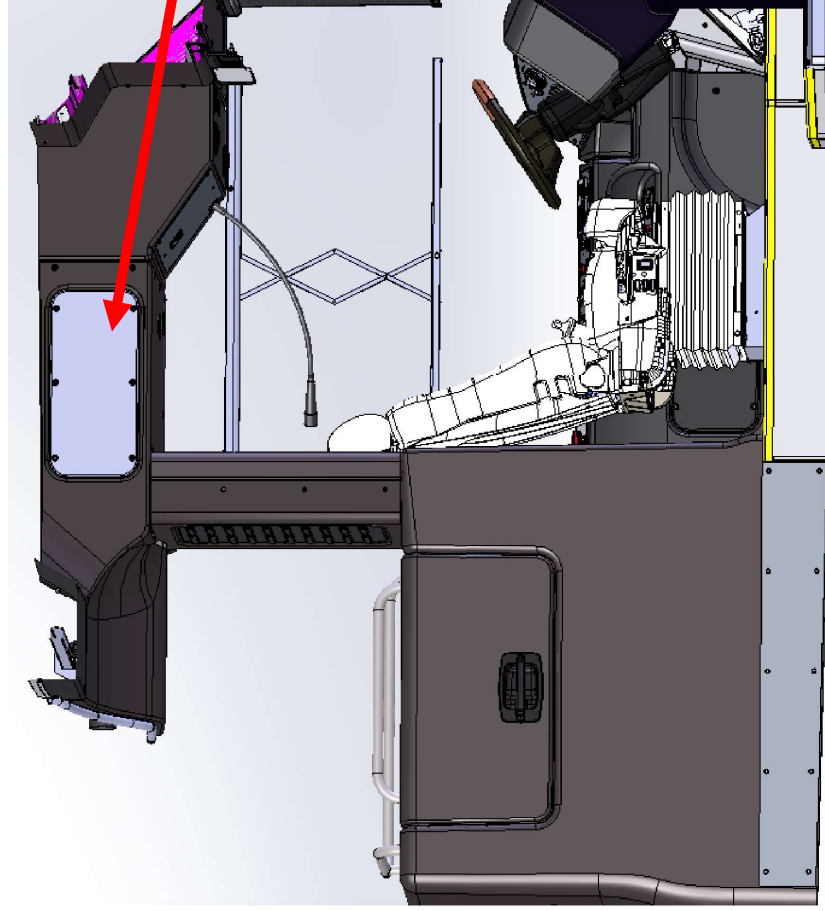
Dimensions



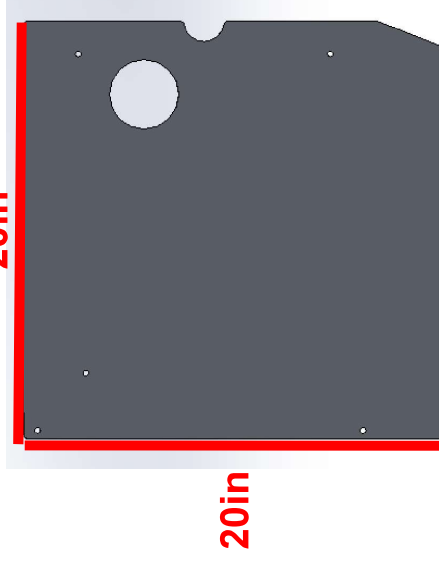
Work light locations



Additional ITS storage



20in

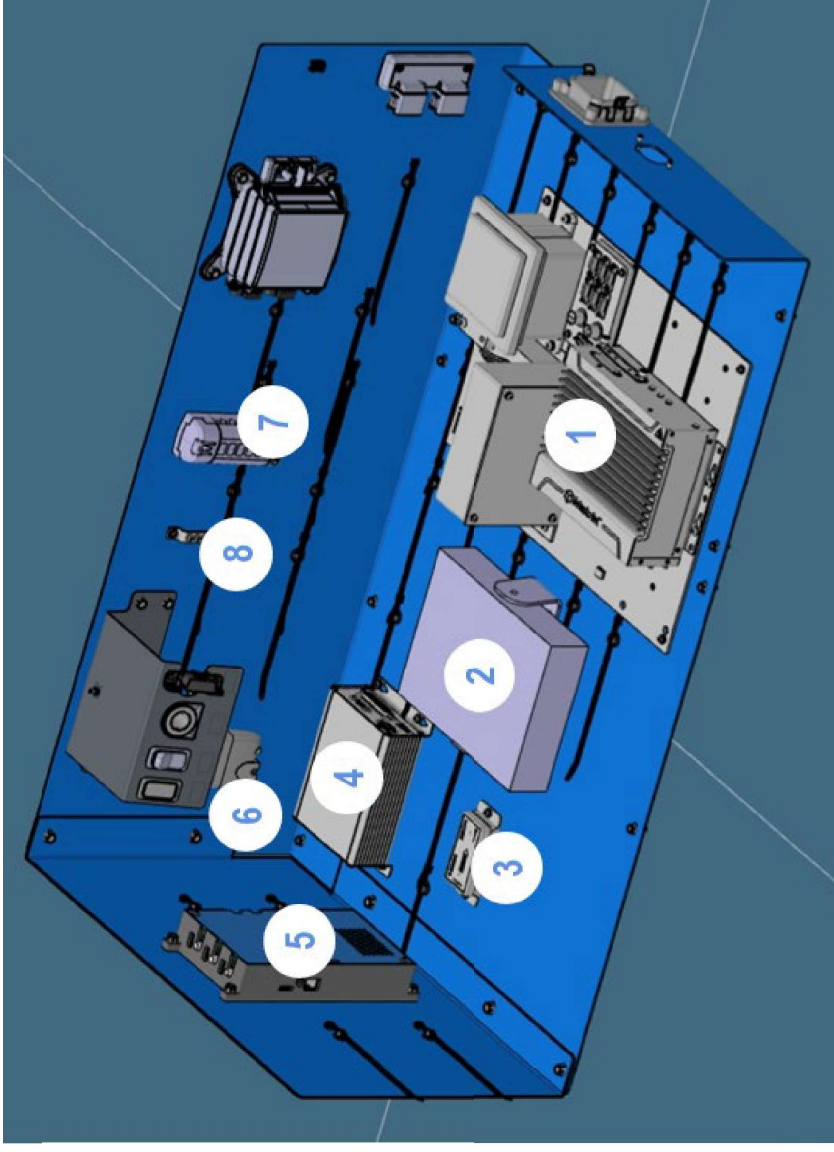


20in

Mounting
surface only
installed
when needed

Example of Average ITS Layout

- 1. Avail Plate – ITS vendor component
- 2. APX6500 Radio – for communication with dispatch
- 3. G Force Sensor – Used to monitor significant g-force events
- 4. IVU3 – ITS vendor (Avail) component
- 5. Mobileye Shield Controller – collision avoidance system
- 6. Ituran Starlink Modem – collision avoidance system
- 7. Fuse Block – power distribution
- 8. Ground Bus Bar – power distribution



FAQ

- What are some recommended ITS suppliers?
 - Clever, Trapeze, Avail, Syncromatics
- What prewire provisions can be accommodated?
 - Full installs are preferable so that the bus is ready to use upon delivery. If anything less than a full install is requested, details must be provided on the electronics template. The more precise requirements can be provided, the more successful the prewire provisions will be.
- What if there are additional ITS components mounted outside the wheel well box?
 - Please provide photos and information on how these components are mounted on other buses in your fleet. We will try to match the other vehicles in your fleet as closely as possible.
- Can Proterra install components provided by the customer?
 - Proterra prefers to purchase new components to install on new buses. This eliminates the potential to receive bad parts which can slow down production.

FAQ

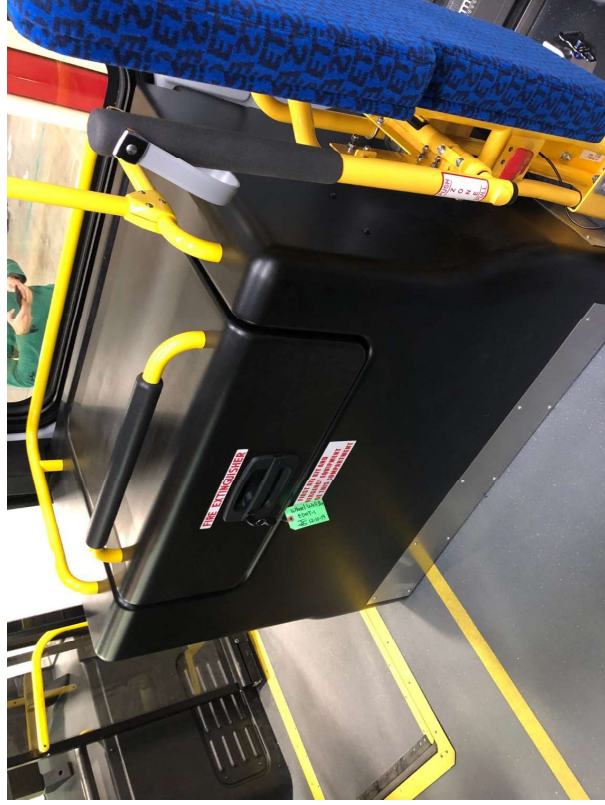


- What validation can Proterra provide?
 - Proterra recommends validation coordinated with the vendor. Most vendors will come onsite to perform validation.

STORAGE BOX—CS FRONT



STORAGE BOX—CS FRONT



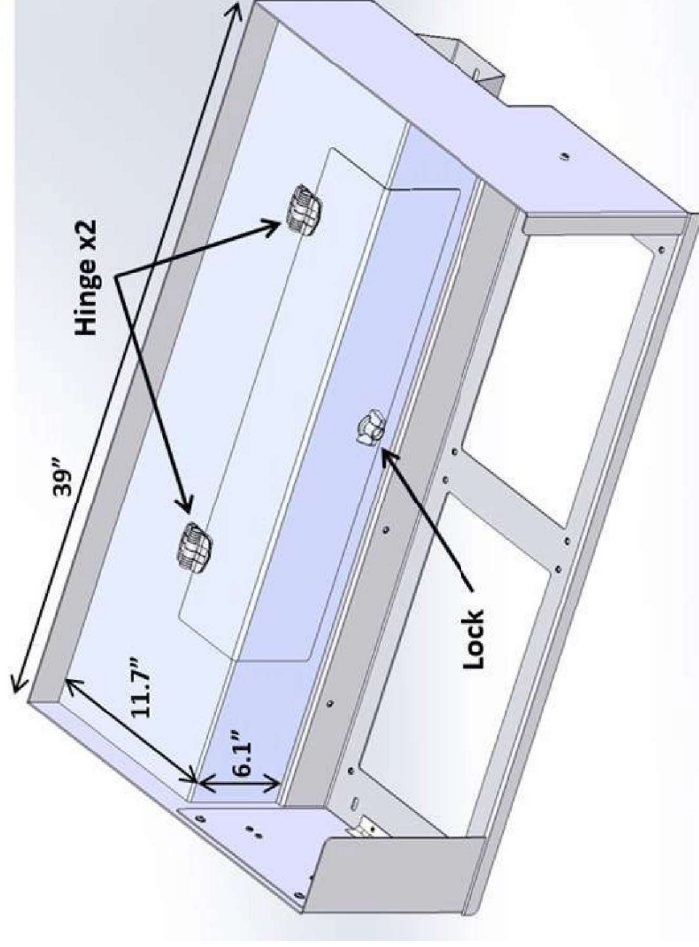
STORAGE BOX—CS FRONT



STORAGE BOX–CS FRONT



CS Wheel Well Box Storage Shelf – Heron



Operator Personal Storage Volume: $39 \times 6.1 \times 11.7 = 2,783 \text{ in}^3$

APTA Guideline: $2,750 \text{ in}^3$



PINELLAS SUNCOAST TRANSIT AUTHORITY (35')

PROPOSED SEATING LAYOUT

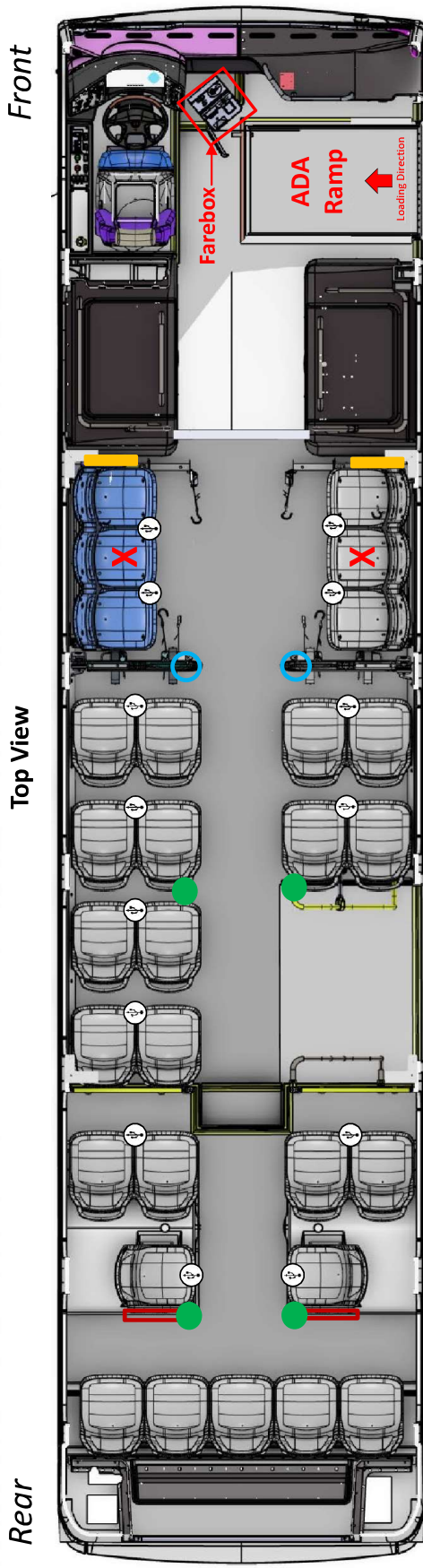
REVISION 00
SEPTEMBER 3RD, 2021

[REFERENCE #: SDR66]
PLATFORM: 35' ZX5

AGENCY APPROVAL:

NAME:

PSTA - PROPOSED SEATING LAYOUT (PROTERRA 35' ZX5)



Misc Options

- Docket 90A:**
 - Aisle Facing Flip Armrest: No
 - Aisle Facing Fixed Armrest: 2
 - Stanchion Cups: 2 (To Be Determined)
 - USB Hubs (optional): 4
- Special Instructions:**
 - Single passenger rear longitudinal seats without clips
 - ADA flip-up seat wiring harness routing "P-clamps"
- Auxiliary Heating Clearance:** No

Restraint Options

- C/S Type:**
 - 4pt - Floor Mounted
 - 4pt - Floor Mounted
- Signaling Device:**
 - Touch Pad (Indicated by X)
 - English / Spanish
- Stanchion Cups:**
 - 2 (x1 per barrier, indicated by O)

Passenger Seating

Model: To Be Determined

Number of Seats: 29

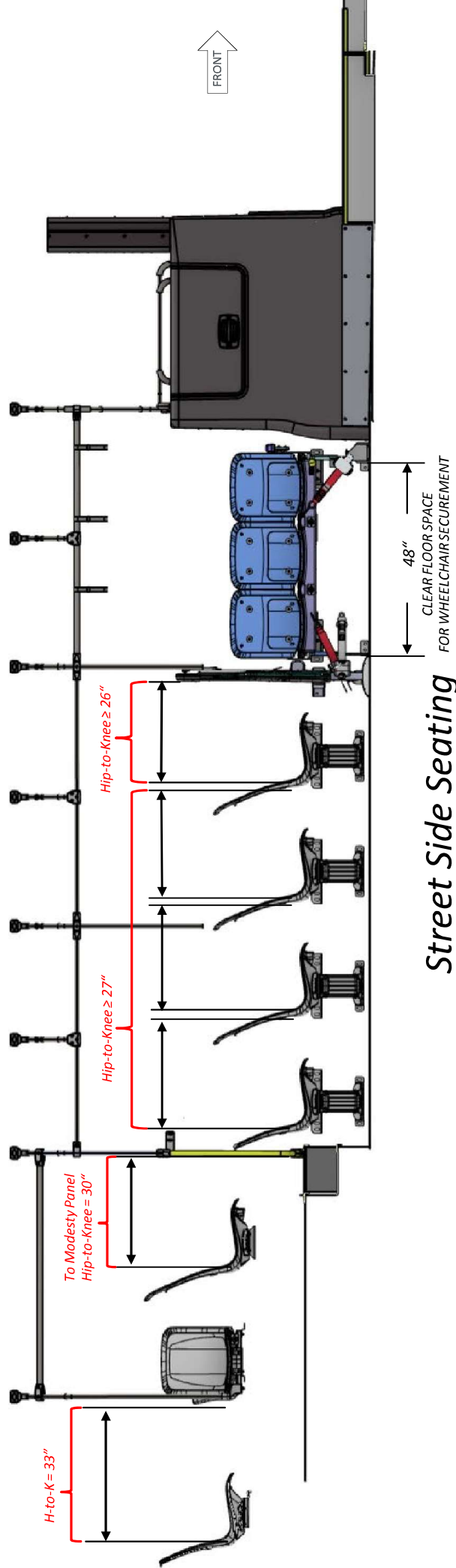
PSTA - PROPOSED SEATING LAYOUT (PROTERRA 35' ZX5)



PROTERRA
1 Whitlee Court | Greenville, SC 29607

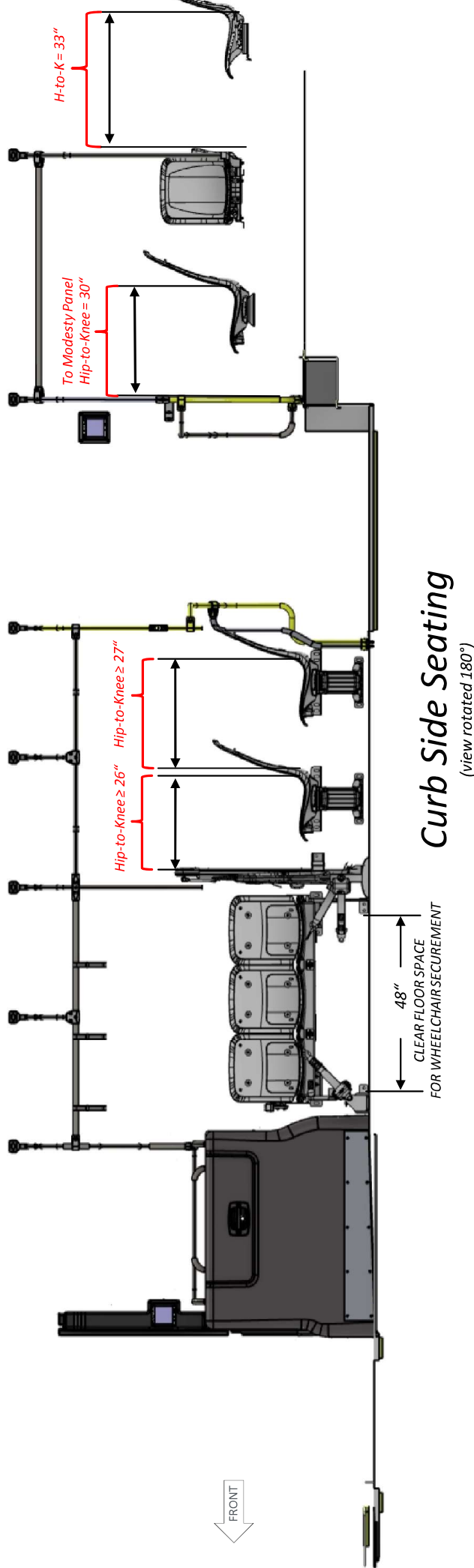
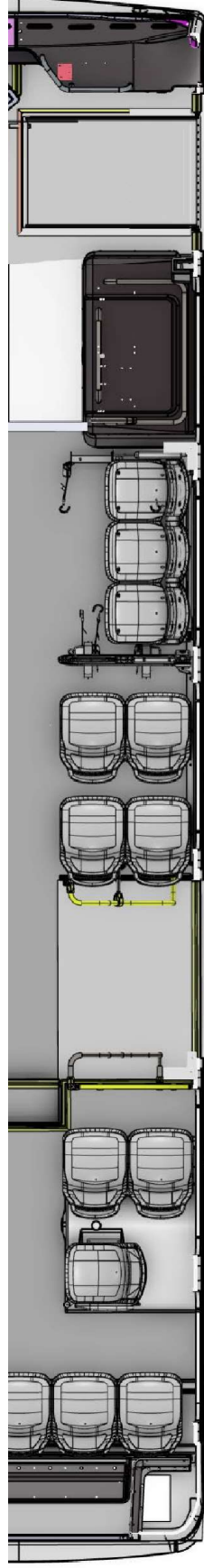


Bus Centerline Section



PSTA - PROPOSED SEATING LAYOUT (PROTERRA 35' ZX5)

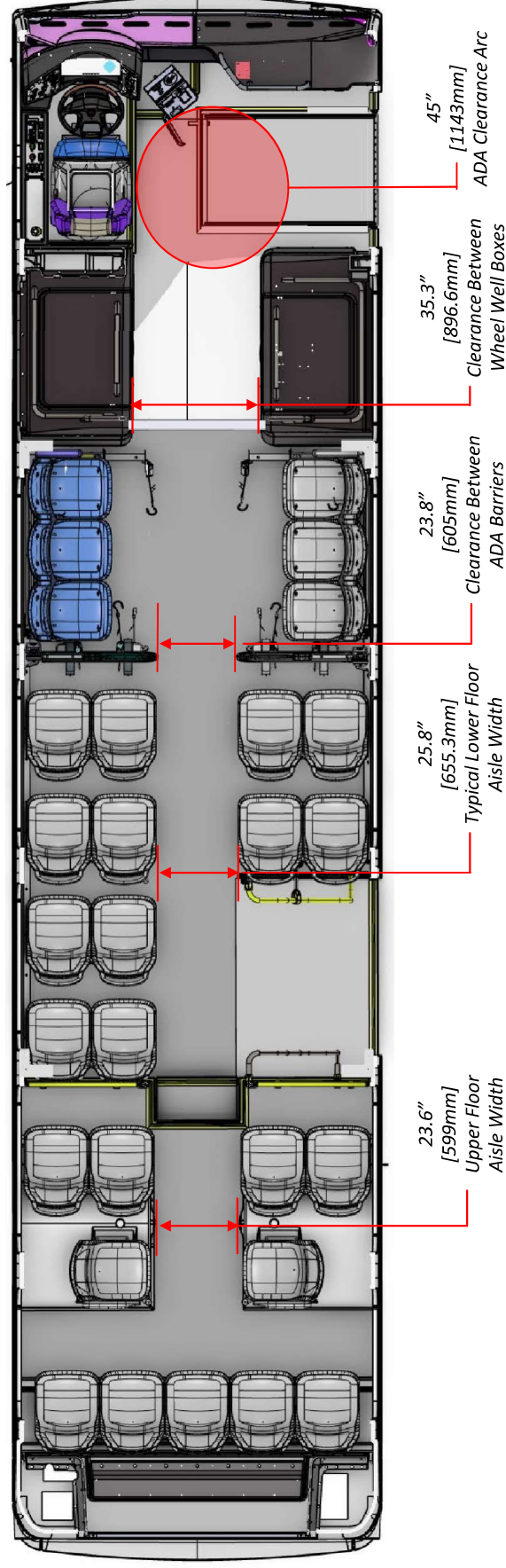
Bus Centerline Section





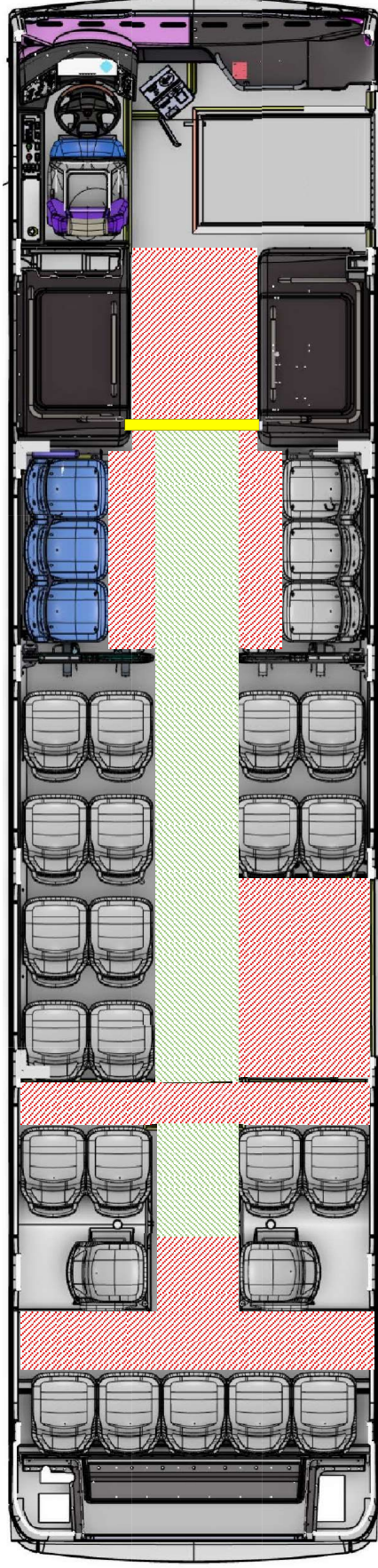
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PSTA - PROPOSED SEATING LAYOUT (PROTERRA 35' ZX5)



Interior Circulation Clearances

PSTA - PROPOSED SEATING LAYOUT (PROTERRA 35' ZX5)

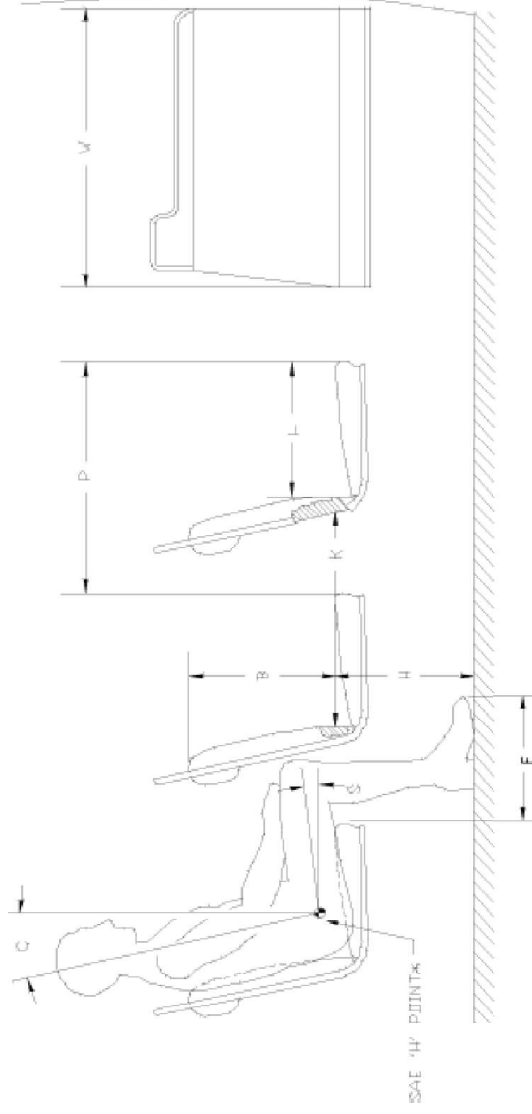


$$3103400\text{mm}^2 = 3.1\text{m}^2 = 33.4\text{ft}^2 / 1.5 = 22 \text{ passengers}$$

Free Floor Space Calculation

PSTA - PROPOSED SEATING LAYOUT (PROTERRA 35' ZX5)

Required Dimensions Per APTA (TS 78)



Width:

- $W \geq 35\text{in}$

Length:

- $L = 17\text{in} \pm 1\text{in}$

Seat Back Height:

- $B \geq 15\text{in}$

Seat Height:

- $H = 17\text{in} \pm 1\text{in}$

Foot Room:

- $F \geq 14\text{in}$

Seat Cushion Slope:

- $S = 5^\circ \text{ to } 11^\circ$

Seat Back Slope:

- $C = 8^\circ \text{ to } 17^\circ$

Hip-to-Knee Room:

- $K \geq 27"$ (seat-to-seat)
- $K \geq 26"$ (to vertical surface)

Aisle Width (per TS 78.10):

- Between seats $\geq 20\text{in}$
- At 32in above floor $\geq 24\text{in}$

PSTA - PROPOSED SEATING LAYOUT (PROTERRA 35' ZX5)

REVISION HISTORY:

REV00...

INITIAL RELEASE FOR RFP ACTIVITY

9/3/2021



PINELLAS SUNCOAST TRANSIT AUTHORITY (40') PROPOSED SEATING LAYOUT

REVISION 00
SEPTEMBER 3RD, 2021

[REFERENCE #: SDR67]
PLATFORM: 40' ZX5

AGENCY APPROVAL:

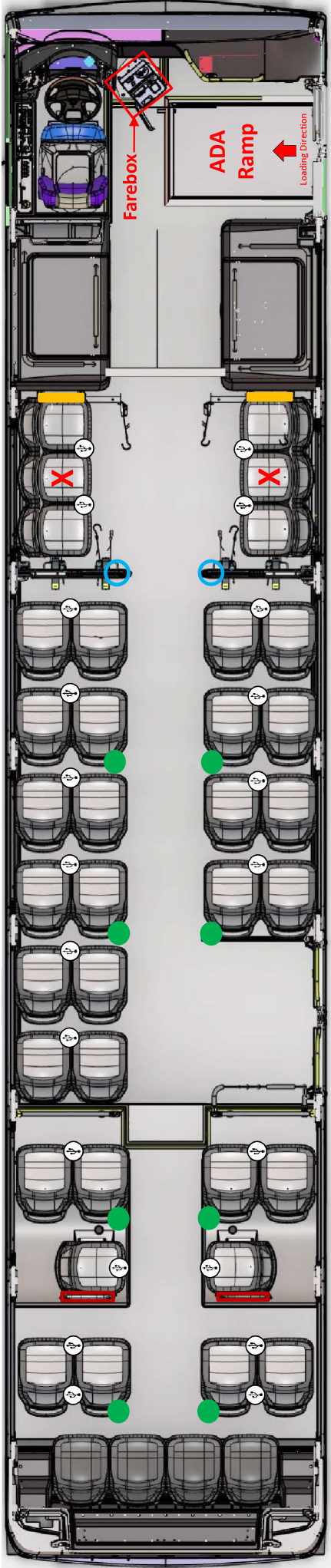
NAME:

PSTA - PROPOSED SEATING LAYOUT (PROTERRA 40' ZX5)

Rear

Top View

Front



Misc Options

- Docket 90A: No
- Aisle Facing Flip Armrest: 2
- Aisle Facing Fixed Armrest: 2 (To Be Determined)
- Stanchion Cups: 8
- USB Hubs (optional): 22
- Special Instructions: Three passenger rear longitudinal seats without clips
ADA flip-up seat wiring harness routing "P-clamps"
- Auxiliary Heating Clearance: No

Restraint Options

- C/S Type: 4pt – Floor Mounted
- S/S Type: 4pt – Floor Mounted
- Signaling Device: Touch Pad (Indicated by X)
- Instruction Language: English / Spanish
- Stanchion Cups: 2 (x1 per barrier, indicated by O)

Passenger Seating

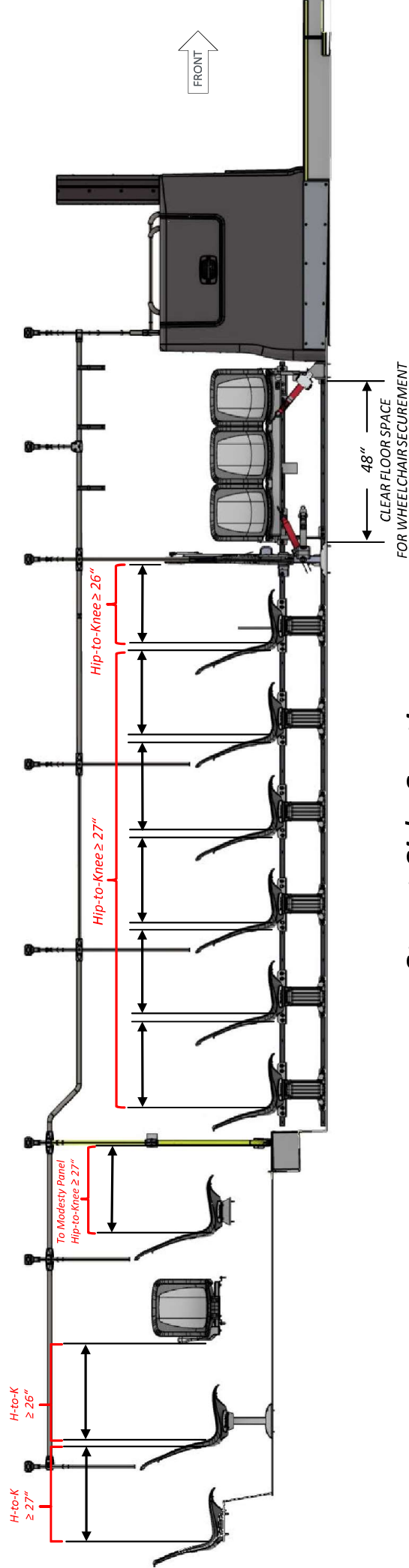
Model: To Be Determined

Number of Seats: 40

PSTA - PROPOSED SEATING LAYOUT (PROTERRA 40' ZX5)



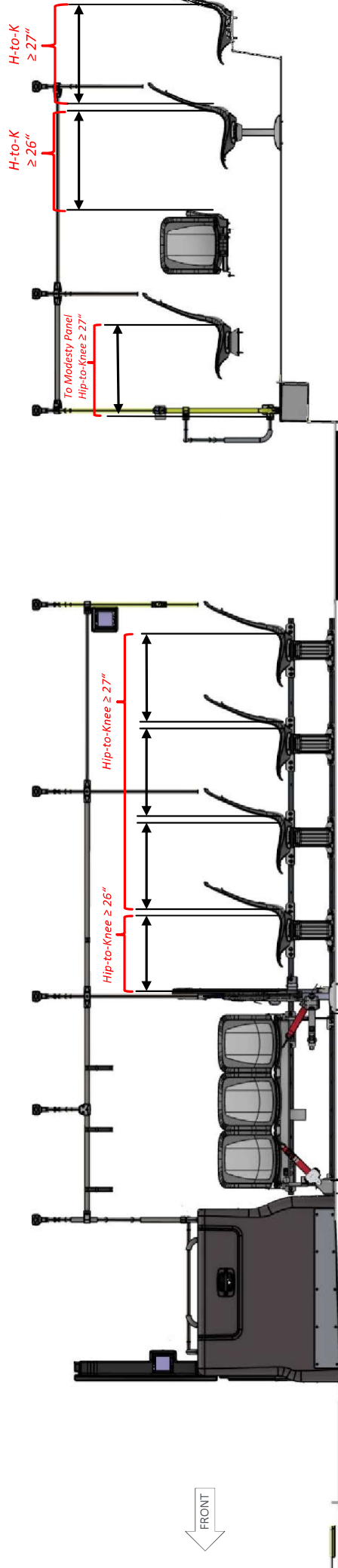
Bus Centerline Section



Street Side Seating

PSTA - PROPOSED SEATING LAYOUT (PROTERRA 40' ZX5)

Bus Centerline Section

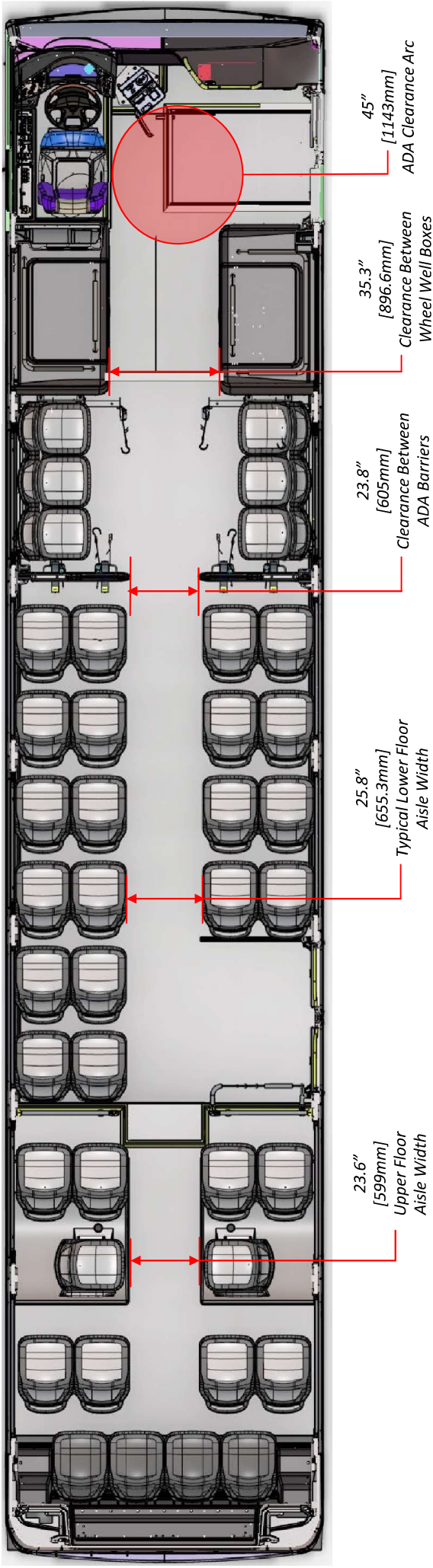


Curb Side Seating (view rotated 180°)



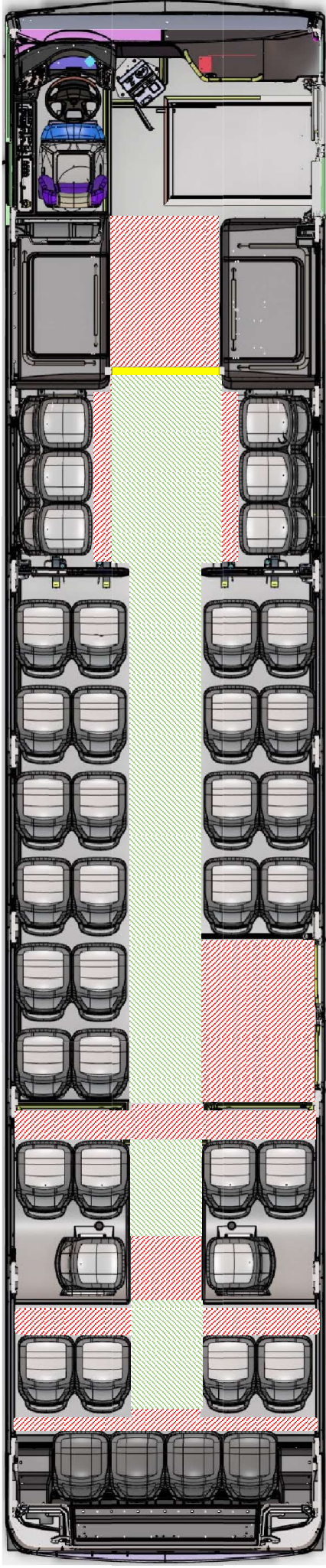
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1 Whitelee Court | Greenville, SC 29607

PSTA - PROPOSED SEATING LAYOUT (PROTERRA 40' ZX5)



Interior Circulation Clearances

PSTA - PROPOSED SEATING LAYOUT (PROTERRA 40' ZX5)

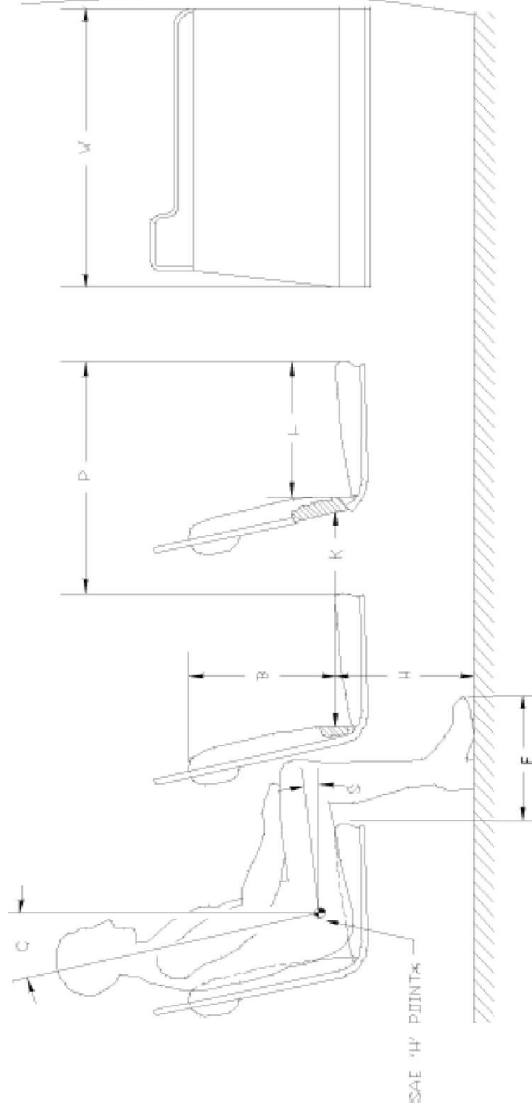


$$4,394,301\text{mm}^2 = 4.39\text{m}^2 = 47.3\text{ft}^2 / 1.5 = 31 \text{ standees}$$

Free Floor Space Calculation

PSTA - PROPOSED SEATING LAYOUT (PROTERRA 40' ZX5)

Required Dimensions Per APTA (TS 78)



Width:

- $W \geq 35\text{in}$

Length:

- $L = 17\text{in} \pm 1\text{in}$

Seat Back Height:

- $B \geq 15\text{in}$

Seat Height:

- $H = 17\text{in} \pm 1\text{in}$

Foot Room:

- $F \geq 14\text{in}$

Seat Cushion Slope:

- $S = 5^\circ \text{ to } 11^\circ$

Seat Back Slope:

- $C = 8^\circ \text{ to } 17^\circ$

Hip-to-Knee Room:

- $K \geq 27''$ (seat-to-seat)
- $K \geq 26''$ (to vertical surface)

Aisle Width (per TS 78.10):

- Between seats $\geq 20\text{in}$
- At 32in above floor $\geq 24\text{in}$

PSTA - PROPOSED SEATING LAYOUT (PROTERRA 40' ZX5)

REVISION HISTORY:

REV00...

INITIAL RELEASE FOR RFP ACTIVITY

9/3/2021



Towing Procedures

Towing procedures for Proterra's proposed ZX5 buses are included on the following pages.



PROTERRA

ZX5 TOWING GUIDE



This towing guide has been prepared to provide you with the information necessary to tow this bus safely in most situations. To ensure vehicle safety, you must read and thoroughly understand the contents of this manual.

The specifications and information in this manual are the most current at the time of publications, and may be subject to change without notice. It is the responsibility of the transit agency to provide you with the necessary instructions when special equipment or changes to standard equipment are implemented.

This manual is not intended to provide all-encompassing towing instructions, nor does it attempt to teach towing skills, rules of the road, or regulations of the DOT, State, or transit agency.

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Chapter 1: ZX5 Towing Guide

About Towing

The bus will need to be towed by the transit agency service vehicle if a total power failure occurs, or if the bus has accidentally driven off a paved surface, and is not able to return. The following procedures describe the method used to flat tow a Proterra bus. These procedures are also applicable to winching a bus onto a trailer.

Prior to towing the Catalyst vehicle, ask and answer the following questions to determine the appropriate procedure(s) to follow:

1. Does the bus have available high-voltage electrical power?
 - YES - Check the operational status of the air compressor.
 - NO - Cage the brakes.
2. Is the air compressor operational?
 - YES - Use the air compressor to release the brakes. Do not cage the brakes.
 - NO - Manually air the bus and listen for potential air leaks.
3. Is there an air leak preventing the brakes from being released?
 - YES - Cage the brakes.
 - NO - Manually air the bus and release the brakes.
 - The Brake Release knob on the left console can be used to supply air to the rear brakes, as needed.
4. Does the bus need to be repositioned for towing?
 - YES - See the *Positioning the Bus for Towing* section of this chapter.
 - NO - Continue with the towing procedure.
5. How far do you need to tow the bus?
 - Less than 1 mile - Do not remove the half shaft.
 - Greater than 1 mile - Remove the half shaft.



DO NOT flat tow the bus (drive wheels on the ground) over 1 mile at speeds above 20 MPH unless you have removed the half-shaft from the rear axle. **Severe damage to the transmission will occur if this caution is not heeded.**

To remove the half-shaft from the rear axle, reference the ZF AV-132 DROP CENTER AXLE Repair Manual.

NOTICE! Check and grease the o-ring on the half-shaft ring nut prior to re-installing the half-shaft. The M18 bolts will need to be cross-torqued to 440 Nm.

ZF AV-132 DROP CENTER AXLE Repair Manual



Figure 1-1. Rear Axle Half-Shaft

Vehicle Ride Height Preparation

1. Maximize ride height by pressing and holding the ride height button until maximum ride height is reached. Turn off the Master Switch at the Driver's workplace.



Figure 1-2. Maximize Ride Height and Turn OFF Master Switch

2. If you do not have power, have the tow truck driver manually air each of the four corners using the Schrader valves located behind the streetside lower rear access panel.

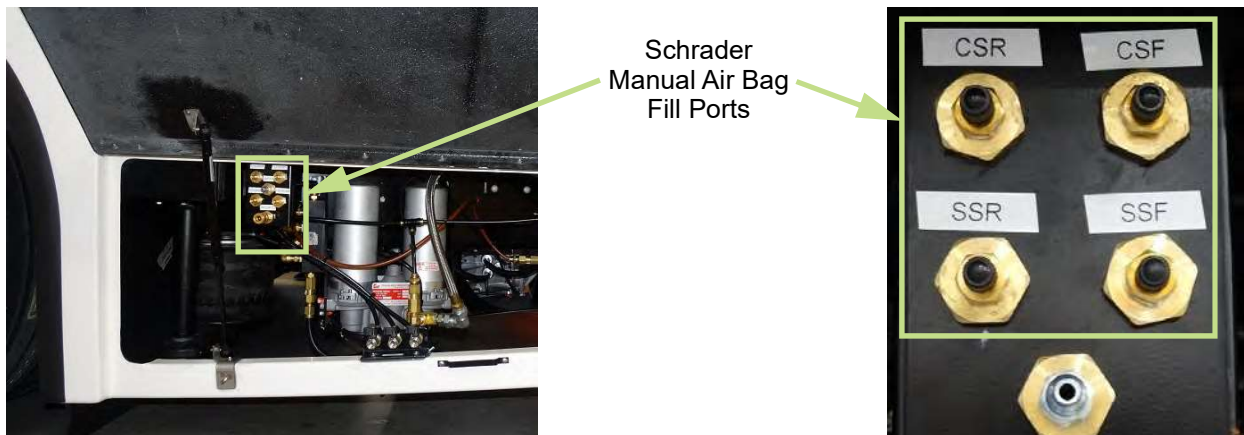


Figure 1-3. Schrader Valves

3. Open the rear deck access panel and remove the VEC locking cover to access the rear deck circuit breakers.



Figure 1-4. Opening the Rear Deck Access Covers

4. Turn off the ride height system by removing circuit breaker CB423. This is necessary to ensure the bus does not try to level itself while lifting and towing.

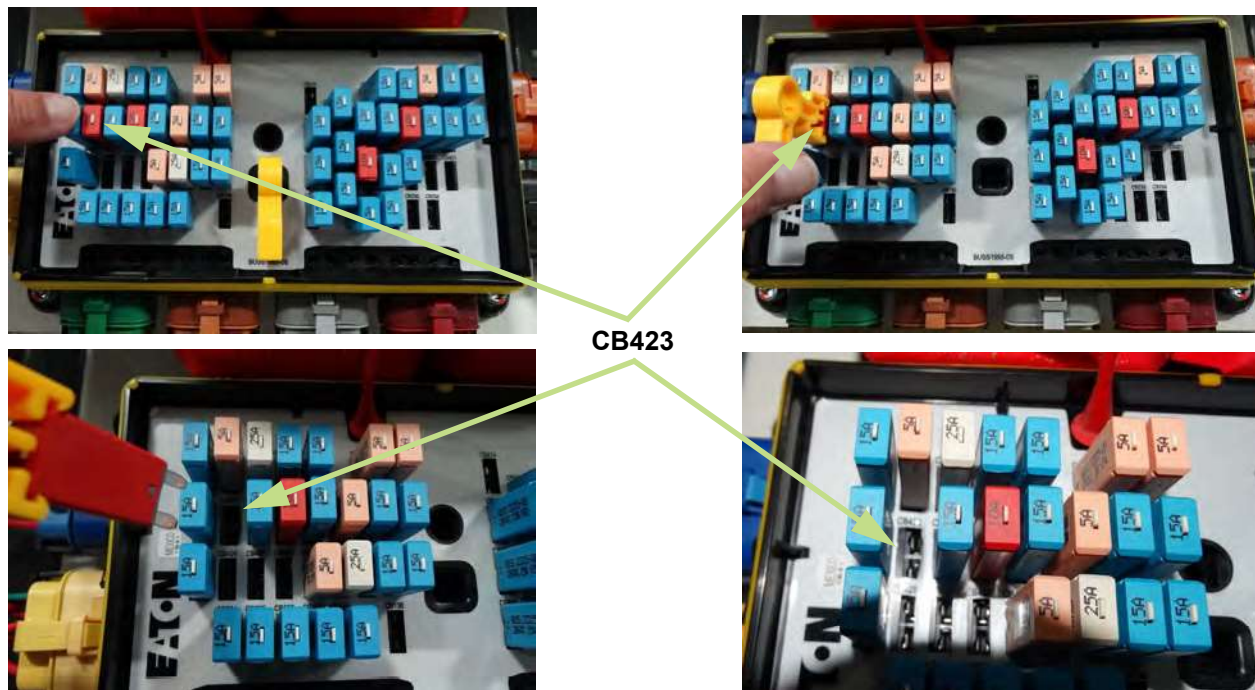


Figure 1-5. Rear Deck Circuit Breaker

Brake System Caging (Disconnect) Procedure

1. In order to cage or disconnect the rear brakes, you must remove the rear brake canister access plug on each rear wheel well.

NOTE: You may need to remove seats to access this plug.

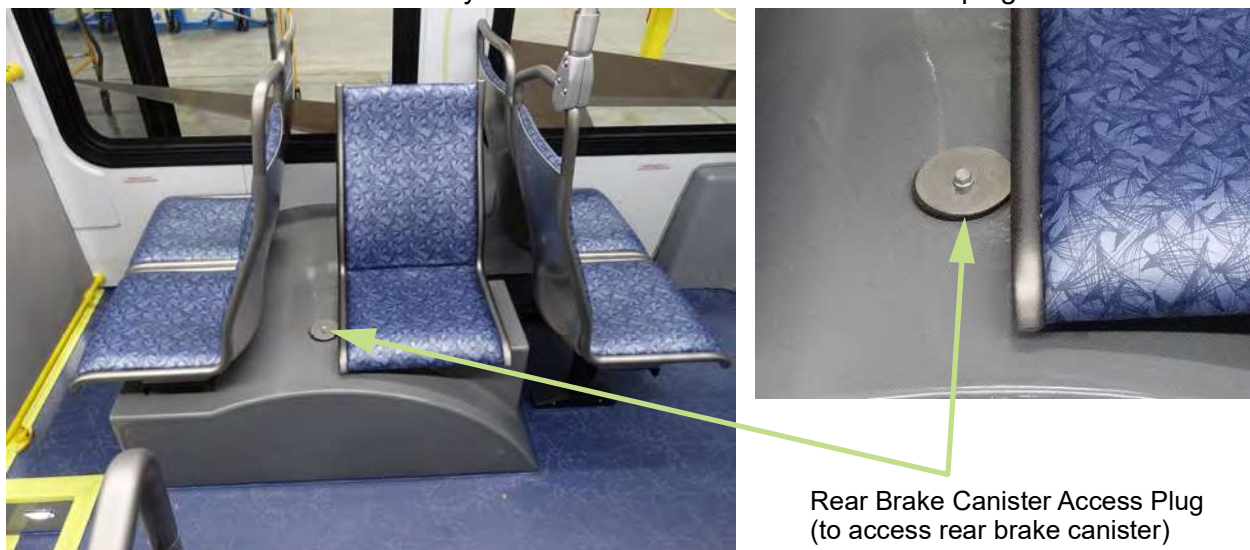


Figure 1-6. Rear Brake Access Plug

2. Using a ratchet with an extension, turn the brake caging bolt counter clockwise to disengage the rear brake. Repeat for both sides.

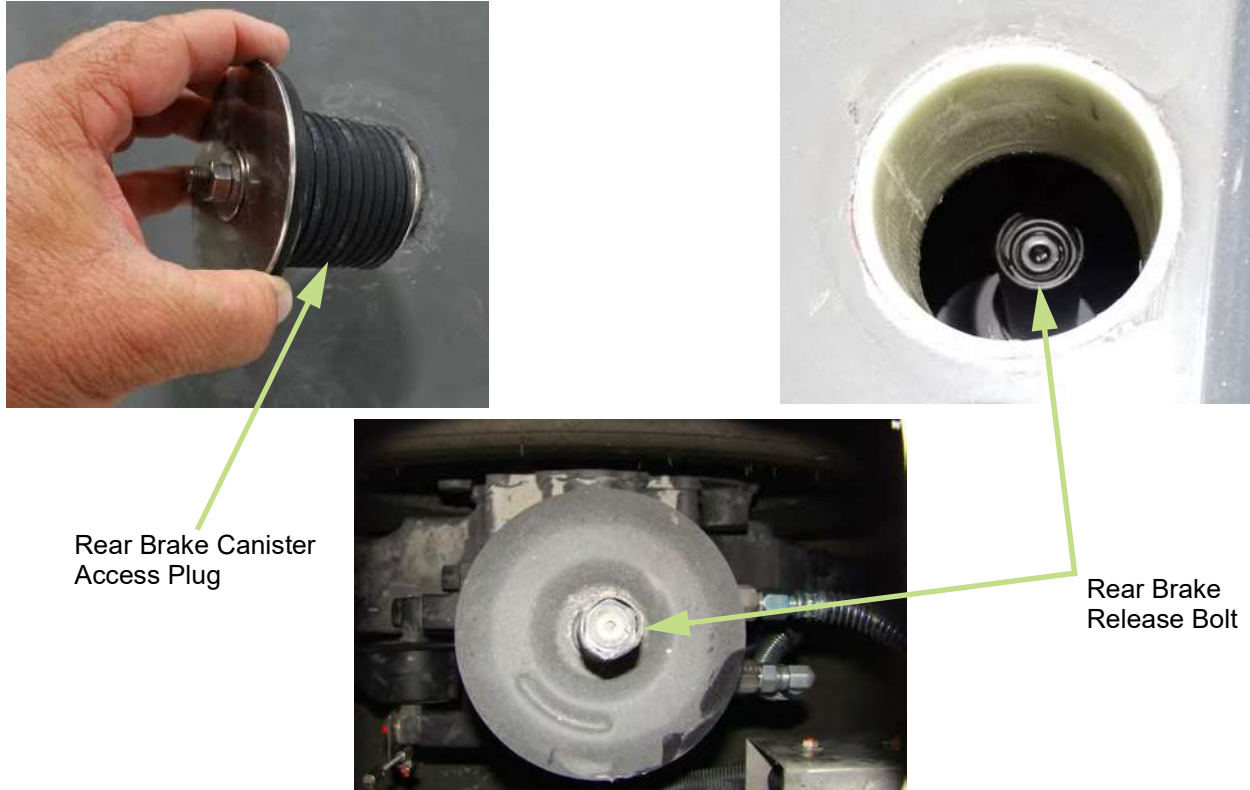


Figure 1-7. Brake Caging Access Panel

3. Follow the vendor recommended procedure for disconnecting the braking system. Reference Bendix Technical Bulletin TCH-002-006 for the Brake Actuator Caging Procedure.

Bendix Technical Bulletin TCH-002-006

Manually Airing the Bus for Towing

The following procedures should be performed if the bus has no power AND the air compressor is not operational.

1. If attaching air from the tow vehicle to the front of the bus, locate the air receptacle behind the front bumper on the curbside of the vehicle. Attach the air connection from the tow truck to the bus front air receptacle.

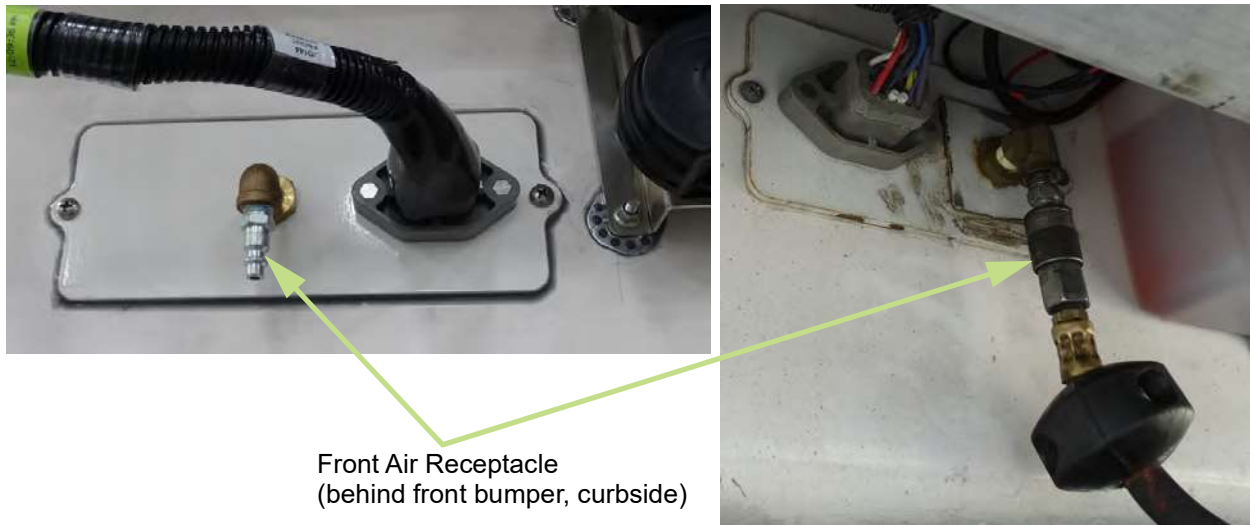


Figure 1-8. Front Air Receptacles

2. If the bus must be extracted by attaching to the **rear** of the bus, open the streetside rear lower access panel on the bus to access the rear air receptacle and attach the air connection from the tow truck to the rear air receptacle, shown in the following figure.



Figure 1-9. Rear Air Receptacle for Tow Truck Attachment

Positioning the Bus for Towing



Do **NOT** attempt to tow or hoist the bus from any other location, except that depicted here.

Front Extraction or Winching Attachment Points

Front extraction or winching may be required to reposition a Proterra bus for towing. If rear extraction is necessary, reference the Rear Towing Attachment Points procedure and only rear tow the bus in order to position it for front towing.

1. For front extraction, route a tow strap through the tow pockets and use the tow truck to reposition the bus.

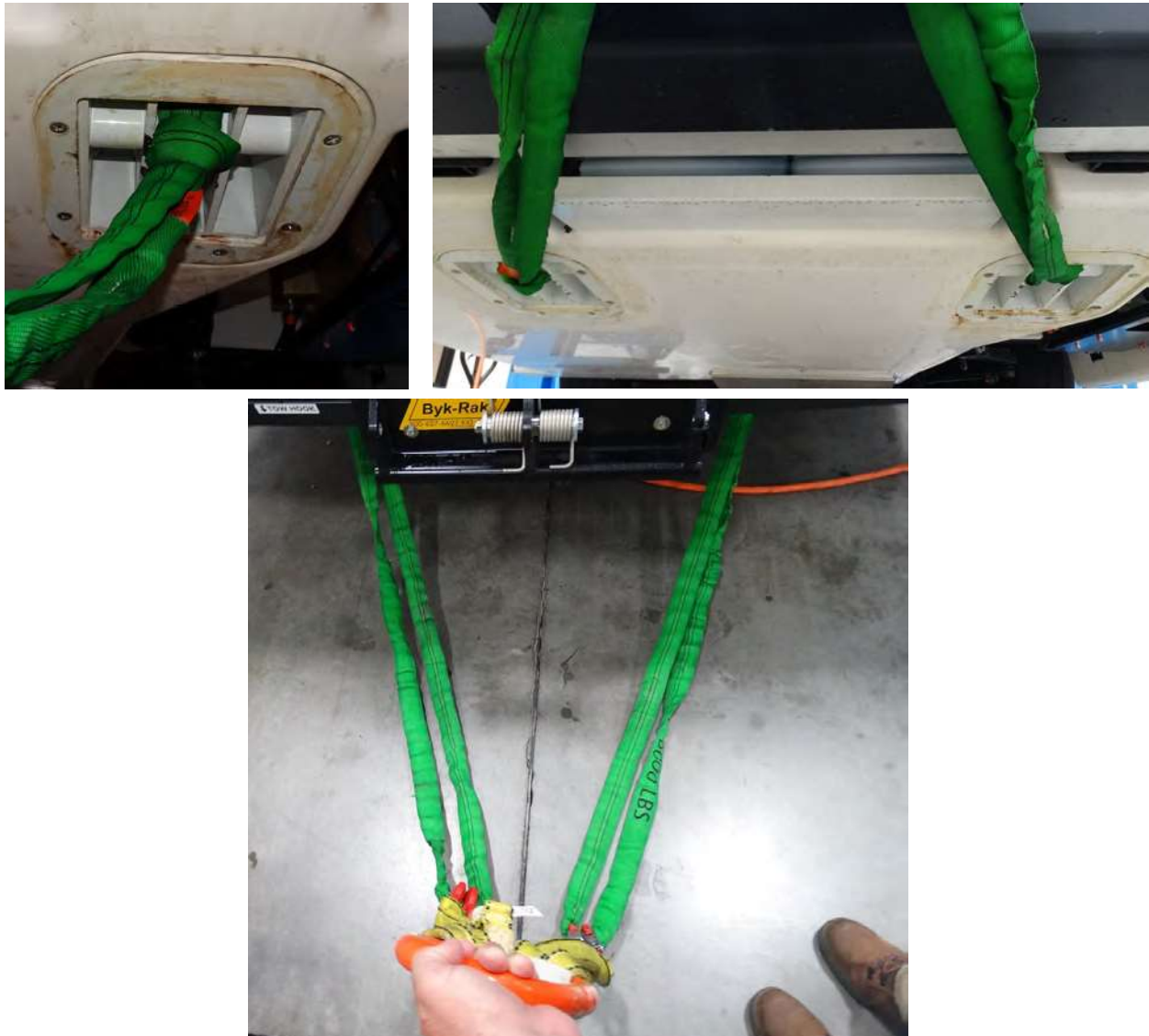


Figure 1-10. Front Extraction - Tow Pockets

Rear Towing Attachment Points

**CAUTION**

Bus should be rear towed only in the event of an emergency or if bus is in a “nose-in” situation. When the front of the bus is cleared, the tow apparatus should be moved to attach to the front tow position.

1. If the bus must be rear-extracted, open the rear trunk and locate the rear extraction attachment points on the ProDrive frame.

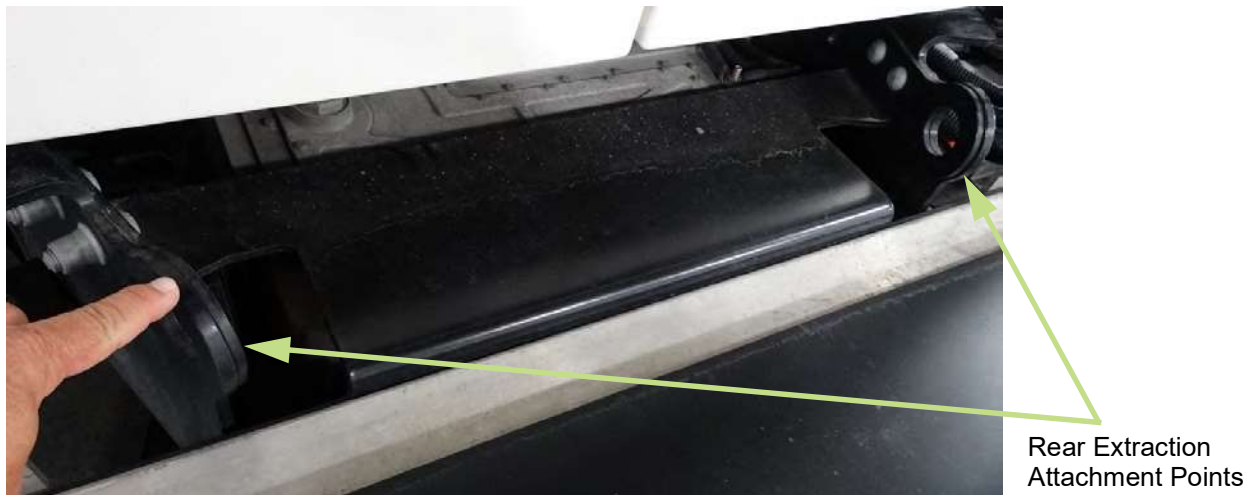


Figure 1-11. Rear Extraction Points on ProDrive Frame

2. Attach clevis hooks (with tow strap) to each of the rear attachment points.

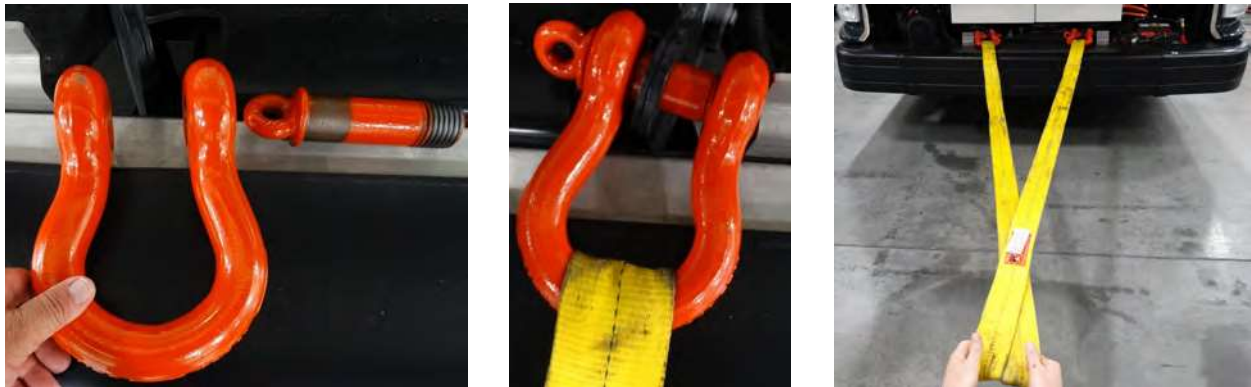


Figure 1-12. Rear Extraction - Clevis Hook Attachment

3. Use the tow truck to reposition the bus for front extraction or towing.

Front Towing Attachment

Front towing is the preferred method when transporting a Proterra bus.

1. Locate the tow truck to access the front of the vehicle.



Figure 1-13. Tow Truck Positioned for Front Extraction

2. The tow truck driver then lowers the stinger, positions it for lifting the front of the bus, and installs the lifting forks.



Figure 1-14. Positioning Stinger Under Front of Bus

3. Reposition the lifting forks to align with the front tow pockets.



Figure 1-15. Repositioning Tow Forks to Align with Tow Pockets

4. Carefully raise the stinger to mate the tow forks with the tow pockets and lift the front of the bus off the ground.



Figure 1-16. Lift the Bus

5. Wrap safety chains around each towing attachment point and secure.



Figure 1-17. Install Tow Fork Safety Chains

6. Install Safety Straps/Safety Chains between the tow pockets of the bus and the tow vehicle.



Figure 1-18. Install Tow Fork Safety Chains

7. Connect the tow vehicle wiring harness to the front of the bus to allow operation of the bus brake lights and turn signals.

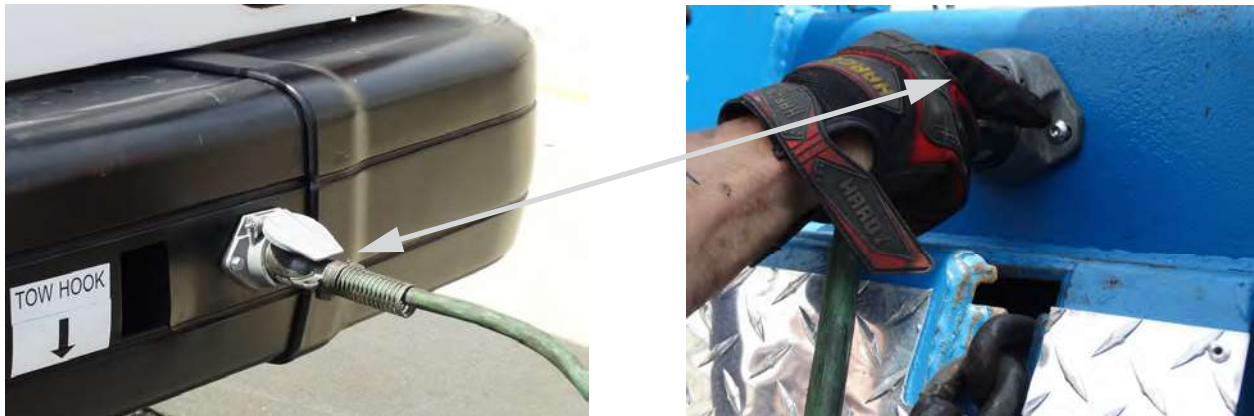


Figure 1-19. Bus Towing 7-Pin Wiring Connector

8. With the bus secured by the tow truck, remove the half shaft on the non-traffic side of the vehicle (streetside shown).



Figure 1-20. Removing the Half Shaft



CAUTION

DO NOT flat tow the bus (drive wheels on the ground) over 1 mile at speeds above 20 MPH unless you have removed the half-shaft from the rear axle or unless you have disconnected and removed the drive shaft. **Severe damage to the transmission will occur if this caution is not heeded.**

9. To remove the half-shaft from the rear axle, reference the ZF AV-132 DROP CENTER AXLE Repair Manual. To remove the drive shaft, reference the Proterra Repair Manual.

[ZF AV-132 DROP CENTER AXLE Repair Manual](#)

10. Tow or winch normally according to the appropriate Bus Towing Process (Power or No Power).

Bus Towing Process with No Power Available

**CAUTION**

DO NOT flat tow the bus (drive wheels on the ground) over 1 mile at speeds above 20 MPH unless you have removed the half-shaft from the rear axle or unless you have disconnected and removed the drive shaft. **Severe damage to the transmission will occur if this caution is not heeded.**

1. To gain temporary ride height clearance when no power is available, see the *Bus Ride Height Preparation* section of this chapter.
2. Release the parking brake by pressing firmly on the brake pedal and then pressing down on the yellow Parking Brake button located on the driver's armrest console.
3. Confirm the tow vehicle wiring harness is connected to the 7-pin wiring connector at the front of the bus to allow operation of the bus brake lights and turn signals.

NOTE: For the tow vehicle wiring harness to be operational, the main power switch should be in the ON position OR the interior light switch must be in one of the ON positions (dim or bright) for the 12/24 volt contactors to be powered, allowing the exterior lights to be operational.

4. Close the front door using the rocker switch in the streetside front access panel. If the bus does not have air to close and secure the doors, the doors will need to be manually closed and secured.
5. Tow or winch the bus normally.

**CAUTION**

If the bus does not have electrical power, it should be towed no faster than 10 mph, and for no longer than 10 miles. Failure to follow this rule could result in severe damage to the drive system.

Bus Towing Process with Power Available

**CAUTION**

DO NOT flat tow the bus (drive wheels on the ground) over 1 mile at speeds above 20 MPH unless you have removed the half-shaft from the rear axle or unless you have disconnected and removed the drive shaft. **Severe damage to the transmission will occur if this caution is not heeded.**

1. Ensure that the bus has adequate power to operate the air compressor, if not reference *Bus Towing Process with No Power Available*.
2. Determine if the bus can be towed from the front and reference the *Front Towing Attachment Points* section. If it cannot be towed from the front, reference the *Rear Towing Attachment Points* section in order to position the bus for front towing.
3. Turn the bus ON to enable the air compressor. The bus is turned ON by rotating the knob located on the lower left side of the dash one click to the right. The dash screen will light up to indicate the bus is on. This can take several seconds.



Figure 1-21. Turn ON Master Switch

4. Ensure that the bus is in Neutral, if not press down on the brake pedal and then press the “N” button located on the driver’s armrest console. The “N” light will flash.

Note: The power steering pump will continue to operate as long as the vehicle is moving. Should the power steering pump stop, repeat Step 4 above.

**CAUTION**

Failure to place the bus into Neutral position, prior to winching or towing will result in damage.

5. Release the parking brake by pressing firmly on the brake pedal and then pressing down on the yellow Parking Brake button located on the driver’s armrest console.

6. To gain temporary ride height clearance, see the *Bus Ride Height Preparation* section of this chapter.
7. Confirm the tow vehicle wiring harness is connected to the 7-pin wiring connector at the front of the bus to allow operation of the bus brake lights and turn signals.

NOTE: For the tow vehicle wiring harness to be operational, the main power switch should be in the ON position OR the interior light switch must be in one of the ON positions (dim or bright) for the 12/24 volt contactors to be powered, allowing the exterior lights to be operational.

8. Close the front door using the rocker switch in the streetside front access panel. If the bus does not have air to close and secure the doors, the doors will need to be manually closed and secured.
9. Tow or winch the bus normally.



If the bus is operational with electrical power, it can be towed no faster than 40 mph, and for no longer than 20 miles. Failure to follow this rule could result in severe damage to the drive system.



Route Simulation and Operating Range Data

Efficiency is extremely important as it plays a vital role to determining operating range. Proterra, much like the other battery-electric bus OEMs, utilizes ~90% of the total energy stored on the vehicle as “usable” energy required to power the vehicle. This is done for a variety of reasons, but namely to extend the battery life cycle and protect against performance degradation over time.

Detailed simulation reports are provided on the attached pages for the base 35' ZX5+ (450kWh) and 40' ZX5+ (450kWh) as well as the optional 40' ZX5 Max (675kWh).



35' ZX5+

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West Coast Manufacturing
383 Cheryl Lane, City of Industry, CA 91789

www.proterra.com

Simulation Report

Simulated ZX5+ Energy Economy for PSTA

Prepared for the Pinellas Suncoast Transit Authority

Report Number: SIM-R2021-038A-PSTA



September 14, 2021

www.proterra.com

Headquarters
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West Coast Manufacturing
393 Cheryl Lane, City of Industry, CA 91789

Simulation Information

Projected gradeability, acceleration, top speed, energy consumption, and range for PSTA

Abbreviations and Definitions

ADB	Advanced Design Bus drive cycle, also known as the Transit Coach Operating Duty Cycle and the Business-Arterial-Commuter (BAC) drive cycle. A composite of the ART, CBD, and COM drive cycles
Ambient Temperature	The temperature of surrounding air
ART	Arterial drive cycle
Attainable Gradeability	Gradeability when drivetrain is a maximum possible performance within normal operating limits, also referred to as peak performance
BOL	Beginning of battery life, 100% of maximum usable energy
BRTC	Larson Transportation Institute's Bus Research and Testing Center, located in Altoona, Pennsylvania, commonly referred to as Altoona
CBD	Central Business District drive cycle
COM	Commuter drive cycle. This report uses the commuter drive cycle previously utilized at the BRTC at Altoona, which has a top speed of 40 mph, not the commuter cycle as stated in SAE J1376, which has a top speed of 55 mph
Continuous Gradeability	Gradeability during sustained climb at high grade for a significant period of time when limitations are imposed on the motors due to thermals
CVW	Curb Vehicle Weight, unloaded vehicle weight assumed to be approximately 31020 lbs. Actual CVW will vary with configuration
Dash SOC	Dash State of Charge, state of charge as displayed to the driver
Drive Cycle	Time series speed data at a sampling rate of 1 Hz or greater
EOL	End of battery life
ft	Feet
Gradeability	The maximum speed that a vehicle can achieve for a specified grade
GVW	Gross Vehicle Weight, vehicle weight loaded with an assumed 51 passengers and a driver at 150 lbs per person. Actual GVW will vary with configuration
GVWR	Gross Vehicle Weight Rating, maximum vehicle load of 42000 lbs
hr	Hours
HVAC	Heating, Ventilation, and Air Conditioning
Jerk	Change in acceleration, $\Delta a / \Delta t$, where a is acceleration and t is time
kW	Kilowatt

kWh	Kilowatt-hour
lbs	Pounds
Michelin® X® InCity Energy Z	Michelin low rolling resistance coach tires, size 315/80R22.5
min	Minutes
MPGe	Diesel Miles Per Gallon Equivalent
mph	Miles per hour
PSTA	Pinellas Suncoast Transit Authority
SLW	Seated Load Weight, vehicle weight loaded with an assumed 29 passengers and a driver at 150 lbs per person. Actual SLW will vary with configuration
Usable Energy	Total amount of energy available for normal operation at any one time, measured in kWh
ZX5 Series	Proterra® fifth-generation battery electric bus series

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1 **Objective**

To predict the gradeability, acceleration, top speed, overall energy consumption, and achievable range of the 35 foot ZX5+^[1] with single motor drivetrain for the conditions specified by the PSTA.

1.1 **Top Speed Requirement**

PSTA stipulated that the proposed vehicle shall be capable of a top speed of 65 mph on a straight, level road at GVWR with all accessories operating and with any variance between peak and sustained performance noted, per RFP TS 7.1 Top Speed^[2].

1.2 **Gradeability Requirement**

PSTA stipulated that the proposed vehicle must be capable achieving and maintaining a speed of 40 mph on a 2.5% ascending grade and 10 mph on a 10% ascending grade continuous, per RFP TS 7.2 Gradeability^[2]. Additionally, PSTA stipulated that that time to speed on flat ground, 5%, 7%, 10%, and maximum grade for the speeds of 5 mph, 10 mph, 15 mph, 25 mph, 35 mph at a 130% passenger load be simulated and provided, per TS 8.2 Design Operating Profile^[2].

1.3 **Acceleration Requirement**

PSTA stipulated that the proposed vehicle must be capable of the acceleration requirements stipulated in Table 1-1 with all systems in operation and on straight, level, dry pavement and at GVWR, per RFP TS 7.3 Acceleration^[2].

Table 1-1. Acceleration Requirement

Speed (mph)	Maximum Time (s)
10	5
20	10
30	18
40	30
50	60
Top Speed	

1.4 **Operating Range Requirement**

PSTA stipulated that the energy consumption and range of the proposed vehicle be provided, per TS 7.4 Operating Range^[2] and TS 8. Range^[2]. The energy economy and range are to be evaluated under two sets of conditions, Altoona Energy Consumption Tests and the PSTA defined Design Operating Profile.

1.4.1 **Altoona Energy Consumption Test Requirement**

PSTA stipulated that Altoona Energy Consumption and Range Test results be provided for the Transit Coach Operating Duty Cycle (ADB cycle), per TS 8.1 Altoona Energy Consumption Tests^[2].

1.4.2 **Design Operating Profile Requirement**

PSTA stipulated that the proposed vehicle must be evaluated on with mathematical modeling, simulations, or empirical methods, per TS 8.2 Design Operating Profile^[2]. Not drive cycle was provided in TS 8.2 Design Operating Profile^[2], however, PSTA went on to clarify that the drive cycles utilized for the Design Operating Profile were to be the CBD, ART, and COM duty cycle in an addendum^[3]. The conditions stipulated in the Design Operating Profile are as follows:

- (a) Maximum auxiliary loads
- (b) Results provided for EOL
- (c) Starting at maximum operating state of charge
- (d) Nominal Conditions
 - i. Ambient temperature of 90°F
 - ii. Vehicle loaded to SLW
- (e) Worst-case Conditions
 - i. Ambient temperature consistent with worst-case heating and cooling loads when operating in the State of Florida as defined by NOAA, or alternative website
 - ii. Vehicle loaded to GVWR

PSTA further stipulated that any modeling, simulations, or empirical testing be validated against Altoona Energy Economy results utilizing ADB cycle data, per TS 8.2 Design Operating Profile^[2].

2 Discussion

The general assumptions of the High-Fidelity simulation are:

- (a) Michelin® X® InCity Energy Z tires
- (b) Battery and cabin air are thermally preconditioned
- (c) Windshield preconditioned (defrosted)
- (d) Usable energy of 404 kWh for the ZX5+ at BOL
- (e) Useable energy of 324 kWh of the ZX5+ at EOL per standard warranty
- (f) Metabolic heat is based on passenger count
- (g) No kneeling operation
- (h) Range estimations are based on simulated values and are subject to change based on driver performance, configuration, and other factors
 - i. Stated values are not guaranteed nor are provided as a warranty term
- (i) Range estimations are based on full useable energy and do not consider any reserves that may be imposed by operators

3 Simulation Results

3.1 Top Speed Results

The ZX5+ has a governed top speed of 65 mph and can achieve this speed at loads up to GVWR according to simulations.

3.2 Gradeability Results

Under the stipulated conditions of dry pavement, at GVWR, and with all systems in operation, simulations indicate that the ZX5+ with single motor drivetrain is capable of achieving an attainable speed of 58.3 mph and a continuous speed of 53.1 mph on a 2.5% grade. On a 10% grade, the ZX5+ is capable of achieving an attainable speed of 23.3 mph and a continuous speed of 19.2 mph. Attainable gradeability refer to the gradeability over short periods, such as on a freeway onramp or short hill. Continuous gradeability is gradeability during a sustained climb at the specified grade when limitations are imposed on the motors due to thermals.

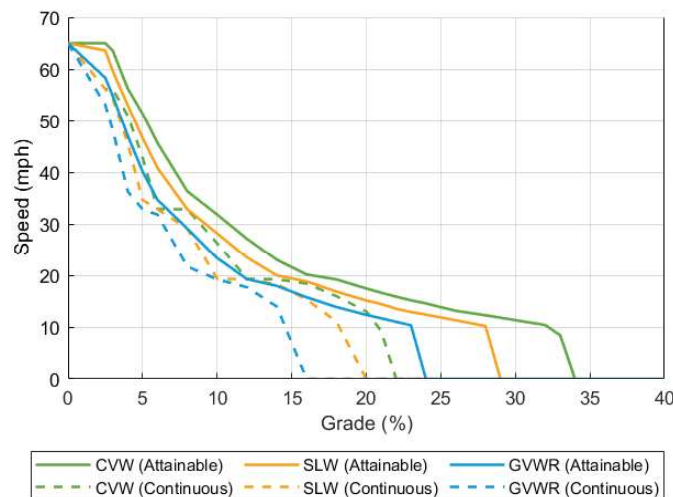


Figure 3-1. Simulated Gradeability at Varying Loads

In addition to the stipulated gradeability requirement, PSTA required simulations of vehicle performance at varying grades and speeds. The results of these simulations can be found in Table 3-1 and Table 3-2 below. The passenger load was stipulated to be 130% passenger load. No definition for 100% passenger load was provided so 100% passenger load was assumed to be GVW or 51 passengers, therefore, 130% passenger load is assumed to be 67 passengers.

Table 3-1. Simulated Performance at Varying Grades and Speeds at 130% Passenger Load (Attainable)

		Time to Speed (s)					Maximum for Grade	
		5 mph	10 mph	15 mph	25 mph	35 mph	Speed (mph)	Time to Speed (s)
Grade	0%	2.4	3.9	5.4	10.7	18.2	65.0	61.4
	5%	2.9	4.4	6.1	15.2	40.6	41.2	250.6
	7%	3.1	4.6	6.5	19.7	N/A	32.8	76.8
	10%	3.5	5.3	7.8	N/A	N/A	24.2	133.4
Maximum for Speed	Grade (%)	24.4	23.8	17.2	9.7	6.1		
	Time to Speed (s)	783.2	251.8	47.2	112.3	208.1		

Table 3-2. Simulated Performance at Varying Grades and Speeds at 130% Passenger Load (Continuous)

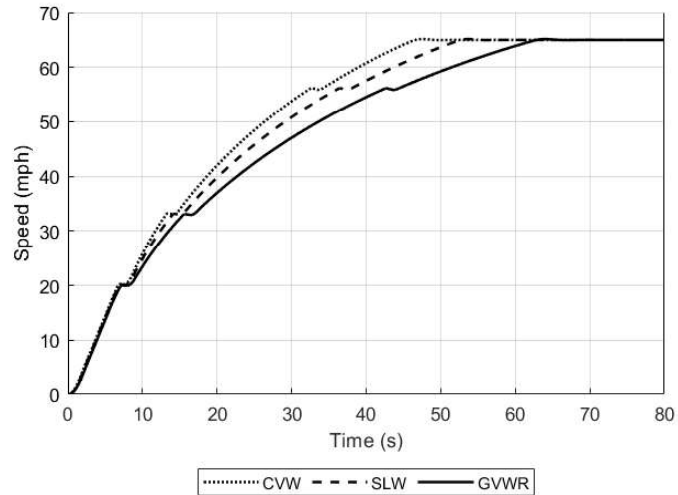
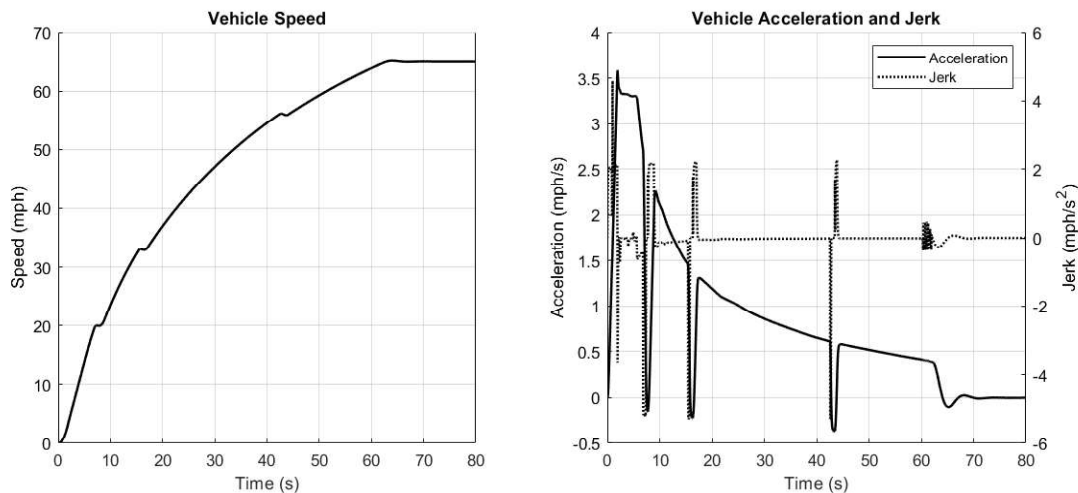
		Time to Speed (s)					Maximum for Grade	
		5 mph	10 mph	15 mph	25 mph	35 mph	Speed (mph)	Time to Speed (s)
Grade	0%	2.5	4.0	5.6	11.8	20.9	65.0	86.3
	5%	3.4	5.7	8.2	22.6	N/A	32.9	45.3
	7%	4.0	6.9	10.0	47.2	N/A	28.1	181.6
	10%	5.6	10.0	15.1	N/A	N/A	19.2	23.7
Maximum for Speed	Grade (%)	15.7	15.5	13.8	7.6	4.2		
	Time to Speed (s)	1077.2	318.5	93.9	209.3	545.5		

3.3 Acceleration Results

Under the stipulated conditions of GVWR on straight, level, dry pavement, simulations show that the ZX5+ can achieve the time to speed listed below in Table 3-3.

Table 3-3. ZX5+ Acceleration Results

Speed (mph)	Time (s)
10	3.9
20	7.3
30	13.6
40	22.7
50	33.7
65	62.9

**Figure 3-2. ZX5+ 0 mph to 65 mph Speed Profile****Figure 3-3. Vehicle Acceleration and Jerk for a 0 mph to 65 mph Speed Profile at GVWR**

3.4 Altoona Energy Economy Results

The Bus Research and Testing Center at Altoona, PA, has yet to complete testing on the proposed vehicle configuration and the drive cycles stipulated by PSTA (CBD, ART, and COM) are no longer in use by the Bus Research and Testing Center at Altoona, PA, for 35ft and 40ft vehicles. As such, simulations were conducted using parameters intended to emulate the testing methodology used in Altoona Energy Economy Tests^[4] and are summarized below.

- (a) HVAC disabled
- (b) At SLW
- (c) Defroster disabled
- (d) Windows and doors closed

It should be noted that the bus testing procedure used at Altoona does not stipulate an ambient temperature so an ambient temperature of 73°F from a previous report^[5] was used.

Table 3-4. ZX5+ Simulated Altoona Energy Economy Range Tests

Cycle	Load	Ambient Temperature (°F)	Energy Economy (kWh/mi)	MPGe	Auxiliary Loads (kW)	BOL Range (mi)	EOL Range (mi)
ADB	SLW	73°F	1.74	21.7	2.7	232	186
CBD	SLW	73°F	1.71	22	2.8	236	189
ART	SLW	73°F	2.16	17.4	2.9	187	150
COM	SLW	73°F	1.34	28	1.9	300	241

3.5 Model Validation Results

As previously stated, the Bus Research and Testing Center at Altoona, PA, has not completed testing of the proposed configuration at the time of writing this report. As such, the model was validated against a previous Altoona report^[6]. The configuration simulated for model validation and test by Altoona in the referenced report is not the proposed configuration and is for model validation purposes only. Note that without information concerning the specific ambient and coast down conditions at Altoona during the test, no model will be able to accurately and consistently emulate Altoona results with exact certainty.

Table 3-5. Simulation Validation Results

Cycle	Simulated		Altoona		Difference	
	Energy Economy (kWh/mi)	Maximum Range (mi)	Energy Economy (kWh/mi)	Maximum Range (mi)	Energy Economy Error (%)	Range Delta (mi)
MANN	2.167	34.1	2.100	32.7	3%	1.4
OCC	2.002	37.0	2.096	32.8	4%	4.2
HD-UDDS	1.874	39.5	2.074	32.0	10%	7.5

3.6 Operating Range Results

PSTA stipulated that range be evaluated on four operating profiles ADB cycle, the CBD cycle, the ART cycle, and the COM cycle. Simulations were conducted on the stipulated drive cycles with the following conditions and parameters.

- (a) Initial maximum dash state of charge
- (b) Defroster enabled
- (c) HVAC enabled
 - i. Setpoint of 73°F
- (d) Door operation at every idle period of 12 seconds or longer
- (e) Nominal Case
 - i. Loaded to SLW
 - ii. Ambient temperature of 90°F
- (f) Worst Case
 - i. Loaded to GVWR
 - 1. Loaded to GVW at 150 lbs per passenger and a thermally inert mass for the remainder
 - ii. Ambient temperature consistent with environmental conditions in the State of Florida

1. Hot temperature case utilizes an hourly temperature profile for the 90th percentile July temperature for zip code 33716, averaged to be 91°F
2. Cold temperature case utilizes an hourly temperature profile for the 10th percentile January temperature for zip code 33716, averaged to be 54°F

(g) Solar loading estimated for US zip code 33716

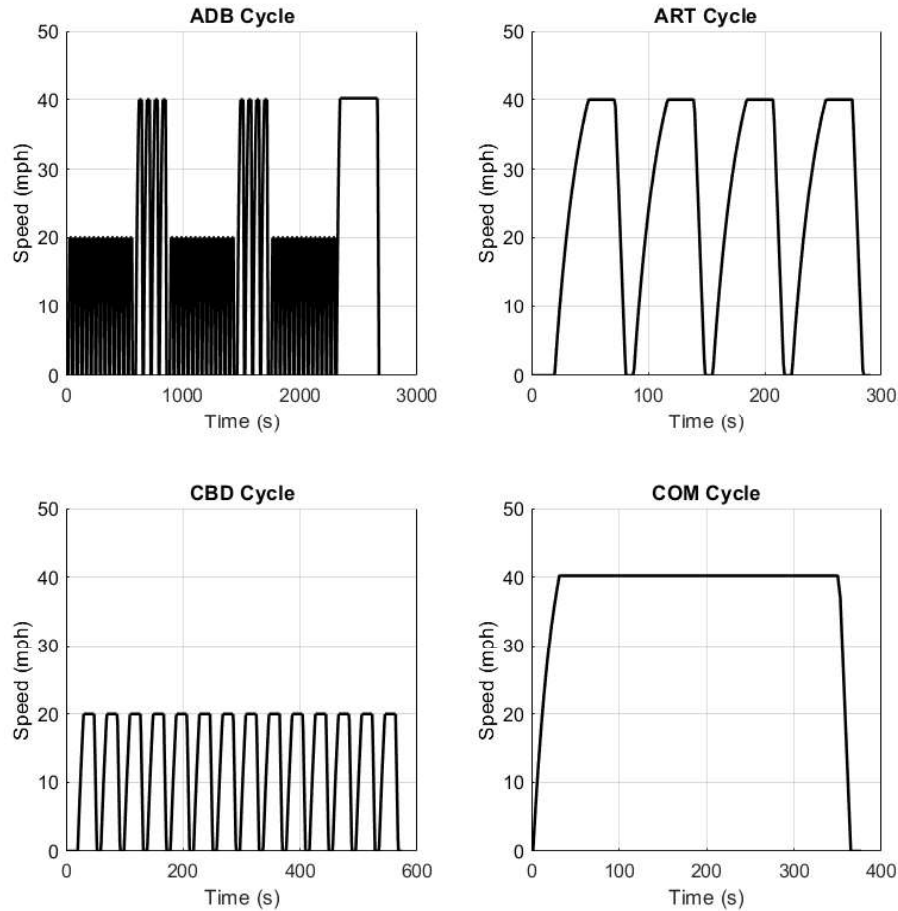


Figure 3-4. Standard Drive Cycles as Utilized in Altoona Energy Economy Testing

Table 3-6. Simulated Range Results

Cycle	Load	Ambient Temperature (°F)	Energy Economy (kWh/mi)	MPGe	Auxiliary Loads (kW)	BOL Range (mi)	EOL Range (mi)
ADB	SLW	90°F	2.09	18.0	3.2	193	155
	GVWR	91°F	2.41	15.6	3.4	167	134
	GVWR	54°F	2.20	17.1	3.6	183	147
CBD	SLW	90°F	2.23	16.9	3.3	181	145
	GVWR	91°F	2.59	14.5	3.5	156	125
	GVWR	54°F	2.26	16.6	3.7	178	143
ART	SLW	90°F	2.43	15.5	3.4	166	133
	GVWR	91°F	2.86	13.2	3.6	141	113
	GVWR	54°F	2.69	14.0	3.7	150	120
COM	SLW	90°F	1.51	24.9	2.4	267	214
	GVWR	91°F	1.68	22.4	2.4	240	192
	GVWR	54°F	1.61	23.4	3.2	250	200

4 References

Reference #	Report #	Title	Agency
1	SPEC_35_002_2020_Q4	Proterra ZX5 35 Foot Bus Platform Specifications	Proterra
2	RFP 21-980369	Florida Electric Transit Buses with Charging and Associated Equipment	PSTA
3	RFP 21980369, Addendum 4	Addendum of Solicitation	PSTA
4	-	Test Bus Procedure: Energy Economy Test	BRTC
5	LTI-BT-R1805-P	PROTERRA, INC. 35-Foot Catalyst FC	BRTC



40' ZX5+

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Simulation Report

Simulated ZX5+ Energy Economy for PSTA

Prepared for the Pinellas Suncoast Transit Authority

Report Number: SIM-R2021-037A-PSTA



September 14, 2021

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Simulation Information

Projected gradeability, acceleration, top speed, energy consumption, and range for PSTA

Abbreviations and Definitions

ADB	Advanced Design Bus drive cycle, also known as the Transit Coach Operating Duty Cycle and the Business-Arterial-Commuter (BAC) drive cycle. A composite of the ART, CBD, and COM drive cycles
Ambient Temperature	The temperature of surrounding air
ART	Arterial drive cycle
Attainable Gradeability	Gradeability when drivetrain is a maximum possible performance within normal operating limits, also referred to as peak performance
BOL	Beginning of battery life, 100% of maximum usable energy
BRTC	Larson Transportation Institute's Bus Research and Testing Center, located in Altoona, Pennsylvania, commonly referred to as Altoona
CBD	Central Business District drive cycle
COM	Commuter drive cycle. This report uses the commuter drive cycle previously utilized at the BRTC at Altoona, which has a top speed of 40 mph, not the commuter cycle as stated in SAE J1376, which has a top speed of 55 mph
Continuous Gradeability	Gradeability during sustained climb at high grade for a significant period of time when limitations are imposed on the motors due to thermals
CVW	Curb Vehicle Weight, unloaded vehicle weight assumed to be approximately 30320 lbs. Actual CVW will vary with configuration
Dash SOC	Dash State of Charge, state of charge as displayed to the driver
Drive Cycle	Time series speed data at a sampling rate of 1 Hz or greater
EOL	End of battery life
ft	Feet
Gradeability	The maximum speed that a vehicle can achieve for a specified grade
GVW	Gross Vehicle Weight, vehicle weight loaded with an assumed 71 passengers and a driver at 150 lbs per person. Actual GVW will vary with configuration
GVWR	Gross Vehicle Weight Rating, maximum vehicle load of 43650 lbs
hr	Hours
HVAC	Heating, Ventilation, and Air Conditioning
Jerk	Change in acceleration, $\Delta a / \Delta t$, where a is acceleration and t is time
kW	Kilowatt

kWh	Kilowatt-hour
lbs	Pounds
Michelin® X® InCity Energy Z	Michelin low rolling resistance coach tires, size 315/80R22.5
min	Minutes
MPGe	Diesel Miles Per Gallon Equivalent
mph	Miles per hour
PSTA	Pinellas Suncoast Transit Authority
SLW	Seated Load Weight, vehicle weight loaded with an assumed 40 passengers and a driver at 150 lbs per person. Actual SLW will vary with configuration
Usable Energy	Total amount of energy available for normal operation at any one time, measured in kWh
ZX5 Series	Proterra® fifth-generation battery electric bus series

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1 **Objective**

To predict the gradeability, acceleration, top speed, overall energy consumption, and achievable range of the 40 foot ZX5+^[1] with single motor drivetrain for the conditions specified by the PSTA.

1.1 **Top Speed Requirement**

PSTA stipulated that the proposed vehicle shall be capable of a top speed of 65 mph on a straight, level road at GVWR with all accessories operating and with any variance between peak and sustained performance noted, per RFP TS 7.1 Top Speed^[2].

1.2 **Gradeability Requirement**

PSTA stipulated that the proposed vehicle must be capable achieving and maintaining a speed of 40 mph on a 2.5% ascending grade and 10 mph on a 10% ascending grade continuous, per RFP TS 7.2 Gradeability^[2]. Additionally, PSTA stipulated that that time to speed on flat ground, 5%, 7%, 10%, and maximum grade for the speeds of 5 mph, 10 mph, 15 mph, 25 mph, 35 mph at a 130% passenger load be simulated and provided, per TS 8.2 Design Operating Profile^[2].

1.3 **Acceleration Requirement**

PSTA stipulated that the proposed vehicle must be capable of the acceleration requirements stipulated in Table 1-1 with all systems in operation and on straight, level, dry pavement and at GVWR, per RFP TS 7.3 Acceleration^[2].

Table 1-1. Acceleration Requirement

Speed (mph)	Maximum Time (s)
10	5
20	10
30	18
40	30
50	60
Top Speed	

1.4 **Operating Range Requirement**

PSTA stipulated that the energy consumption and range of the proposed vehicle be provided, per TS 7.4 Operating Range^[2] and TS 8. Range^[2]. The energy economy and range are to be evaluated under two sets of conditions, Altoona Energy Consumption Tests and the PSTA defined Design Operating Profile.

1.4.1 **Altoona Energy Consumption Test Requirement**

PSTA stipulated that Altoona Energy Consumption and Range Test results be provided for the Transit Coach Operating Duty Cycle (ADB cycle), per TS 8.1 Altoona Energy Consumption Tests^[2].

1.4.2 **Design Operating Profile Requirement**

PSTA stipulated that the proposed vehicle must be evaluated on with mathematical modeling, simulations, or empirical methods, per TS 8.2 Design Operating Profile^[2]. Not drive cycle was provided in TS 8.2 Design Operating Profile^[2], however, PSTA went on to clarify that the drive cycles utilized for the Design Operating Profile were to be the CBD, ART, and COM duty cycle in an addendum^[3]. The conditions stipulated in the Design Operating Profile are as follows:

- (a) Maximum auxiliary loads
- (b) Results provided for EOL
- (c) Starting at maximum operating state of charge
- (d) Nominal Conditions
 - i. Ambient temperature of 90°F
 - ii. Vehicle loaded to SLW
- (e) Worst-case Conditions
 - i. Ambient temperature consistent with worst-case heating and cooling loads when operating in the State of Florida as defined by NOAA, or alternative website
 - ii. Vehicle loaded to GVWR

PSTA further stipulated that any modeling, simulations, or empirical testing be validated against Altoona Energy Economy results utilizing ADB cycle data, per TS 8.2 Design Operating Profile^[2].

2 Discussion

The general assumptions of the High-Fidelity simulation are:

- (a) Michelin® X® InCity Energy Z tires
- (b) Battery and cabin air are thermally preconditioned
- (c) Windshield preconditioned (defrosted)
- (d) Usable energy of 404 kWh for the ZX5+ at BOL
- (e) Useable energy of 324 kWh of the ZX5+ at EOL per standard warranty
- (f) Metabolic heat is based on passenger count
- (g) No kneeling operation
- (h) Range estimations are based on simulated values and are subject to change based on driver performance, configuration, and other factors
 - i. Stated values are not guaranteed nor are provided as a warranty term
- (i) Range estimations are based on full useable energy and do not consider any reserves that may be imposed by operators

3 Simulation Results

3.1 Top Speed Results

The ZX5+ has a governed top speed of 65 mph and can achieve this speed at loads up to GVWR according to simulations.

3.2 Gradeability Results

Under the stipulated conditions of dry pavement, at GVWR, and with all systems in operation, simulations indicate that the ZX5+ with single motor drivetrain is capable of achieving an attainable speed of 56.9 mph and a continuous speed of 51.7 mph on a 2.5% grade. On a 10% grade, the ZX5+ is capable of achieving an attainable speed of 22.3 mph and a continuous speed of 19.2 mph. Attainable gradeability refer to the gradeability over short periods, such as on a freeway onramp or short hill. Continuous gradeability is gradeability during a sustained climb at the specified grade when limitations are imposed on the motors due to thermals.

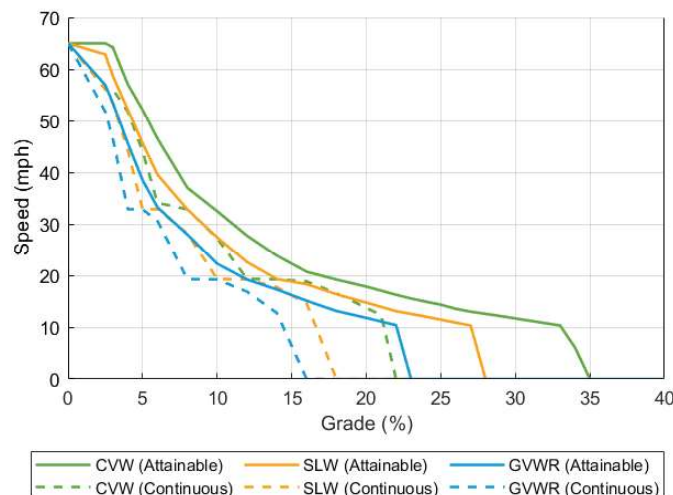


Figure 3-1. Simulated Gradeability at Varying Loads

In addition to the stipulated gradeability requirement, PSTA required simulations of vehicle performance at varying grades and speeds. The results of these simulations can be found in Table 3-1 below. The passenger load was stipulated to be 130% passenger load. No definition for 100% passenger load was provided so 100% passenger load was assumed to be GVW or 71 passengers, therefore, 130% passenger load is assumed to be 92 passengers. It should be noted that with the assumed CVW of 30320 lbs., which will vary with configuration, 130% passenger load will exceed the GVWR of 43650 lbs.

Table 3-1. Simulated Performance at Varying Grades and Speeds at 130% Passenger Load (Attainable)

		Time to Speed (s)					Maximum for Grade	
		5 mph	10 mph	15 mph	25 mph	35 mph	Speed (mph)	Time to Speed (s)
Grade	0%	2.5	4.0	5.5	11.0	19.0	65.0	66.4
	5%	3.0	4.5	6.3	16.6	52.0	38.2	204.5
	7%	3.3	4.9	7.0	23.0	N/A	31.0	138.9
	10%	3.8	5.8	8.7	N/A	N/A	22.0	81.7
Maximum for Speed	Grade (%)	22.6	22.0	15.9	9.0	5.6		
	Time to Speed (s)	600.7	176.8	48.1	117.8	217.5		

Table 3-2. Simulated Performance at Varying Grades and Speeds at 130% Passenger Load (Continuous)

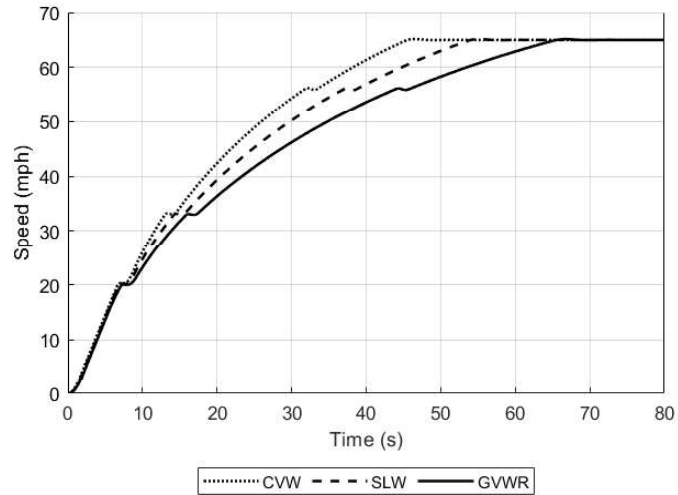
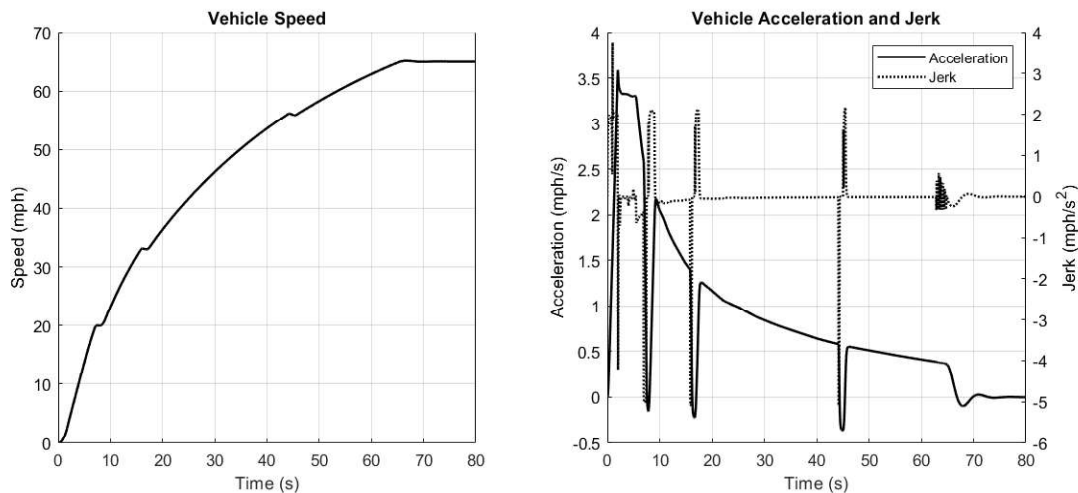
		Time to Speed (s)					Maximum for Grade	
		5 mph	10 mph	15 mph	25 mph	35 mph	Speed (mph)	Time to Speed (s)
Grade	0%	2.6	4.2	6.0	12.5	22.3	65.0	95.4
	5%	3.7	6.3	9.0	26.4	N/A	32.8	61.1
	7%	4.5	7.7	11.3	167.1	N/A	25.0	263.8
	10%	3.8	5.8	8.7	N/A	N/A	19.2	63.8
Maximum for Speed	Grade (%)	14.6	14.3	12.8	7.0	3.8		
	Time to Speed (s)	1676.8	323.8	98.1	172.1	434.1		

3.3 Acceleration Results

Under the stipulated conditions of GVWR on straight, level, dry pavement, simulations show that the ZX5+ can achieve the time to speed listed below in Table 3-3.

Table 3-3. ZX5+ Acceleration Results

Speed (mph)	Time (s)
10	4.0
20	7.4
30	13.9
40	23.4
50	34.8
65	65.6

**Figure 3-2. ZX5+ 0 mph to 65 mph Speed Profile****Figure 3-3. Vehicle Acceleration and Jerk for a 0 mph to 65 mph Speed Profile at GVWR**

3.4 Altoona Energy Economy Results

The Bus Research and Testing Center at Altoona, PA, has yet to complete testing on the proposed vehicle configuration and the drive cycles stipulated by PSTA (CBD, ART, and COM) are no longer in use by the Bus Research and Testing Center at Altoona, PA, for 35ft and 40ft vehicles. As such, simulations were conducted using parameters intended to emulate the testing methodology used in Altoona Energy Economy Tests^[4] and are summarized below.

- (a) HVAC disabled
- (b) At SLW
- (c) Defroster disabled
- (d) Windows and doors closed

It should be noted that the bus testing procedure used at Altoona does not stipulate an ambient temperature so an ambient temperature of 73°F from a previous report^[5] was used.

Table 3-4. ZX5+ Simulated Altoona Energy Economy Range Tests

Cycle	Load	Ambient Temperature (°F)	Energy Economy (kWh/mi)	MPGe	Auxiliary Loads (kW)	BOL Range (mi)	EOL Range (mi)
ADB	SLW	73°F	1.78	21.2	2.8	227	182
CBD	SLW	73°F	1.75	21.5	2.9	231	185
ART	SLW	73°F	2.22	17	2.9	182	146
COM	SLW	73°F	1.37	27.5	1.9	295	237

3.5 Model Validation Results

As previously stated, the Bus Research and Testing Center at Altoona, PA, has not completed testing of the proposed configuration at the time of writing this report. As such, the model was validated against a previous Altoona report^[6]. The configuration simulated for model validation and test by Altoona in the referenced report is not the proposed configuration and is for model validation purposes only. Note that without information concerning the specific ambient and coast down conditions at Altoona during the test, no model will be able to accurately and consistently emulate Altoona results with exact certainty.

Table 3-5. Simulation Validation Results

Cycle	Simulated		Altoona		Difference	
	Energy Economy (kWh/mi)	Maximum Range (mi)	Energy Economy (kWh/mi)	Maximum Range (mi)	Energy Economy Error (%)	Range Delta (mi)
MANN	2.167	34.1	2.100	32.7	3%	1.4
OCC	2.002	37.0	2.096	32.8	4%	4.2
HD-UDDS	1.874	39.5	2.074	32.0	10%	7.5

3.6 Operating Range Results

PSTA stipulated that range be evaluated on four operating profiles ADB cycle, the CBD cycle, the ART cycle, and the COM cycle. Simulations were conducted on the stipulated drive cycles with the following conditions and parameters.

- (a) Initial maximum dash state of charge
- (b) Defroster enabled
- (c) HVAC enabled
 - i. Setpoint of 73°F
- (d) Door operation at every idle period of 12 seconds or longer
- (e) Nominal Case
 - i. Loaded to SLW
 - ii. Ambient temperature of 90°F
- (f) Worst Case
 - i. Loaded to GVWR
 - 1. Loaded to GVW at 150 lbs per passenger and a thermally inert mass for the remainder
 - ii. Ambient temperature consistent with environmental conditions in the State of Florida

1. Hot temperature case utilizes an hourly temperature profile for the 90th percentile July temperature for zip code 33716, averaged to be 91°F
2. Cold temperature case utilizes an hourly temperature profile for the 10th percentile January temperature for zip code 33716, averaged to be 54°F

(g) Solar loading estimated for US zip code 33716

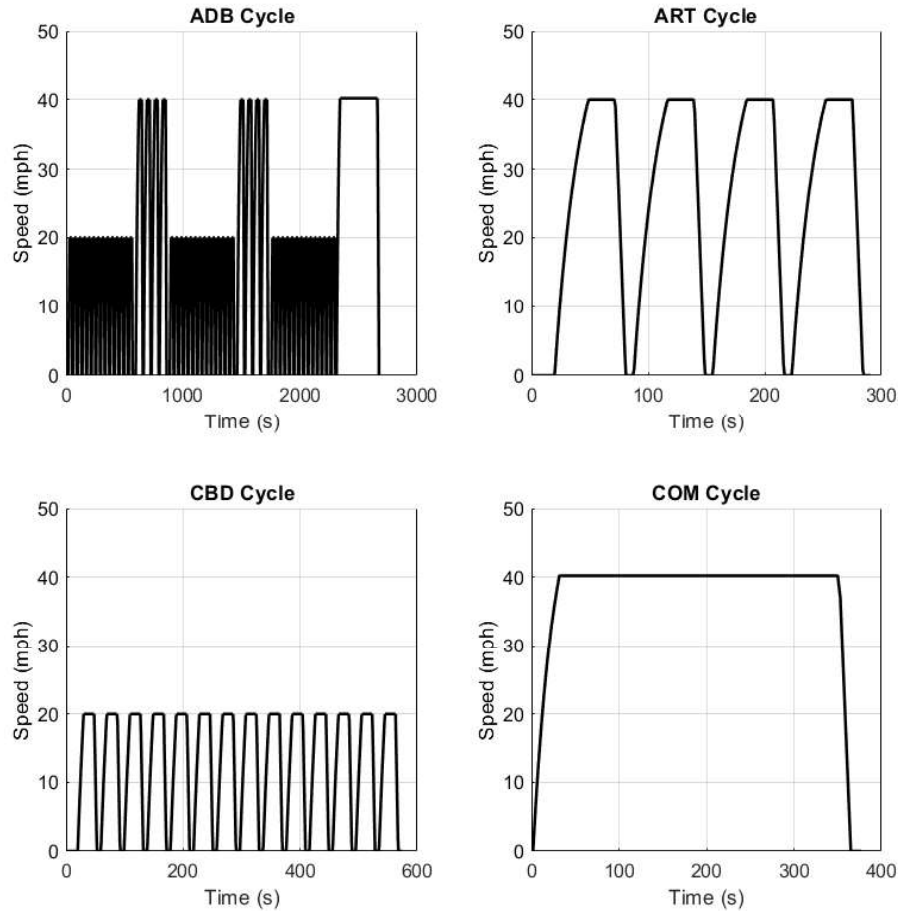


Figure 3-4. Standard Drive Cycles as Utilized in Altoona Energy Economy Testing

Table 3-6. Simulated Range Results

Cycle	Load	Ambient Temperature (°F)	Energy Economy (kWh/mi)	MPGe	Auxiliary Loads (kW)	BOL Range (mi)	EOL Range (mi)
ADB	SLW	90°F	2.14	17.6	3.2	188	151
	GVWR	91°F	2.52	15.0	3.4	160	128
	GVWR	54°F	2.30	16.3	3.6	175	140
CBD	SLW	90°F	2.29	16.4	3.3	176	141
	GVWR	91°F	2.71	13.9	3.6	149	119
	GVWR	54°F	2.38	15.8	3.8	169	135
ART	SLW	90°F	2.51	15.0	3.5	161	129
	GVWR	91°F	2.98	12.6	3.7	135	108
	GVWR	54°F	2.81	13.4	3.7	143	115
COM	SLW	90°F	1.54	24.5	2.4	262	210
	GVWR	91°F	1.73	21.8	2.4	233	187
	GVWR	54°F	1.64	23.0	2.2	247	198

4 References

Reference #	Report #	Title	Agency
1	SPEC_40_002_2021_Q2	Proterra ZX5 40 Foot Bus Platform Specifications	Proterra
2	RFP 21-980369	Florida Electric Transit Buses with Charging and Associated Equipment	PSTA
3	RFP 21980369, Addendum 4	Addendum of Solicitation	PSTA
4	-	Test Bus Procedure: Energy Economy Test	BRTC
5	LTI-BT-R1805-P	PROTERRA, INC. 35-Foot Catalyst FC	BRTC



40' ZX5 Max (optional)

Simulation Report

Simulated ZX5 MAX Energy Economy for PSTA

Prepared for the Pinellas Suncoast Transit Authority

Report Number: SIM-R2021-042A-PSTA



September 20, 2021

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Simulation Information

Projected gradeability, acceleration, top speed, energy consumption, and range for PSTA

Abbreviations and Definitions

ADB	Advanced Design Bus drive cycle, also known as the Transit Coach Operating Duty Cycle and the Business-Arterial-Commuter (BAC) drive cycle. A composite of the ART, CBD, and COM drive cycles
Ambient Temperature	The temperature of surrounding air
ART	Arterial drive cycle
Attainable Gradeability	Gradeability when drivetrain is a maximum possible performance within normal operating limits, also referred to as peak performance
BOL	Beginning of battery life, 100% of maximum usable energy
BRTC	Larson Transportation Institute's Bus Research and Testing Center, located in Altoona, Pennsylvania, commonly referred to as Altoona
CBD	Central Business District drive cycle
COM	Commuter drive cycle. This report uses the commuter drive cycle previously utilized at the BRTC at Altoona, which has a top speed of 40 mph, not the commuter cycle as stated in SAE J1376, which has a top speed of 55 mph
Continuous Gradeability	Gradeability during sustained climb at high grade for a significant period of time when limitations are imposed on the motors due to thermals
CVW	Curb Vehicle Weight, unloaded vehicle weight assumed to be approximately 33740 lbs. Actual CVW will vary with configuration
Dash SOC	Dash State of Charge, state of charge as displayed to the driver
Drive Cycle	Time series speed data at a sampling rate of 1 Hz or greater
EOL	End of battery life
ft	Feet
Gradeability	The maximum speed that a vehicle can achieve for a specified grade
GVW	Gross Vehicle Weight, vehicle weight loaded with an assumed 71 passengers and a driver at 150 lbs per person. Actual GVW will vary with configuration
GVWR	Gross Vehicle Weight Rating, maximum vehicle load of 43650 lbs
hr	Hours
HVAC	Heating, Ventilation, and Air Conditioning
Jerk	Change in acceleration, $\Delta a / \Delta t$, where a is acceleration and t is time
kW	Kilowatt

kWh	Kilowatt-hour
lbs	Pounds
Michelin® X® InCity Energy Z	Michelin low rolling resistance coach tires, size 315/80R22.5
min	Minutes
MPGe	Diesel Miles Per Gallon Equivalent
mph	Miles per hour
PSTA	Pinellas Suncoast Transit Authority
SLW	Seated Load Weight, vehicle weight loaded with an assumed 40 passengers and a driver at 150 lbs per person. Actual SLW will vary with configuration
Usable Energy	Total amount of energy available for normal operation at any one time, measured in kWh
ZX5 Series	Proterra® fifth-generation battery electric bus series

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1 **Objective**

To predict the gradeability, acceleration, top speed, overall energy consumption, and achievable range of the 40 foot ZX5 MAX^[1] with single motor drivetrain for the conditions specified by the PSTA.

1.1 **Top Speed Requirement**

PSTA stipulated that the proposed vehicle shall be capable of a top speed of 65 mph on a straight, level road at GVWR with all accessories operating and with any variance between peak and sustained performance noted, per RFP TS 7.1 Top Speed^[2].

1.2 **Gradeability Requirement**

PSTA stipulated that the proposed vehicle must be capable achieving and maintaining a speed of 40 mph on a 2.5% ascending grade and 10 mph on a 10% ascending grade continuous, per RFP TS 7.2 Gradeability^[2]. Additionally, PSTA stipulated that that time to speed on flat ground, 5%, 7%, 10%, and maximum grade for the speeds of 5 mph, 10 mph, 15 mph, 25 mph, 35 mph at a 130% passenger load be simulated and provided, per TS 8.2 Design Operating Profile^[2].

1.3 **Acceleration Requirement**

PSTA stipulated that the proposed vehicle must be capable of the acceleration requirements stipulated in Table 1-1 with all systems in operation and on straight, level, dry pavement and at GVWR, per RFP TS 7.3 Acceleration^[2].

Table 1-1. Acceleration Requirement

Speed (mph)	Maximum Time (s)
10	5
20	10
30	18
40	30
50	60
Top Speed	

1.4 **Operating Range Requirement**

PSTA stipulated that the energy consumption and range of the proposed vehicle be provided, per TS 7.4 Operating Range^[2] and TS 8. Range^[2]. The energy economy and range are to be evaluated under two sets of conditions, Altoona Energy Consumption Tests and the PSTA defined Design Operating Profile.

1.4.1 **Altoona Energy Consumption Test Requirement**

PSTA stipulated that Altoona Energy Consumption and Range Test results be provided for the Transit Coach Operating Duty Cycle (ADB cycle), per TS 8.1 Altoona Energy Consumption Tests^[2].

1.4.2 **Design Operating Profile Requirement**

PSTA stipulated that the proposed vehicle must be evaluated on with mathematical modeling, simulations, or empirical methods, per TS 8.2 Design Operating Profile^[2]. Not drive cycle was provided in TS 8.2 Design Operating Profile^[2], however, PSTA went on to clarify that the drive cycles utilized for the Design Operating Profile were to be the CBD, ART, and COM duty cycle in an addendum^[3]. The conditions stipulated in the Design Operating Profile are as follows:

- (a) Maximum auxiliary loads
- (b) Results provided for EOL
- (c) Starting at maximum operating state of charge
- (d) Nominal Conditions
 - i. Ambient temperature of 90°F
 - ii. Vehicle loaded to SLW
- (e) Worst-case Conditions
 - i. Ambient temperature consistent with worst-case heating and cooling loads when operating in the State of Florida as defined by NOAA, or alternative website
 - ii. Vehicle loaded to GVWR

PSTA further stipulated that any modeling, simulations, or empirical testing be validated against Altoona Energy Economy results utilizing ADB cycle data, per TS 8.2 Design Operating Profile^[2].

2 Discussion

The general assumptions of the High-Fidelity simulation are:

- (a) Michelin® X® InCity Energy Z tires
- (b) Battery and cabin air are thermally preconditioned
- (c) Windshield preconditioned (defrosted)
- (d) Usable energy of 606 kWh for the ZX5 MAX at BOL
- (e) Useable energy of 486 kWh of the ZX5 MAX at EOL per standard warranty
- (f) Metabolic heat is based on passenger count
- (g) No kneeling operation
- (h) Range estimations are based on simulated values and are subject to change based on driver performance, configuration, and other factors
 - i. Stated values are not guaranteed nor are provided as a warranty term
- (i) Range estimations are based on full useable energy and do not consider any reserves that may be imposed by operators

3 Simulation Results

3.1 Top Speed Results

The ZX5 MAX has a governed top speed of 65 mph and can achieve this speed at loads up to GVWR according to simulations.

3.2 Gradeability Results

Under the stipulated conditions of dry pavement, at GVWR, and with all systems in operation, simulations indicate that the ZX5 MAX with single motor drivetrain is capable of achieving an attainable speed of 56.9 mph and a continuous speed of 51.7 mph on a 2.5% grade. On a 10% grade, the ZX5 MAX is capable of achieving an attainable speed of 22.3 mph and a continuous speed of 19.2 mph. Attainable gradeability refer to the gradeability over short periods, such as on a freeway onramp or short hill. Continuous gradeability is gradeability during a sustained climb at the specified grade when limitations are imposed on the motors due to thermals.

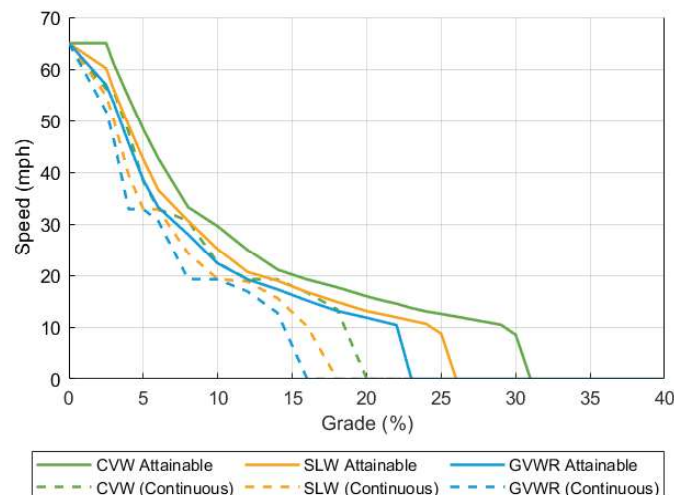


Figure 3-1. Simulated Gradeability at Varying Loads

In addition to the stipulated gradeability requirement, PSTA required simulations of vehicle performance at varying grades and speeds. The results of these simulations can be found in Table 3-1 below. The passenger load was stipulated to be 130% passenger load. No definition for 100% passenger load was provided so 100% passenger load was assumed to be GVW or 71 passengers, therefore, 130% passenger load is assumed to be 92 passengers. It should be noted that with the assumed CVW of 33740 lbs., which will vary with configuration, 130% passenger load will exceed the GVWR of 43650 lbs.

Table 3-1. Simulated Performance at Varying Grades and Speeds at 130% Passenger Load (Attainable)

		Time to Speed (s)					Maximum for Grade	
		5 mph	10 mph	15 mph	25 mph	35 mph	Speed (mph)	Time to Speed (s)
Grade	0%	2.5	4.0	5.6	11.5	20.0	65.0	72.3
	5%	3.1	4.7	6.7	18.5	85.8	35.9	301.0
	7%	3.5	5.3	7.7	28.4		29.0	235.8
	10%	4.1	6.4	10.0			20.4	117.7
Maximum for Speed	Grade (%)	20.8	20.3	14.7	8.2	5.2		
	Time to Speed (s)	568.6	213.4	53.5	97.7	215.4		

Table 3-2. Simulated Performance at Varying Grades and Speeds at 130% Passenger Load (Continuous)

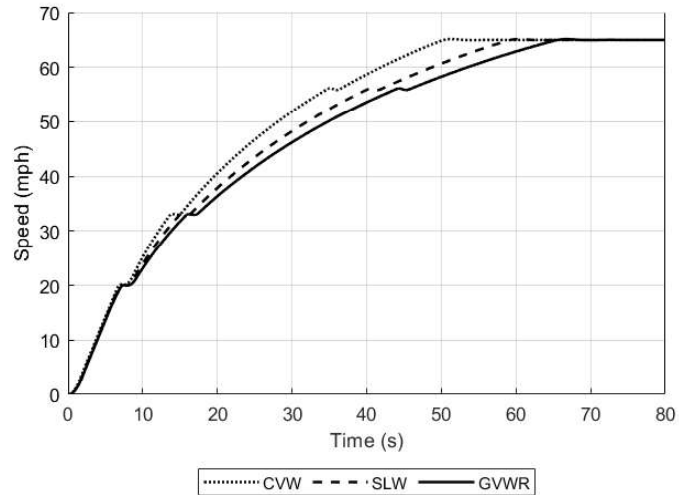
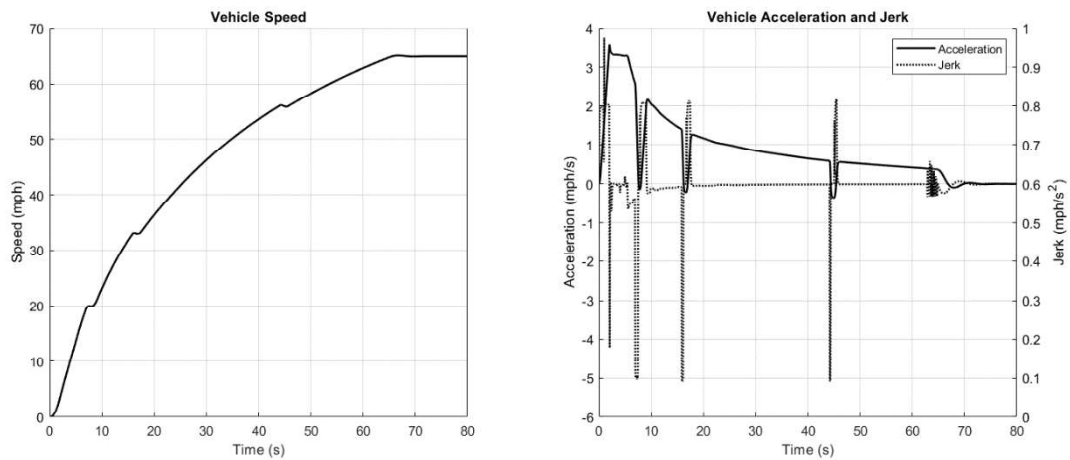
		Time to Speed (s)					Maximum for Grade	
		5 mph	10 mph	15 mph	25 mph	35 mph	Speed (mph)	Time to Speed (s)
Grade	0%	2.7	4.5	6.4	13.3	23.9	65.0	106.4
	5%	4.0	6.9	10.0	32.0		32.8	229.0
	7%	5.0	8.8	13.1			21.5	325.6
	10%	8.4	15.6	24.8			18.6	102.8
Maximum for Speed	Grade (%)	13.4	13.2	11.8	6.4	3.5		
	Time to Speed (s)	875.3	321.7	110.7	179.0	691.5		

3.3 Acceleration Results

Under the stipulated conditions of GVWR on straight, level, dry pavement, simulations show that the ZX5 MAX can achieve the time to speed listed below in Table 3-3.

Table 3-3. ZX5 MAX Acceleration Results

Speed (mph)	Time (s)
10	4.0
20	7.4
30	13.9
40	23.4
50	34.8
65	65.6

**Figure 3-2. ZX5 MAX 0 mph to 65 mph Speed Profile****Figure 3-3. Vehicle Acceleration and Jerk for a 0 mph to 65 mph Speed Profile at GVWR**

3.4 Altoona Energy Economy Results

The Bus Research and Testing Center at Altoona, PA, has yet to complete testing on the proposed vehicle configuration and the drive cycles stipulated by PSTA (CBD, ART, and COM) are no longer in use by the Bus Research and Testing Center at Altoona, PA, for 35ft and 40ft vehicles. As such, simulations were conducted using parameters intended to emulate the testing methodology used in Altoona Energy Economy Tests^[4] and are summarized below.

- (a) HVAC disabled
- (b) At SLW
- (c) Defroster disabled
- (d) Windows and doors closed

It should be noted that the bus testing procedure used at Altoona does not stipulate an ambient temperature so an ambient temperature of 73°F from a previous report^[5] was used.

Table 3-4. ZX5 MAX Simulated Altoona Energy Economy Range Tests

Cycle	Load	Ambient Temperature (°F)	Energy Economy (kWh/mi)	MPGe	Auxiliary Loads (kW)	BOL Range (mi)	EOL Range (mi)
ADB	SLW	73°F	1.93	19.5	2.9	314	252
CBD	SLW	73°F	1.91	19.7	3.0	317	254
ART	SLW	73°F	2.42	15.6	3.0	250	201
COM	SLW	73°F	1.45	26.0	1.9	419	336

3.5 Model Validation Results

As previously stated, the Bus Research and Testing Center at Altoona, PA, has not completed testing of the proposed configuration at the time of writing this report. As such, the model was validated against a previous Altoona report^[6]. The configuration simulated for model validation and test by Altoona in the referenced report is not the proposed configuration and is for model validation purposes only. Note that without information concerning the specific ambient and coast down conditions at Altoona during the test, no model will be able to accurately and consistently emulate Altoona results with exact certainty.

Table 3-5. Simulation Validation Results

Cycle	Simulated		Altoona		Difference	
	Energy Economy (kWh/mi)	Maximum Range (mi)	Energy Economy (kWh/mi)	Maximum Range (mi)	Energy Economy Error (%)	Range Delta (mi)
MANN	2.167	34.1	2.100	32.7	3%	1.4
OCC	2.002	37.0	2.096	32.8	4%	4.2
HD-UDDS	1.874	39.5	2.074	32.0	10%	7.5

3.6 Operating Range Results

PSTA stipulated that range be evaluated on four operating profiles ADB cycle, the CBD cycle, the ART cycle, and the COM cycle. Simulations were conducted on the stipulated drive cycles with the following conditions and parameters.

- (a) Initial maximum dash state of charge
- (b) Defroster enabled
- (c) HVAC enabled
 - i. Setpoint of 73°F
- (d) Door operation at every idle period of 12 seconds or longer
- (e) Nominal Case
 - i. Loaded to SLW
 - ii. Ambient temperature of 90°F
- (f) Worst Case
 - i. Loaded to GVWR
 - 1. Loaded to GVW at 150 lbs per passenger and a thermally inert mass for the remainder
 - ii. Ambient temperature consistent with environmental conditions in the State of Florida

1. Hot temperature case utilizes an hourly temperature profile for the 90th percentile July temperature for zip code 33716, averaged to be 91°F
2. Cold temperature case utilizes an hourly temperature profile for the 10th percentile January temperature for zip code 33716, averaged to be 54°F

(g) Solar loading estimated for US zip code 33716

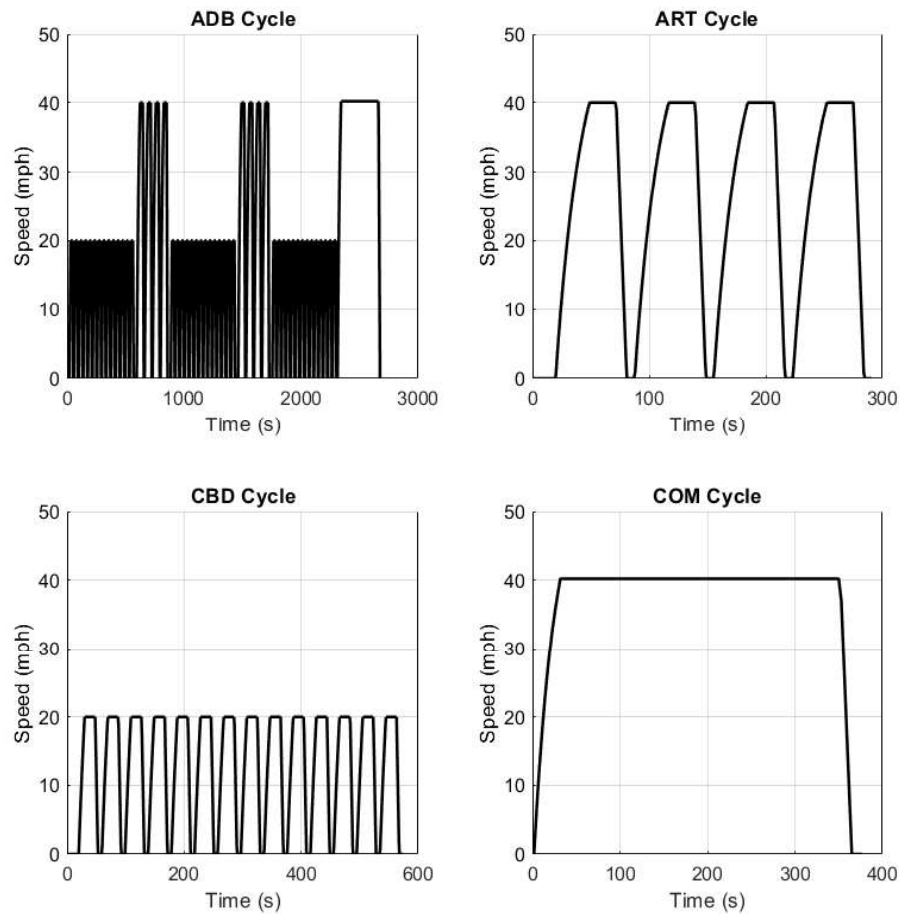


Figure 3-4. Standard Drive Cycles as Utilized in Altoona Energy Economy Testing

Table 3-6. Simulated Range Results

Cycle	Load	Ambient Temperature (°F)	Energy Economy (kWh/mi)	MPGe	Auxiliary Loads (kW)	BOL Range (mi)	EOL Range (mi)
ADB	SLW	90°F	2.29	16.4	3.3	264	212
	GVWR	91°F	2.51	15.0	3.4	241	193
	GVWR	54°F	2.31	16.3	3.9	262	210
CBD	SLW	90°F	2.45	15.4	3.4	247	198
	GVWR	91°F	2.71	13.9	3.6	223	179
	GVWR	54°F	2.40	15.7	4.0	253	202
ART	SLW	90°F	2.70	14.0	3.5	224	180
	GVWR	91°F	2.97	12.7	3.6	204	163
	GVWR	54°F	2.81	13.4	4.0	215	172
COM	SLW	90°F	1.62	23.2	2.4	374	300
	GVWR	91°F	1.73	21.7	2.5	349	280
	GVWR	54°F	1.68	22.4	3.8	361	289

4 References

Reference #	Report #	Title	Agency
1	SPEC_40_002_2021_Q2	Proterra ZX5 40 Foot Bus Platform Specifications	Proterra
2	RFP 21-980369	Florida Electric Transit Buses with Charging and Associated Equipment	PSTA
3	RFP 21980369, Addendum 4	Addendum of Solicitation	PSTA
4	-	Test Bus Procedure: Energy Economy Test	BRTC
5	LTI-BT-R1805-P	PROTERRA, INC. 35-Foot Catalyst FC	BRTC



Warranty Documentation

Proterra's standard and extended warranty policies are included on the following pages, for the base buses as well as the High Voltage Batteries / Energy Storage System (ESS). Note: Proterra's proposal is compliant with PSTA's required 6-year warranty for the High Voltage Batteries (ESS), Traction Motors, Inverters, Depot Chargers and On Route Chargers.

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Base Warranty Documentation

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East Coast Manufacturing

1 Whitlee Court, Greenville, SC 29607

West Coast Manufacturing

383 Cheryl Lane, City of Industry, CA 91789

www.proterra.com



PROTERRA TRANSIT BUS COMPLETE VEHICLE LIMITED WARRANTY

Proterra, Inc. ("**Proterra**") warrants to the original purchaser/lessee ("**Customer**") that its Proterra ZX5 / ZX5+ / ZX5 Max - Series Battery Electric Transit Bus will be free from defects in material and workmanship under normal use and when properly serviced. Proterra agrees to repair or replace defective parts with either new, or re-certified parts when available, subject to the terms and conditions set forth herein.

NOTE: This Warranty does not include Proterra High Voltage Battery Packs. Please refer to the [Battery Pack Limited Warranty](#) section.

The final determination of required repairs or parts replacement shall be the sole discretion of Proterra. This Proterra Transit Bus Complete Vehicle Limited Warranty ("**Warranty**") is a limited warranty subject to the terms and conditions stated in the sections below.

EXCEPT FOR THE OBLIGATIONS, WARRANTIES AND REPRESENTATIONS SPECIFIED HEREIN, PROTERRA MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AND SPECIFICALLY DISCLAIMS ANY REPRESENTATION OR WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE OR NON-INFRINGEMENT, AND SPECIFICALLY DISCLAIMS ANY WARRANTY ARISING BY USAGE OF TRADE OR BY COURSE OF DEALING.

This Warranty is comprised of two sections; Section **A** applies to the Complete Vehicle, Vehicle Structural Warranty, and Body Warranty. Section **B** applies to the Major Components listed below.

Proterra will reimburse the customer for the parts and labor as published in the Proterra Standard Repair Time Guide ("**SRT**") and shall follow local ordinances as necessary and if applicable in accordance with the terms of this warranty and the purchase/lease agreement, along with associated freight costs to provide required replacement parts during the warranty time period identified below.

Warranty repairs may be performed by the Customer, an authorized warranty provider, or Proterra only and must adhere to the terms and conditions outlined in the following statement of warranty. All components replaced under the warranty are exclusive property of Proterra Inc. and must be returned following the procedures set forth in the "Part Return" section of the warranty manual.

Proterra, at its sole discretion or as part of a Proterra Service Plan, may perform warranty repairs at the Customer location. Costs associated with these repairs will be at the expense of Proterra during standard operating hours. Emergency afterhours warranty support may be performed at the request of the Customer for a fee.

At Proterra, safety is of the utmost importance for our customers and our employees. Therefore, we require our customers to have and maintain the necessary safety equipment, in accordance with state and local OSHA regulations, for the use of any Proterra employee, or authorized provider, that may be performing or assisting with repairs at the Customer's location. This includes but is not limited to, fall restraints, proper lifting equipment and jack stands. Proterra employees will not be permitted to perform any repairs without the necessary safety equipment being provided.



WARRANTY TERMS SECTION A – PROTERRA TRANSIT BUS – STANDARD BASE WARRANTY COVERAGE

This section includes manufactured or assembled components and systems, including some purchased assemblies listed below.

Proterra Complete Vehicle Limited Warranty 1 Year / 50,000 Miles, whichever occurs first. (1 Year / 80,467 Kilometers, whichever occurs first).	<p>Coverage includes all components and workmanship that were provided with the Complete Vehicle from the factory.</p> <p>Excludes:</p> <ul style="list-style-type: none"> • Normal maintenance items or wearable items including, but not limited to, brake pads, filters, light bulbs, fuses, circuit breakers, bushings, or any consumable items that are the sole responsibility of the Customer • Provided Customer Equipment, including but not limited to, cameras, fare boxes, counters, and ITS components. • Adjustments, Alignments and/or loose hardware after the first 90 days following vehicle acceptance.
Vehicle Structural Warranty 3 Year / 150,000 Miles, whichever occurs first. (3 Year / 241,401 Kilometers, whichever occurs first).	<p>Includes the structural elements of the following: Suspension, Front & Rear, Powertrain Cradle, Including Support Members.</p> <p>Excludes:</p> <ul style="list-style-type: none"> • Physically damaged components due to accidents or other impacts. • Modified/Repaired components that were damaged and repaired after collision.
Body Warranty (Monocoque Assembly) 12 Year / 500,000 Miles, whichever occurs first. (12 Year / 804,672 Kilometers, whichever occurs first).	<p>This applies to any structural and/or workmanship defects discovered in the Monocoque structure.</p> <p>Excludes:</p> <ul style="list-style-type: none"> • Non-structural members.



WARRANTY TERMS SECTION B - PROTERRA TRANSIT BUS – STANDARD MAJOR COMPONENT COVERAGE – 2YR/100K

This section includes major components purchased and installed by Proterra and listed below and is guided by the manufacture warranty. Each item listed in Section B is covered for 2 years or 100,000 miles (160,934 Kilometers), whichever occurs first.

Propulsion System Warranty	<p>System Components including but not limited to; Traction Motor, Traction Motor Inverter, Transmission, Drive Shaft, Output Flange, Differential, Gearboxes, Planetary Sets, and Axle shafts, Oil pump(s), and all internally lubricated parts.</p> <p>Excludes: Lack of maintenance and/or physically damaged components</p>
HV Power Electronics and HV Cooling Warranty	<p>System Components including but not limited to, VFD, DC-DC, HV Junction Box, Radiator, and Battery Coolant Pump(s), Contactors, Shunts and Buss Bars.</p> <p>Excludes: Lack of maintenance and/or physically damaged components</p>
HVAC Warranty	<p>System Components including but not limited to, Condenser, Compressor, Controller, HVAC Inverter, Evaporator, Receiver/Drier, Blower Fan, Ducting, Thermostat/Thermistor, VFD, and related Sensors and Switches.</p> <p>Excludes:</p> <ul style="list-style-type: none"> • Maintenance items/filters • Debris from external sources (e.g. leaves, dust/dirt) • Routine Recharge/System Tests • Lack of maintenance • Physically damaged components
Control Systems & Driver Convenience Warranty	<p>System Components including but not limited to, ZR Vehicle Controller, Multiplex, Powertrain Controller, D-MUX, Charge Controller, WCCM (Pantograph), Factory Telemetry/Data Logger, Ride Height Controller, Body Controller, Defroster and Blower Motor, Driver Workplace Controls and Switches,</p> <p>Excludes:</p> <ul style="list-style-type: none"> • Modifications to system architecture • Physically damaged components
Chassis System Warranty	<p>System Components including but not limited to, ABS Controller, Air Bags/Shocks, Ride Height Linkage/Sensors, Ride Height Controller, Ride Height Manifold, Air Compressor, Air Dryer, Brake Calipers, Wheel Speed Sensors, Power Steering Motor and Pump, Steering Linkage and Gear.</p> <p>Excludes:</p> <ul style="list-style-type: none"> • Air Compressor Filter & Oil Separator Maintenance • Lack of maintenance • Physically damaged components
Auxiliary Heater Warranty	<p>System Components limited to added components within the Auxiliary Heating Option if selected by the Customer. This includes, Auxiliary Heating Unit, Aux. Heat Fuel System Components, Aux. Blower Motor(s), Aux. Ducting, Aux. Thermistor(s), and Aux. Control(s) as equipped per specification.</p> <p>Excludes:</p> <ul style="list-style-type: none"> • Maintenance items/filters • Debris from external sources (e.g. leaves, dust/dirt) • Lack of maintenance • Physically damaged components



Configuration Package Warranty	<p>Subsystem Components including but not limited to, Wheelchair Access Ramp(s), Wheelchair Securement System(s), Door System(s), Windows, Destination Signs, Fire Suppression System, and Seating. This includes associated components within each system ordered and identified by the Sales Contract.</p> <p>This is contract-specific coverage based on Customer's selected Options.</p> <p>Excludes:</p> <ul style="list-style-type: none">• Glass breakage, wear and tear• Refilling and/or certification of fire suppression bottles• Seat Covers and Upholstery• Physically damaged components
---------------------------------------	--

WHAT IS NOT COVERED:

The following conditions are not covered by this Warranty:

- Alteration or modification of any part of the Product with any third-party item,
- Misuse or negligent use of the bus, including but not limited to Customer's, or a third-party's, failure to follow Proterra's Operating Manual,
- Intentional or accidental collision and/or other physical damage.
- Acts of Nature,
- Neglect or Failure to perform the Preventative Maintenance as outlined in the maintenance documentation for the Product,
- Unauthorized use or operation outside of the terms and conditions of the applicable lease contract,
- Improper maintenance and repair, or
- Intentional acts of destruction, tampering or vandalism.
- Adjustments and Alignments past the first 90 days after the bus is delivered to the Customer's site.
- Normal maintenance items or wearable items including, but not limited to, brake pads, filters, light bulbs, fuses, circuit breakers, bushings, or any consumable items.
- Oil, coolant, refrigerant and other fluids are not covered except when used in conjunction with a covered repair as identified in the Proterra Service Manual.
- Any physical damage to Product while in transit to Customer site. This includes shipping damage by carrier delivering a bus. Any damage incurred while in transit will require a claim being filed to the transportation company.
- Body paint and/or vehicle wraps are not covered by this Warranty. Speak to a Proterra representative regarding paint and/or vehicle wrap warranty.

LOW VOLTAGE 12/24 BATTERY POLICY

Proterra warrants the original 12/24V low voltage batteries during the first 90-day period upon delivery of the Proterra Bus and is not extendable. No claims for these batteries will be accepted after the original 90-day period.

For approved low voltage battery replacements during the Warranty period, Customer shall acquire battery at their local vendor and submit for reimbursement through the Warranty Claim submission process outlined within this manual. Customer is advised to contact their local battery vendor for replacement low voltage batteries when required. Proterra will not sell nor ship low voltage batteries through its Service Parts Operation.

Any subsequent battery failures will be subject to the warranty terms provided from the local battery vendor.



ACTIVATION OF WARRANTY

The Warranty term starts on the Date of Acceptance for each Product in accordance with the terms of the applicable purchasing contract.

Proterra administers the warranty process, and all warranty claim approvals are at the sole and absolute discretion of Proterra.

In connection with any claim brought under this Warranty, the Customer must submit a completed Proterra Warranty Claim Form along with a copy of their internal work order, showing technician punch times, and any additional applicable documentation. Customer is required to retain any parts related to a Warranty transaction for thirty (30) days from the date that the claim has been approved. Proterra reserves the right to request any removed parts be returned at any time during the 30-day period.

Customer also has thirty (30) days to return any parts that are identified as “Core” parts or will be charged the applicable “Core Charge”. Proterra may perform an inspection of the failed component and supporting documentation to make a claim determination. Proterra will not provide any compensation, labor, repairs, or replacement part to the Customer without the above documentation.

Proterra reserves the right to adjust the approved amount to align with the current published SRT guide if excess amounts are claimed without prior authorization from Proterra.

NOTE: Towing coverage is only reimbursed during the initial ***Transit Bus Complete Vehicle Limited Warranty*** for 1 Year/ 50,000 miles, whichever occurs first. All towing claims must be accompanied the warranty repair order and the towing invoice from the provider. Proterra will not pay mark-up on any sublet claims.

For assistance with any warranty claim transactions, please email warranty@proterra.com for support. Please include vehicle VIN, current odometer, unit number, claim number and/or invoice in your correspondence.

DELAYED WARRANTY STARTS

A Delayed Warranty Start may be granted for the Customer to ready the Product for revenue service. This Delayed Warranty Start period shall not exceed 30 days after the Date of Acceptance for each Product and must be approved in writing by Proterra.

This period will allow for Customer to install any necessary equipment, have graphics applied, or any other service readiness activities.

For Delayed Warranty Start approval, the Customer must apply for this added time as part of the Purchase Agreement for the Product, or by submitting the Delayed Warranty Start Application included in the Forms Section of the Appendix.

PLEASE SEE THE PROTERRA TRANSIT WARRANTY MANUAL FOR ALL SERVICE, PARTS AND WARRANTY POLICIES AND PROCEDURES



2170 BATTERY PACK LIMITED WARRANTY

Subject to the terms, conditions and limitations set forth in this Battery Pack Limited Warranty (the "Warranty"), including, without limitation, the Approved Use Conditions, Proterra, Inc. ("Proterra") warrants to the original purchaser or lessee (individually or collectively, the "Customer") that its high voltage battery pack (the "Battery Pack") for the Proterra ZX5 / ZX5+ /ZX5 Max - series battery-electric bus will be free from defects in materials and workmanship.

This Warranty covers the parts, labor (if applicable and in accordance with the terms of this Warranty and/or any purchase or lease agreement), and freight costs incurred during the Warranty Period.

The Battery Pack may not be serviced by the Customer, or any third-party maintenance provider, without having completed the proper factory training and have successfully been certified by Proterra to service the Battery Pack. Any servicing of the Battery Pack by the Customer, or any third-party maintenance provider, without having become Proterra-Certified will void the Warranty. Proterra, or a Proterra-Certified technician, will perform all necessary repairs to the Battery Pack.

2170 BATTERY PACK LIMITED WARRANTY TERMS

As it pertains to this section, the following terms are defined:

"Gross Discharge Throughput" means the total energy discharged through the Battery Pack during its life, including energy from external chargers and energy recuperated from regenerative braking. The Gross Discharge Throughput will be tracked by the BMS at the Battery Pack level and reported through the onboard vehicle telemetry system.

"Nameplate Energy" means the amount of energy stated in the specifications, bid proposal, and/or contract, divided by the number of Battery Packs (e.g., 4 Battery Packs at 400 kWh would have 100 kWh nameplate energy per Battery Pack).

"Available Energy" means the amount of energy available between 0% state of charge ("SOC") and 100% SOC - This information can be obtained using the Proterra diagnostic tool and a snapshot thereof must accompany any battery claims.

Battery Pack Material and Workmanship Warranty 6 Years / Unlimited Mileage	Coverage to include all materials, components and workmanship of the Battery Pack to be free of defects.
Battery Packs with Nameplate energy of 112.5 kWh 6 Years / 200 MWh	For Battery Packs with 112.5 kWh of Nameplate Energy and the Available Energy of 101 kWh in new condition, Proterra warrants Available Energy of 81 kWh per Battery Pack for 6 years, or 200 MWh of Gross Discharge Throughput per Battery Pack, whichever comes first.



COMPONENTS INCLUDED IN BATTERY PACK LIMITED WARRANTY

This Warranty includes the following Battery Pack components:

- Battery Modules
- Battery Management System (BMS)
- Battery Cooling System
- Battery Pack Enclosure
- Electrical, Mechanical, and Thermal Interfaces
- Manual Service Disconnect (MSD)

WHAT IS NOT COVERED

The following conditions are not covered by the Battery Pack Limited Warranty:

- Battery Packs that have been serviced by a non-Proterra-Certified technician without prior authorization by Proterra.
- Alteration or modification of any part of the Product with any third-party item
- Misuse or negligent use of the bus, including but not limited to Customer's, or a third-party's, failure to follow Proterra's Operating Manual
- Intentional or accidental collision and/or other physical damage
- Acts of Nature
- Neglect or Failure to perform the Preventative Maintenance as outlined in the maintenance documentation for the Product
- Unauthorized use or operation outside of the terms and conditions of the applicable lease contract,
- Improper maintenance and repair
- Intentional acts of destruction, tampering or vandalism



Extended Warranty Documentation

Note: We are offering an optional 12-year extended warranty for the high voltage batteries (ESS) as priced on the Pricing Schedule, in accordance with the battery pack limited extended warranty documentation provided on the following pages.



2170 BATTERY PACK LIMITED EXTENDED WARRANTY

Subject to the terms, conditions and limitations set forth in this Battery Pack Limited Warranty (the "Warranty"), including, without limitation, the Approved Use Conditions, Proterra, Inc. ("Proterra") warrants to the original purchaser or lessee (individually or collectively, the "Customer") that its high voltage battery pack (the "Battery Pack") for the Proterra ZX5 / ZX5+ /ZX5 Max - series battery-electric bus will be free from defects in materials and workmanship.

This Warranty covers the parts, labor (if applicable and in accordance with the terms of this Warranty and/or any purchase or lease agreement), and freight costs incurred during the Warranty Period.

The Battery Pack may not be serviced by the Customer, or any third-party maintenance provider, without having completed the proper factory training and have successfully been certified by Proterra to service the Battery Pack. Any servicing of the Battery Pack by the Customer, or any third-party maintenance provider, without having become Proterra-Certified will void the Warranty. Proterra, or a Proterra-Certified technician, will perform all necessary repairs to the Battery Pack.

2170 BATTERY PACK LIMITED EXTENDED WARRANTY TERMS

As it pertains to this section, the following terms are defined:

"Gross Discharge Throughput" means the total energy discharged through the Battery Pack during its life, including energy from external chargers and energy recuperated from regenerative braking. The Gross Discharge Throughput will be tracked by the BMS at the Battery Pack level and reported through the onboard vehicle telemetry system.

"Nameplate Energy" means the amount of energy stated in the specifications, bid proposal, and/or contract, divided by the number of Battery Packs (e.g., 4 Battery Packs at 400 kWh would have 100 kWh nameplate energy per Battery Pack).

"Available Energy" means the amount of energy available between 0% state of charge ("SOC") and 100% SOC - This information can be obtained using the Proterra diagnostic tool and a snapshot thereof must accompany any battery claims.

Battery Pack Material and Workmanship Warranty 12 Years / Unlimited Mileage	Coverage to include all materials, components and workmanship of the Battery Pack to be free of defects.
Battery Packs with Nameplate energy of 112.5 kWh 12 Years / 400 MWh	For Battery Packs with 112.5 kWh of Nameplate Energy and the Available Energy of 101 kWh in new condition, Proterra warrants Available Energy of 81 kWh per Battery Pack for 12 years, or 400 MWh of Gross Discharge Throughput per Battery Pack, whichever comes first.



COMPONENTS INCLUDED IN BATTERY PACK LIMITED WARRANTY

This Warranty includes the following Battery Pack components:

- Battery Modules
- Battery Management System (BMS)
- Battery Cooling System
- Battery Pack Enclosure
- Electrical, Mechanical, and Thermal Interfaces
- Manual Service Disconnect (MSD)

WHAT IS NOT COVERED

The following conditions are not covered by the Battery Pack Limited Warranty:

- Battery Packs that have been serviced by a non-Proterra-Certified technician without prior authorization by Proterra.
- Alteration or modification of any part of the Product with any third-party item
- Misuse or negligent use of the bus, including but not limited to Customer's, or a third-party's, failure to follow Proterra's Operating Manual
- Intentional or accidental collision and/or other physical damage
- Acts of Nature
- Neglect or Failure to perform the Preventative Maintenance as outlined in the maintenance documentation for the Product
- Unauthorized use or operation outside of the terms and conditions of the applicable lease contract,
- Improper maintenance and repair
- Intentional acts of destruction, tampering or vandalism

***Altoona Status***

Proterra BEBs have been tested at Altoona on nine (9) different occasions, including three distinct full STURRA tests. The proposed ZX5 buses recently completed the Altoona pass/fail testing after a lengthy shutdown due to the COVID-19 pandemic. The full Altoona Test Report for the 40' ZX5 with DuoPower (identified as CAT40DP) is included on the following pages.

The additional partial test for the ZX5 Max (675kWh), which shows the longest documented range of any 40' electric bus ever tested at Altoona, is available upon request.



40' Complete Test
September 2020
Report Number: LTI-BT-R1906

FEDERAL TRANSIT BUS TEST

**Performed for the Federal Transit Administration U.S. DOT
In accordance with 49 CFR, Part 665**

**Manufacturer: Proterra
Model: CAT40DP**

**Tested in Service-Life Category
12 Year / 500,000 Miles**

September 2020

Report Number: LTI-BT-R1906

**The Thomas D. Larson
Pennsylvania Transportation Institute
201 Transportation Research Building
The Pennsylvania State University
University Park, PA 16802
(814) 865-1891**

**Bus Testing and Research Center
2237 Plank Road
Duncansville, PA 16635
(814) 695-3404**



PennState
College of Engineering

**LTI BUS RESEARCH
AND TESTING CENTER**

FEDERAL TRANSIT BUS TEST

Performed for the Federal Transit Administration, U.S. DOT
1200 New Jersey Avenue, SE
Washington, DC 20590

In accordance with 49 CFR Part, 665

Manufacturer: Proterra
Manufacturer's address: 1815 Rollins Road
Burlingame, CA 94010

Model: CAT40DP

Tested in Service-Life Category
12 Year / 500,000 Miles

Report Number: LTI-BT-R1906



David Klinikowski

Quality Authorization

Director, Bus Research
and Testing Center

Title

09/23/2020

Date

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EXECUTIVE SUMMARY

TEST HIGHLIGHTS

The information in this report pertains only to this specific bus, as received from the manufacturer for testing.

The Check-In section of the report provides a description of the bus and specifies its major components. The following table gives the salient specifications.

Manufacturer	Proterra
Model	CAT40DP
Chassis Make/Model	Proterra / Catalyst
Chassis Modified	No
Length	42 feet, 5 inches
Fuel	Battery Electric
Service Life	12 Years / 500,000 miles
Number of Seats (including driver)	39 or 33 and 2 wheelchairs
Manufacturer-Designated Standing Passenger Capacity	38
Gross Vehicle Weight used for testing	43,640
Gross Vehicle Weight Rating	43,650 (Manufacturer Specified)
Mileage at Delivery	2,330
Test Start Date	March 28, 2019
Test Completion Date	September 10, 2020*

*Due to the COVID-19 pandemic, all bus testing activities were suspended during the period of March 26, 2020 through July 16, 2020.

The measured curb weight was 14,490 lb. for the front axle and 18,870 lb. for the rear axle. These combined weights provided a total measured curb weight of 33,360 lb. There are 39 seats including the driver and free floor space for 49 standing passengers bringing the potential total passenger capacity to 88. However, a placard limits the maximum number of standing passengers to 29. Therefore, the gross load represents 39 seated passengers and 29 standees for a total of 68 passengers. Gross load is calculated as 150 lb. x 68 = 10,200 lb. At full declared capacity, the measured gross vehicle weight was 43,640 lb. There is a potential to overload this bus with the available floor space for standing passengers.

For the Performance and Energy Economy Tests, ballast weight equivalent of the roof mount battery packs was removed to represent the four-pack battery configuration per the Federal Transit Administration determination letter. Therefore, the seated load weight used was 36,960 lbs. for those tests.

During the Structural Durability testing the bus experienced periodic instances of mileage loss by the odometer. The issues appeared to be resolved after a software update. Mileage accumulation was tracked secondarily on a hub-odometer to ensure accuracy. Late in the test, the bus developed an intermittent shifting problem in the rear axle. The manufacturer traced a contributor to the problem to be contamination in the air

line actuating the pneumatic shift valves. The manufacturer stated that the contamination was caused by a degradation of the grease used during the shifter mechanism assembly and the issue would be resolved in the production process.

BUS TESTING BACKGROUND

On August 1, 2016, FTA announced a final rule for bus testing for improving the process of ensuring the safety and reliability of new transit buses. The rule satisfies requirements in MAP-21 to establish minimum performance standards, a standardized scoring system, and a pass-fail threshold based on the score.

FTA's Bus Testing Program (often referred to as "Altoona Testing" due to the location of the main testing center) tests new transit bus models for:

- Maintainability
- Reliability
- Safety
- Performance (including Braking Performance)
- Structural Integrity (including Structural Durability)
- Fuel Economy (Energy Efficiency and Range, for electric buses)
- Noise
- Emissions

Bus models that fail to meet one or more minimum performance standards will "fail" their test and thus be ineligible for purchase with FTA funds until the failures are resolved and validated through further testing. FTA will use this authority to make sure defects are corrected before a bus model can be acquired with FTA funding.

In each application to FTA for the purchase or lease of any new bus model, or any bus model with a major change in configuration or components to be acquired or leased with funds obligated by the FTA, the recipient shall certify that it has received the appropriate full Bus Testing Report and any applicable partial testing report(s) before final acceptance of the first vehicle. In dealing with a bus manufacturer or dealer, the recipient shall be responsible for determining whether a vehicle to be acquired requires full testing or partial testing or has already satisfied the requirements of this part. A bus manufacturer or recipient may request guidance from FTA in making these determinations.

The purpose of the testing is intended set a "Pass/Fail" standard and grade the performance of the buses in order to provide performance information to the transit authorities that can be used in their purchase or lease decisions. The intent of this report is to provide the grantee a relative measure of the performance of a particular model of transit bus against a standard of performance. The passing of this test should ensure a vehicle has a high probability of meeting its service life in the category it was tested.

The data included in this test report and other applicable reports should be reviewed to choose the most suitable bus for a grantee's operation. A higher scoring bus is not necessarily the best bus for a given application. For example, a bus with a

powerful engine may score well because of its performance and gradeability, but another bus with a smaller and more fuel-efficient engine could be a better choice for applications in mostly flat areas. It is the responsibility of the grantee to ensure the proper test report or applicable partial report is in their possession and has been thoroughly reviewed.

The score sheet for the subject vehicle of this test report is provided below. **This bus passed the Altoona test, with an aggregate score of 79.9**

Bus 1906 Proterra							
Test category	Standard	Base Pts.	Bonus Pts.	Range	Test Data	Score	FAIL
1. Maintainability	Unscheduled maint.	2	14	0	94.6	5.40	
2. Reliability	# Class 2 failures	2	6	0	0	8.00	
	Hazards	10	0	P	P	10.00	
	Stability	2.5	0	P	P	2.50	
3. Safety	< 158 feet at 45mph	0.5	2	80	139.3	0.98	
	Braking	2.5	0	P	P	2.50	
	Acceleration 0-30 mph	2.5	0	P	P	2.50	
4. Performance	Gradeability 2.5%	1.5	0	P	P	1.50	
	Gradeability 10%	2	0	P	P	2.00	
	Distortion	1	0	P	P	1.00	
	Static Towing	1	0	P	P	1.00	
	Dynamic Towing	1	0	P	P	1.00	
5. Structural Integrity	Jacking	1	0	P	P	1.00	
	Hoisting	1	0	P	P	1.00	
	Durability-Structural	13	0	P	P	13.00	
	Durability-Powertrain	12	0	P	P	12.00	
	Liquid fuels	1-13mpg		1	13	0.00	
6. Fuel Economy	CNG	10-50 scf/mi	1	10	50	0.00	
	Hydrogen	15-98 cf/mi		15	98	0.00	
	Electric	1-3 kWh/mi		1	3	3.31	
7. Noise	Int. Noise (0-35 mph)	less than 80 db	0.5	30	80	0.86	
	Ext. Noise (0-35 mph)	less than 83 db	0.5	50	83	1.81	
	CO ₂	0-4000 g/mi		0	4000	5.00	
	CO	0-20 g/mi		0	20	0.40	
8. Emissions	Total hydrocarbon	0-3 g/mi	1	0	3	0.40	
	NMHC	0-3 g/mi		0	3	0.40	
	Nitrogen oxides	0-3 g/mi		0	2	0.40	
	Particulates	0-0.1 g/m		0	0.1	0.40	
Total		60	40			79.9	

Note: The use of the scoring system is not mandatory for procurement. It is only necessary that the bus being procured has received a passing score.

ABBREVIATIONS AND ACRONYMS

ABS	- anti-skid braking system
ABTC	- Altoona Bus Test Center
A/C	- air conditioner, or air conditioning
AC	- alternating current
ADA	- American Disability Act
CDCTS	- chassis dynamometer test control system
CVS	- constant volume sampling
CW	- curb weight (bus weight including maximum fuel, oil, and coolant; but without passengers or driver)
dB(A)	- decibels with reference to 0.0002 microbar as measured on the "A" scale
DC	- direct current
DIR	- test director
DR	- bus driver
EPA	- Environmental Protection Agency
GAWR	- gross axle weight rating
GVL	- gross vehicle load (150 lb. for every designed passenger seating position, for the driver, and for each 1.5 sq ft of free floor space)
GVW	- gross vehicle weight (curb weight plus gross vehicle load)
GVWR	- gross vehicle weight rating
HD-UDDS	- Heavy Duty-Urban Dynamometer Driving Schedule
LTI	- Larson Transportation Institute
mpg	- miles per gallon
mph	- miles per hour
PM	- Preventive maintenance
PSTT	- Penn State Test Track
rpm	- revolutions per minute
SAE	- Society of Automotive Engineers
SCF	- Standard cubic foot
SCH	- test scheduler
SA	- staff assistant
SLW	- seated load weight (curb weight plus 150 lb. for every designed passenger seating position and for the driver)
TD	- test driver
TECH	- test technician
TM	- track manager
TP	- test personnel
Wh	- Watt hour

TEST BUS CHECK-IN

I. OBJECTIVE

The objective of this task is to log in the test bus, assign a bus number, complete the vehicle data form, and perform a safety check.

II. TEST DESCRIPTION

The test consisted of assigning a bus test number to the bus, cleaning the bus, completing the vehicle data form, obtaining any special information and tools from the manufacturer, determining a testing schedule, performing an initial safety check, and performing the manufacturer's recommended preventive maintenance. The bus manufacturer certified that the bus meets all Federal regulations.

III. DISCUSSION

The check-in procedure is used to identify in detail the major components and configuration of the bus.

The test bus consisted of a Proterra CAT40DP bus model. The bus has a front passenger door with a fold out Ricon ADA accessible ramp forward of the front axle, and a rear passenger door forward of the rear axle. Power is provided by a battery electric, Proterra DuoPower Control System and a pair of Parker GVM310-125 traction motors.

The measured curb weight was 14,490 lb. for the front axle and 18,870 lb. for the rear axle. These combined weights provided a total measured curb weight of 33,360 lb. There are 39 seats including the driver and free floor space for 49 standing passengers bringing the potential total passenger capacity to 88. However, a placard limits the maximum number of standing passengers to 29. Therefore, the gross load represents 39 seated passengers and 29 standees for a total of 68 passengers. Gross load is calculated as $150 \text{ lb.} \times 68 = 10,200 \text{ lb.}$ At full declared capacity, the measured gross vehicle weight was 43,640 lb. There is a potential to overload this bus with the available floor space for standing passengers.

VEHICLE DATA FORM

Page 1 of 7

Bus Number: 1906	Date of Check-In: 03/28/19
Bus Manufacturer: Proterra	Vehicle Identification Number (VIN): 1M9TH16J0JS816351
Model Number: CAT40DP	Chassis Mfr./Mod. #: Proterra / Catalyst
Personnel: T.S., E.D., E.L. & S.R.	Starting Odometer Reading: 2330

WEIGHT:

Individual Wheel Reactions:

Weights (lb.)	Front Axle		Middle Axle		Rear Axle	
	Curb	Street	Curb	Street	Curb	Street
CW	7,230	7,260	N/A	N/A	9,370	9,500
SLW	8,450	8,410	N/A	N/A	10,950	11,740
GVW	9,050	9,010	N/A	N/A	12,550	13,030

Total Weight Details:

Weight (lb.)	CW	SLW	GVW	GAWR
Front Axle	14,490	16,860	18,060	18,078
Middle Axle	N/A	N/A	N/A	N/A
Rear Axle	18,870	22,690	25,580	28,660
Total	33,360	39,550	43,640	Manufacturer Specified GVWR: 43,650

Dimensions:

Length (ft/in)	42/5 (+ 5 ½" for bike rack mount brackets)
Width (in)	102
Height (in)	126 ¾
Front Overhang (in)	102 ¼
Rear Overhang (in)	110 ½
Wheelbase (in)	296 ¼
Wheel Track (in)	Front: 86.1
	Middle: N/A
	Rear: 76.2

VEHICLE DATA FORM

Page 2 of 7

Bus Number: 1906	Date: 03/28/19
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CLEARANCES:

Lowest Point Outside Front Axle	Location: skid plate	Clearance(in): 6.3
Lowest Point Outside Rear Axle	Location: door	Clearance(in): 9.0
Lowest Point between Axles	Location: frame	Clearance(in): 8.7
Ground Clearance at the center (in)	8.7	
Front Approach Angle (deg)*	8.5	
Rear Approach Angle (deg)*	9.2	
Ramp Clearance Angle (deg)	3.3	
Aisle Width (in)	Front: 24	Rear: 22.2
Inside Standing Height at Center Aisle (in)	Front: 90.7	Rear: 73.9

*measurements used to calculate approach and departure angles are taken from the centerline of the axles.

BODY DETAILS:

Body Structural Type	Monocoque		
Frame Material	Composite / Laminate Construction		
Body Material	Composite / Laminate Construction		
Floor Material	Composite / Laminate Construction		
Roof Material	Composite / Laminate Construction		
Windows Type	<input checked="" type="checkbox"/> Fixed	<input type="checkbox"/> Movable	
Window Mfg./Model No.	Arow / AS3 DOT 411		
Number of Doors	<u>1</u> Front	<u>1</u> Rear	
Mfr. / Model No.	Front: Ventura / IGE 1100		Rear: Ventura / PSE 1250
Dimension of Each Door (in)	Front: 75.3 x 33.8		Rear: 76.9 x 43.3
Passenger Seat Type	<input checked="" type="checkbox"/> Cantilever (Front)	<input checked="" type="checkbox"/> Pedestal (Rear)	<input type="checkbox"/> Other
Driver Seat Type	<input checked="" type="checkbox"/> Air	<input type="checkbox"/> Spring	<input type="checkbox"/> Other (explain)
Mfr. / Model No.	Recaro / Ergo Metro (AM80)		
Number of Seats (including Driver)	39 or 33 & 2 wheelchair positions		

VEHICLE DATA FORM

Page 3 of 7

Bus Number: 1906	Date: 03/28/19
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BODY DETAILS (Contd.)

Free Floor Space (ft ²)	76.4				
Height of Each Step at Normal Position (in)	Front	1. 15.2	2. N/A	3. N/A	4. N/A
	Middle	1. N/A	2. N/A	3. N/A	4. N/A
	Rear	1. 17.2	2. N/A	3. N/A	4. N/A
Step Elevation Change - Kneeling (in)	Front: 2.1		Rear: 0.4		

ENGINE

Type	<input type="checkbox"/> C.I.	<input type="checkbox"/> Alternate Fuel	
	<input type="checkbox"/> S.I.	<input checked="" type="checkbox"/> Other (Battery Electric)	
Air Compressor Mfr. / Model No.	Hydrovane / 0009-0010-07		
Maximum Capacity (ft ³ / min)	8.96		
Starter Type – N/A	<input type="checkbox"/> Electrical	<input type="checkbox"/> Pneumatic	<input type="checkbox"/> Other (explain)
Starter Mfr. / Model No.	N/A		

BATTERY SYSTEM

Maximum Rated Capacity (kWh)	440
Usable Capacity (kWh)	391
Nominal Voltage (Vdc)	326

PROPULSION CONTROL SYSTEM (Rear Axle)

Propulsion Control System Mfr. / Model No.	Proterra / DuoPower Control System
Traction Motor - Mfr. / Model No.	Parker / GVM310-125
Traction Motor Power rating (kW)	190 kW per motor / 2 motors within DuoPower Axle

OTHERS

DCDC Converter Mfr. / Model No.	TDI Power / T100103677-LF
HV Distribution Box Mfr. / Model No.	Proterra / 034640
PTC Mfr./ Model No.	ThermaTech / 074020004

VEHICLE DATA FORM

Page 4 of 7

Bus Number: 1906	Date: 03/28/19
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SUSPENSION

Number of Axles	2		
Front Axle Type	<input checked="" type="checkbox"/> Independent	<input type="checkbox"/> Beam Axle	
Mfr. / Model No.	ZF / RL75EC		
Axle Ratio (if driven)	N/A		
Suspension Type	<input checked="" type="checkbox"/> Air	<input type="checkbox"/> Spring	<input type="checkbox"/> Other (explain)
No. of Shock Absorbers	2		
Mfr. / Model No.	Sachs / 481700004723 (Start of Test) Replaced with: Koni / 5414 (June 13, 2019)		
Middle Axle Type	<input type="checkbox"/> Independent	<input type="checkbox"/> Beam Axle	
Mfr. / Model No.	N/A		
Axle Ratio (if driven)	N/A		
Suspension Type	<input type="checkbox"/> Air	<input type="checkbox"/> Spring	<input type="checkbox"/> Other (explain)
No. of Shock Absorbers	N/A		
Mfr. / Model No.	N/A		
Rear Axle Type	<input type="checkbox"/> Independent	<input checked="" type="checkbox"/> Beam Axle	
Mfr. / Model No.	Proterra / DuoPower		
Axle Ratio (if driven)	3.31:1		
Suspension Type	<input checked="" type="checkbox"/> Air	<input type="checkbox"/> Spring	<input type="checkbox"/> Other (explain)
No. of Shock Absorbers	4		
Mfr. / Model No.	Sachs / 47 1700 006 149 (Start of Test) Replaced with: Koni / 5415 (June 13, 2019)		

VEHICLE DATA FORM

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Bus Number: 1906	Date: 03/28/19
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WHEELS & TIRES

Front	Wheel Mfr./ Model No.	Alcoa / LVLone 22.5 x 9.00-176
	Tire Mfr./ Model No.	Michelin / Xlncity 315/80R22.5
Rear	Wheel Mfr./ Model No.	Alcoa / LVLone 22.5 x 9.00-176
	Tire Mfr./ Model No.	Michelin / Xlncity 315/80R22.5

BRAKES

Front Axle Brakes Type	<input type="checkbox"/> Cam	<input checked="" type="checkbox"/> Disc	<input type="checkbox"/> Other (explain)
Mfr. / Model No.	Knorr / SN7		
Middle Axle Brakes Type	<input type="checkbox"/> Cam	<input type="checkbox"/> Disc	<input type="checkbox"/> Other
Mfr. / Model No.	N/A		
Rear Axle Brakes Type	<input type="checkbox"/> Cam	<input checked="" type="checkbox"/> Disc	<input type="checkbox"/> Other (explain)
Mfr. / Model No.	Knorr / SB7		

HVAC

Heating System Type	<input type="checkbox"/> Air	<input type="checkbox"/> Water	<input type="checkbox"/> Other
Capacity (Btu/hr.)	54,594		
Mfr. / Model No.	Eberspaecher / AC136 model 88-50-26-00755-00		
Air Conditioner	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
Location	Roof		
Capacity (Btu/hr.)	102,363		
A/C Compressor Mfr. / Model No.	Eberspaecher / HGX34e / 380-4SA (Boch / GEA compressor)		

STEERING

Steering Gear Box Type	Hydraulic gear		
Mfr. / Model No.	Ross / TRW model TAS85		
Steering Wheel Diameter	19.9		
Number of turns (lock to lock)	4 ½		
Control Type	<input type="checkbox"/> Electric	<input checked="" type="checkbox"/> Hydraulic	<input type="checkbox"/> Other (explain)

VEHICLE DATA FORM

Page 6 of 7

Bus Number: 1906	Date: 03/28/19
------------------	----------------

OTHERS

Wheelchair Ramps	Location: Front	Type: Fold out
Wheelchair Lifts	Location: N/A	Type: N/A
Mfr. / Model No.	Ricon / RISSR-OC27301B00	
Emergency Exit	Location: Window Door Roof hatch	Number: 4 2 2

CAPACITIES

Fuel Tank Capacity	N/A
Engine Crankcase Capacity	N/A
Transmission Capacity	4.5 L per Transmission / 2 Transmissions within DuoPower axle
Differential Capacity	2.8 L per wheel end / 2 wheel ends within DuoPower axle
Cooling System Capacity	Battery Thermal Loop: 12.8 g Power Electronics Thermal Loop: 11.8 g
Power Steering Fluid Capacity	11 quarts

VEHICLE DATA FORM

Page 7 of 7

Bus Number: 1906	Date: 03/28/19
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List all spare parts, tools and manuals delivered with the bus.

[illegible]

COMPONENT/SUBSYSTEM INSPECTION FORM

Page 1 of 1

Bus Number: 1906	Date: 03/28/19
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Subsystem	Checked	Initials	Comments
Air Conditioning Heating and Ventilation	✓	E.D.	None noted.
Body and Sheet Metal	✓	E.D.	None noted.
Frame	✓	E.D.	None noted.
Steering	✓	E.D.	None noted.
Suspension	✓	E.D.	None noted.
Interior/Seating	✓	E.D.	None noted.
Axles	✓	E.D.	None noted.
Brakes	✓	E.D.	None noted.
Tires/Wheels	✓	E.D.	None noted.
Exhaust	N/A	E.D.	None noted.
Fuel System	✓	E.D.	Battery Electric
Power Plant	✓	E.D.	Battery Electric
Accessories	✓	E.D.	None noted.
ADA Accessible Lift System	N/A	E.D.	None noted.
ADA Accessible Ramp System	✓	E.D.	None noted.
Interior Fasteners	✓	E.D.	None noted.
Batteries	✓	E.D.	None noted.

CHECK - IN



PROTERRA CAT40DP



CHECK - IN CONT.



**PROTERRA
CAT40DP**



CHECK - IN CONT.

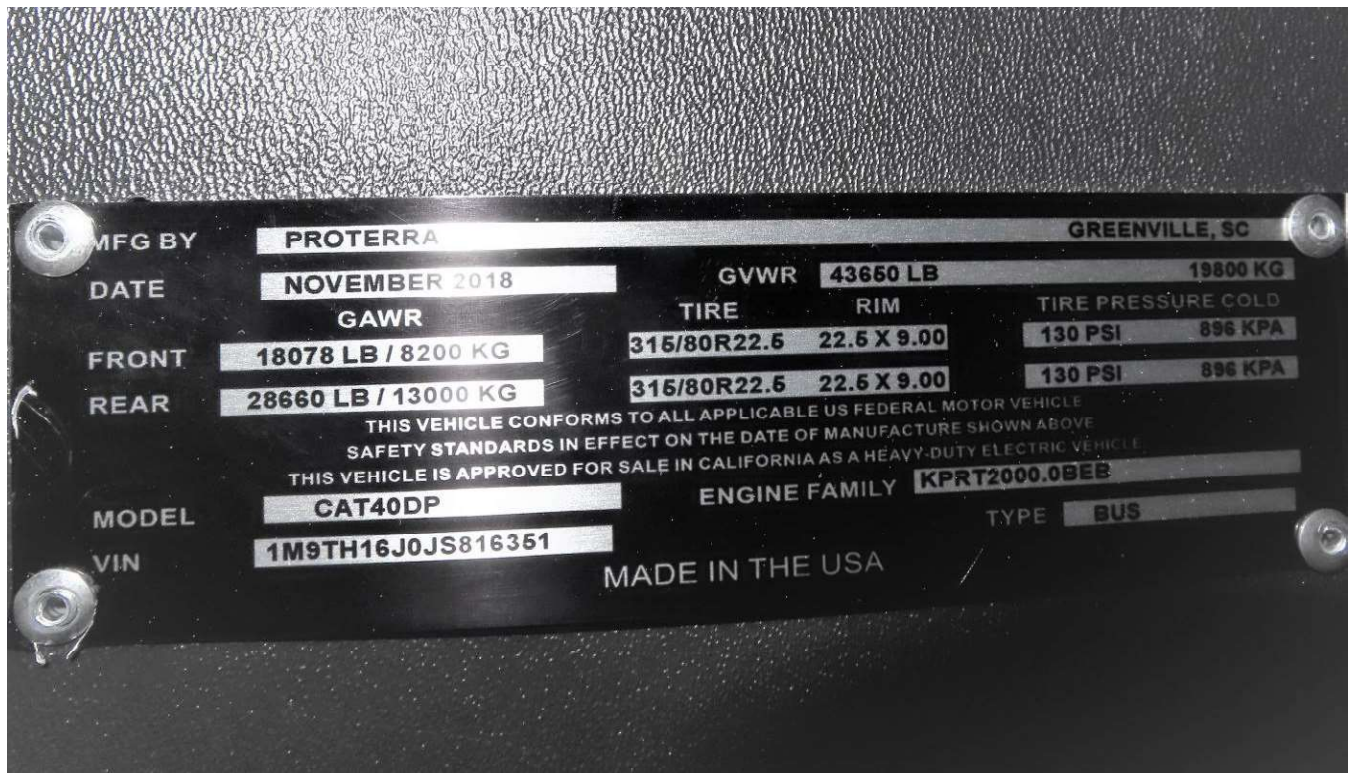


OPERATOR'S AREA



INTERIOR FROM FRONT

CHECK - IN CONT.



VIN TAG



PLACARD SHOWING MAXIMUM STANDEES

CHECK - IN CONT.



REAR COMPARTMENT

1. MAINTAINABILITY

1.1 ACCESSIBILITY OF COMPONENTS AND SUBSYSTEMS

1.1-I. TEST OBJECTIVE

The objective of this test is to check the accessibility of components and subsystems.

1.1-II. TEST DESCRIPTION

Accessibility of components and subsystems was checked, and where accessibility was restricted the subsystem was noted along with the reason for the restriction.

1.1-III. DISCUSSION

Accessibility, in general, was adequate. Components covered in Section 1.3 (repair and/or replacement of selected subsystems), along with all other components encountered during testing, were found to be readily accessible and no restrictions were noted, with the exception of the windshield wiper motor. Both dash panels inside the bus needed to be removed to access this component.

ACCESSIBILITY DATA FORM

Page 1 of 2

Bus Number: 1906	Date: 08/20/2020
------------------	------------------

Component	Checked	Comments
ENGINE:		
Oil Dipstick	N/A	N/A
Oil Filler Hole	N/A	N/A
Oil Drain Plug	N/A	N/A
Oil Filter	N/A	N/A
Fuel Filter	N/A	N/A
Air Filter	N/A	N/A
Belts	N/A	N/A
Coolant Level	✓	Drive Motors
Coolant Filler Hole	✓	Drive Motors
Coolant Drain	✓	Drive Motors
Spark / Glow Plugs	N/A	N/A
Alternator	N/A	N/A
Diagnostic Interface Connector	✓	None noted.
TRANSMISSION:		
Fluid Dipstick	N/A	N/A
Filler Hole	N/A	N/A
Drain Plug	N/A	N/A
SUSPENSION:		
Bushings	✓	None noted.
Shock Absorbers	✓	None noted.
Air Springs	✓	None noted.
Leveling Valves	✓	None noted.
Grease Fittings	✓	None noted.

ACCESSIBILITY DATA FORM

Page 2 of 2

Bus Number: 1906	Date: 08/20/2020
------------------	------------------

Component	Checked	Comments
HVAC:		
A/C Compressor	✓	None noted.
Filters	✓	None noted.
Fans	✓	None noted.
ELECTRICAL SYSTEM:		
Fuses	✓	None noted.
Batteries	✓	None noted.
Voltage regulator	✓	None noted.
Voltage Converters	✓	None noted.
Lighting	✓	None noted.
MISCELLANEOUS:		
Brakes	✓	None noted.
ADA Accessible Lifts/Ramps	✓	None noted.
Instruments	✓	None noted.
Axles	✓	None noted.
Exhaust	N/A	N/A
Fuel System	N/A	Battery Electric
OTHERS:		
Wiper Motor	✓	Both dash pieces need to be removed to access motor

1.1 ACCESSIBILITY OF COMPONENTS AND SUBSYSTEMS



DASH PIECES REMOVED TO ACCESS WIPER MOTOR

1.2 SERVICING, PREVENTIVE MAINTENANCE, AND REPAIR AND MAINTENANCE DURING TESTING

1.2-I. TEST OBJECTIVE

The objective of this test is to collect maintenance data about the servicing, preventive maintenance, and repair.

1.2.-II. TEST DESCRIPTION

The test was conducted by operating the bus and collecting the following data on work order forms and a driver log.

1. Scheduled Maintenance
 - a. Bus number
 - b. Date
 - c. Mileage
 - d. Results of scheduled inspections
 - e. Description of malfunction (if any)
 - f. Repair action and parts used (if any)
 - g. Man-hours required
2. Unscheduled Maintenance
 - a. Bus number
 - b. Date
 - c. Mileage
 - d. Description of malfunction
 - e. Place and time of malfunction (e.g., in service or undergoing inspection)
 - f. Repair action and parts used
 - g. Man-hours required

The bus was operated in accelerated durability service. While typical items are given below, the specific service schedule was that specified by the manufacturer.

- A. Service
 1. Fueling
 2. Consumable checks
 3. Interior cleaning
- B. Preventive Maintenance
 1. Brake adjustments
 2. Lubrication
 3. 3,000 mi (or manufacturer recommended) inspection

4. Oil and filter change inspection
5. Major inspection
6. Tune-up

C. Periodic Repairs

1. Brake reline*
2. Transmission change
3. Engine change*
4. Windshield wiper motor change
5. Stoplight bulb change*
6. Towing operations
7. Hoisting operations

*These items are attended to if found necessary, while the others in the list are removed/replaced/tested for all buses undergoing a full test.

1.2-III. DISCUSSION

Servicing and preventive maintenance were performed at manufacturer-specified intervals. The following Scheduled Maintenance Form lists the mileage, items serviced, the service interval, and amount of time required to perform the maintenance.

The Unscheduled Maintenance List along with related photographs is included in Section 5.7, Structural Durability. This list supplies information related to failures that occurred during the durability portion of testing. The Unscheduled Maintenance List includes the date and mileage at which the malfunction was detected, a description of the malfunction and repair, and the time required to perform the repair.

(Page 1 of 2)
SCHEDULED MAINTENANCE
 Proterra Bus# 1906

DATE	TEST MILES	SERVICE	ACTIVITY	DOWN TIME	LABOR HOURS
05/17/19	1,220	P.M./Inspection	Steering linkages and tie rods, all checked; all fluids checked. Inspected frame, body and suspension.	4.00	4.00
06/24/19	2,711	P.M./Inspection	Steering linkages and tie rods, all checked; all fluids checked. Inspected frame, body and suspension.	4.00	4.00
07/31/19	3,910	P.M./Inspection	Steering linkages and tie rods, all checked; all fluids checked. Inspected frame, body and suspension.	4.00	4.00
08/04/19	4,094	P.M./Inspection	Steering linkages and tie rods, all checked; all fluids checked. Inspected frame, body and suspension.	4.00	4.00
08/15/19	4,532	P.M./Inspection	Steering linkages and tie rods, all checked; all fluids checked. Inspected frame, body and suspension.	4.00	4.00
10/13/19	7,851	P.M./Inspection	Steering linkages and tie rods, all checked; all fluids checked. Inspected frame, body and suspension.	4.00	4.00

(Page 2 of 2)
SCHEDULED MAINTENANCE
 Proterra Bus# 1906

DATE	TEST MILES	SERVICE	ACTIVITY	DOWN TIME	LABOR HOURS
11/05/19	8,976	P.M./Inspection	Steering linkages and tie rods, all checked; all fluids checked. Inspected frame, body and suspension.	4.00	4.00
11/26/19	10,163	P.M./Inspection	Steering linkages and tie rods, all checked; all fluids checked. Inspected frame, body and suspension.	4.00	4.00
12/17/19	11,573	P.M./Inspection	Steering linkages and tie rods, all checked; all fluids checked. Inspected frame, body and suspension.	4.00	4.00
02/08/20	14,388	P.M./Inspection Energy Economy Prep	Steering linkages and tie rods, all checked; all fluids checked. Inspected frame, body and suspension.	8.00	8.00
02/20/20	14,584	P.M./Inspection	Steering linkages and tie rods, all checked; all fluids checked. Inspected frame, body and suspension.	4.00	4.00

1.3 REPLACEMENT AND/OR REPAIR OF SELECTED SUBSYSTEMS

1.3-I. TEST OBJECTIVE

The objective of this test is to establish the time required to replace and/or repair selected subsystems.

1.3-II. TEST DESCRIPTION

The test involved components that may be expected to fail or require replacement during the service life of the bus. In addition, any component that failed during testing of the bus was added to this list. Components to be included are:

1. Transmission
2. Alternator
3. Starter
4. Batteries
5. Windshield wiper motor

1.3-III. DISCUSSION

At the end of the test, the items on the list were removed and replaced. The DuoPower axle assembly took 4.00 labor-hours (2 persons @ 2.00 hrs.) to remove and replace. The time required for repair/replacement of the other four components is given on the following Repair and/or Replacement Form.

REPLACEMENT AND/OR REPAIR FORM

Subsystem	Replacement Time
DuoPower Axle	4.00 labor hours
Wiper Motor	2.00 labor hours
DC-DC Converter	1.00 labor hours
ESS Battery Pack (Streetside)	2.00 labor hours
Batteries (12 volt)	1.00 labor hours

During removal and replacement of the windshield wiper motor, it is noted that the dash of the bus had to be removed to access the motor.

During the test, additional components were removed for repair or replacement and the details are available in Section 5.7 in Unscheduled Maintenance.

1.3 REPLACEMENT AND/OR REPAIR OF SELECTED SUBSYSTEMS



DUOPOWER AXLE REMOVAL AND REPLACEMENT (4.00 LABOR HOURS)



WIPER MOTOR REMOVAL AND REPLACEMENT (2.00 LABOR HOURS)

1.3 REPLACEMENT AND/OR REPAIR OF SELECTED SUBSYSTEMS CONT.



**DC-DC CONVERTER REMOVAL AND REPLACEMENT
(1.00 LABOR HOURS)**



**HIGH VOLTAGE ESS BATTERY PACK REMOVAL AND
REPLACEMENT (2.00 LABOR HOURS)**

2. RELIABILITY - DOCUMENTATION OF BREAKDOWN AND REPAIR TIMES DURING TESTING

2-I. TEST OBJECTIVE

The objective of this test is to document unscheduled breakdowns, repairs, down time, and repair time that occur during testing.

2-II. TEST DESCRIPTION

Using the driver log and unscheduled work order forms, all significant breakdowns, repairs, labor-hours to repair, and hours out of service were recorded on the Reliability Data Form.

CLASS OF FAILURES

Classes of failures are described below:

- (a) Class 1: Physical Safety. A failure that could lead directly to Injury, a crash and/or significant physical damage.
- (b) Class 2: Road Call. A failure resulting in an en-route interruption of revenue service. Service is discontinued until the bus is replaced or repaired at the point of failure.
- (c) Class 3: Bus Change. A failure that requires removal of the bus from service during its assignments. The bus is operable to a rendezvous point with a replacement bus.
- (d) Class 4: Bad Order. A failure that does not require removal of the bus from service during its assignments but does degrade coach operation. The failure shall be reported by driver, inspector, or hostler.

2-III. DISCUSSION

A listing of breakdowns and unscheduled repairs was accumulated during the Structural Durability Test. The following Reliability Data Form lists all unscheduled repairs under classes as defined above.

The classification of repairs according to subsystem is intended to emphasize those systems which had persistent minor or more serious problems. There was a total of 80 failures throughout various subsystems. There was one Class One failure that affected the ADA Ramp. There were six Class Two failures, 67 Class Three failures and six Class Four failures. These failures are available for review in the Unscheduled Maintenance List, located in Section 5.7 Structural Durability.

This bus passed the Structural and Powertrain Durability sections of the test.

RELIABILITY DATA FORMS

Bus Number: 1906	Date: 09/22/2020
Personnel: B.L. & D.K.	

Subsystems	Failure Type				Labor Hours	Down Time
	Class 4 Bad Order	Class 3 Bus Change	Class 2 Road Call	Class 1 Physical Safety		
Electrical	Mileage	Mileage	Mileage	Mileage		
			239		1.25	1.25
		381			1.00	1.00
		992			1.00	1.00
			1,087		2.50	2.50
		1,517			0.75	0.75
		1,652			1.00	1.00
		1,744			1.50	1.50
		2,049			0.08	0.08
		2,049			1.00	1.00
		2,359			0.50	0.50
		2,669			2.00	2.00
		2,957			0.50	0.50
		3,682			0.25	0.25
		3,874			0.25	0.25
		4,292			0.50	0.50
		4,529			0.10	0.10
		5,581			0.08	0.08
		6,446			0.50	0.50
		6,511			0.20	0.20
			6,615		2.85	2.85
	9,461				---	---
		10,783			0.08	0.08

RELIABILITY DATA FORMS

Bus Number: 1906	Date: 09/22/2020
Personnel: B.L. & D.K.	

	Failure Type				Labor Hours	Down Time
	Class 4 Bad Order	Class 3 Bus Change	Class 2 Road Call	Class 1 Physical Safety		
Subsystems	Mileage	Mileage	Mileage	Mileage		
Electrical (Cont.)		10,783			1.25	1.25
	11,595				---	---
		12,044			0.25	0.25
		12,999			0.50	0.50
		12,999			1.00	1.00
		13,267			0.25	0.25
		14,930			1.00	1.00
Body		381			0.50	0.50
		681			0.25	0.25
		681			0.75	0.75
		1,220			1.00	1.00
		1,648			2.50	2.50
	1,744				0.08	0.08
		2,593			1.00	1.00
		3,437			0.50	0.50
		4,094			0.25	0.25
		4,592			0.20	0.20
		5,581			0.08	0.08
		6,446			3.25	3.25
		6,446			1.00	1.00
		8,754			0.25	0.25
		9,098			0.75	0.75

RELIABILITY DATA FORMS

Bus Number: 1906	Date: 09/22/2020
Personnel: B.L. & D.K.	

Subsystems	Failure Type				Labor Hours	Down Time
	Class 4 Bad Order	Class 3 Bus Change	Class 2 Road Call	Class 1 Physical Safety		
Mileage	Mileage	Mileage	Mileage			
Body (Cont.)		10,510			0.08	0.08
		10,783			0.50	0.50
		11,803			2.50	2.50
		12,598			2.50	2.50
		12,999			7.50	7.50
		13,267			0.25	0.25
	14,587				0.25	0.25
		14,782			1.50	1.50
Coolant (Motor & Battery)		381			0.25	0.25
		12,044			0.50	0.50
Software/Electrical			381		0.25	0.25
		7,132			2.00	2.00
		10,103			0.25	0.25
Electrical/Body		681			2.50	2.50
			2,285		1.00	1.00
			9,334		3.00	3.00
Drivetrain		755			2.00	2.00
		992			4.50	4.50
		2,085			2.00	2.00
		3,612			0.50	0.50
		6,911			0.50	0.50

RELIABILITY DATA FORMS

Bus Number: 1906	Date: 09/22/2020
Personnel: B.L. & D.K.	

Subsystems	Failure Type				Labor Hours	Down Time
	Class 4 Bad Order	Class 3 Bus Change	Class 2 Road Call	Class 1 Physical Safety		
Mileage	Mileage	Mileage	Mileage			
Drivetrain (Cont.)		12,999			---	---
Suspension		1,220			0.50	0.50
		2,285			0.50	0.50
		2,285			0.50	0.50
		2,302			0.50	0.50
		2,421			1.00	1.00
		7,302			0.50	0.50
		9,398			12.00	12.00
Hardware		1,231			4.00	4.00
HVAC	2,757				2.00	2.00
Electrical / Motor and Battery Cooling		3,437			0.75	0.75
Coach Air Compressor	5,180				1.00	1.00
Software		6,265			0.10	0.10
Compressed Air System		6,511			0.25	0.25
Door		12,999			1.00	1.00
ADA Ramp				13,644	1.25	1.25

3.1 SAFETY - A DOUBLE-LANE CHANGE (OBSTACLE AVOIDANCE)

3.1-I. TEST OBJECTIVE

The objective of this test is to determine handling and stability of the bus by measuring speed through a double lane change test.

3.1-II. TEST DESCRIPTION

The Safety Test consisted of an obstacle avoidance maneuver to evaluate the handling and stability of the bus. The test was conducted at the LTI test track on the vehicle dynamics pad. The bus was driven through a double-lane change course at increasing speeds until the test was determined to be unsafe or a speed of 45 mph is reached. The test is determined unsafe if vehicle handling becomes unstable or if any of the tires lose contact with the pavement.

The layout of the test course was defined by placing pylons along painted guidelines that delineated the course. The guidelines marked off two 12-foot center-to-center lanes. Each lane had two 100 foot long gates with a spacing distance of 100 feet between them. The bus entered the test course in one lane, crossed over to the other lane within the 100 foot gate, traveled for 100 feet, and then returned back into the original lane within the next 100 foot gate. This maneuver was repeated from 20 mph with speed increasing in increments of 5 mph. The test was performed starting from both the right and left lanes.

A test run is considered valid if the bus is able to perform the maneuver at a constant speed without deviating from the test course or striking pylons. If the bus is not able to successfully complete the maneuver due to vehicle instability, the test will be terminated. The highest speed at which the maneuver can be successfully performed up to a maximum speed of 45 mph is recorded on the Safety Data Form.

3.1-III. DISCUSSION

The double-lane change was performed in both right-hand and left-hand directions. The bus was able to safely negotiate the test course in both the right-hand and left-hand directions up to the maximum test speed of 45 mph, and therefore, passed this portion of the test.

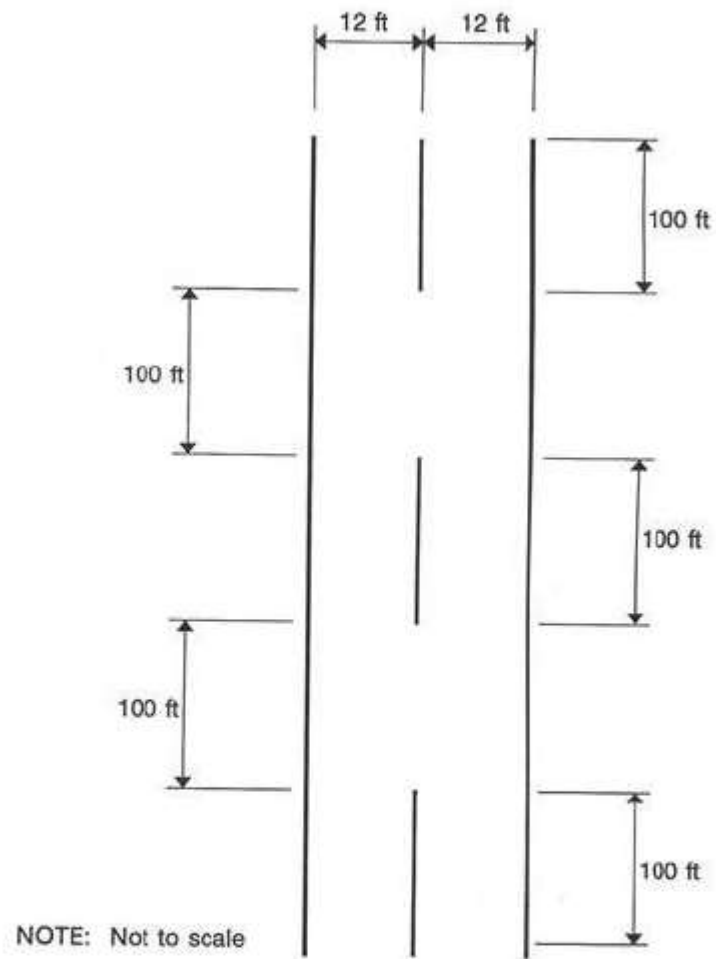


Figure 3.1. Double lane change test course

SAFETY DATA FORM

Page 1 of 1

Bus Number: 1906	Date: 08/30/19
Personnel: E.D., E.L., S.R. & J.S.	

Temperature (°F): 73	Humidity (%): 65
Wind Direction: SW	Wind Speed (mph): Steady at 3, gusts to 10
Barometric Pressure (inHg): 30.06	

SAFETY TEST: DOUBLE LANE CHANGE	
Maximum safe speed tested for double-lane change to left	45 mph
Maximum safe speed tested for double-lane change to right	45 mph
Comments of the position of the bus during the lane change:	
The bus maintained a safe profile through all portions of testing.	
Comments of the tire/ground contact patch:	
The bus maintained the tire/ground patch throughout the test.	

3.1 SAFETY



RIGHT - HAND APPROACH



LEFT - HAND APPROACH

3.2 Safety - Braking

3.2 I. TEST OBJECTIVE

The objective of this test is to provide, for comparison purposes, braking performance data on transit buses produced by different manufacturers.

3.2 II. TEST DESCRIPTION

The testing was conducted at the LTI Test Track skid pad area. Brake tests were conducted after completion of the GVW portion of the vehicle durability test. At this point in testing the brakes have been subjected to a large number of braking snubs and will be considered well burnished. For buses that have not completed Durability Testing, the brakes will be burnished according to the test procedure. Testing was performed when the bus was fully loaded at its GVW. All tires on each bus were representative of the tires on the production model vehicle and inflated to the bus manufacturer's specified pressures.

The brake testing procedure is comprised of three phases:

1. Stopping distance tests
 - i. Dry surface (high-friction, Skid Number within the range of 70-76)
 - ii. Wet surface (low-friction, Skid Number within the range of 30-36)
2. Stability tests
3. Parking brake test

3.2-III. DISCUSSION

The results of the Stopping Distance phase of the Brake Test are available in table 3.2-2. There was no deviation from the test lane during the performance of the Stopping Distance phase. The bus passed this portion of the test.

During the Stability phase of Brake Testing the test bus experienced no deviation from the test lane during both approaches to the Split Friction Road surface.

The Parking Brake phase was completed with the test bus maintaining the parked position for the full five-minute period with no slip or roll observed in both the uphill and downhill positions.

This bus passed all three phases of the Safety –Braking Test.

Table 3.2-1. Braking Test Data Forms

Page 1 of 3

Bus Number: 1906	Date: 04/29/19
Personnel: S.R., T.S. & E.D.	
Amb. Temperature (°F): 56	Wind Speed (mph): 9
Wind Direction: SE	Pavement Temp (°F) Start: 79 End: 86

TIRE INFLATION PRESSURE (psi):				
Tire Type: Front and Rear: Michelin X Incity				
	Left Tire(s)		Right Tire(s)	
Front	130		130	
	Inner	Outer	Inner	Outer
Middle	N/A	N/A	N/A	N/A
Rear	130	130	130	130

AXLE LOADS (lb.)		
	Left	Right
Front	9,010	9,050
Middle	N/A	N/A
Rear	13,030	12,550

Table 3.2-2. Stopping Distance Test Results Form
(longest stopping distance in each test condition in bold)

Stopping Distance (ft)					
Vehicle Direction	CW	CW	CCW	CCW	
Speed (mph)	Stop 1	Stop 2	Stop 3	Stop 4	Average
20 (dry)	29.22	26.40	29.88	28.20	28.42
30 (dry)	60.94	60.64	57.59	53.85	58.25
40 (dry)	101.84	112.86	104.14	102.33	105.29
45 (dry)	145.07	148.94	133.10	130.05	139.29
20 (wet)	28.33	27.28	33.65	27.84	29.27

Table 3.2-3. Stability Test Results Form

Stability Test Results (Split Friction Road surface)			
Vehicle Direction	Attempt	Did test bus stay in 12' lane? (Yes/No)	Comments
Driver side on high friction	1	Yes	None noted.
	2	Yes	None noted.
Driver side on low friction	1	Yes	None noted.
	2	Yes	None noted.

Table 3.2-4. Parking Brake Test Form

PARKING BRAKE (GVW) – GRADE HOLDING						
Vehicle Direction	Attempt	Hold Time (min)	Slide (in)	Roll (in)	Did Hold	No Hold
Front up	1	5:00	0	0	✓	
	2	N/A	N/A	N/A	N/A	N/A
	3	N/A	N/A	N/A	N/A	N/A
Front down	1	5:00	0	0	✓	
	2	N/A	N/A	N/A	N/A	N/A
	3	N/A	N/A	N/A	N/A	N/A

Table 3.2-5. Record of All Braking System Faults/Repairs.

Date	Fault/Repair	Description
04/29/19	None noted.	None noted.

3.2 Safety - Bus Braking



**PARKING BRAKE TEST
PARKING BRAKE HELD FOR 5 MINUTES IN
BOTH 20% UP AND 20% DOWN POSITIONS**



4. PERFORMANCE - AN ACCELERATION, GRADEABILITY, AND TOP SPEED TEST

4-I. TEST OBJECTIVE

The objective of this test is to determine the acceleration, gradeability, and top speed capabilities of the bus.

4-II. TEST DESCRIPTION

In this test, the bus was operated at SLW on a chassis dynamometer. The procedure dictates that the test bus be accelerated to a maximum “power-limited”/“governed” or maximum “safe” speed not exceeding 80 mph. The maximum power-limited/governed speed, if applicable, is the top speed as limited by the engine control system. The maximum safe speed is defined as the maximum speed that the dynamometer, the tires or other bus components are limited to. The test vehicle speed was measured using a speed encoder built in the chassis dynamometer. The time intervals between 10 mph increments were recorded using a Data Acquisitions System. Time-speed data and the top speed attained were recorded on the Performance Data Form. The recorded data was used to generate a percent grade versus speed table and a speed versus time curve. All the above are available in the following pages.

4-III. DISCUSSION

This test consisted of three runs from standstill to full throttle on the chassis dynamometer. Speed versus time data was obtained for each run and results are averaged to minimize test variability. The test was performed up to a maximum safe speed of 64.2 mph. The calculated gradeability results are attached. The average time to reach 30 mph was 4.2 seconds. The maximum gradeability at 10 mph was 45.3% and at 40 mph was 10.4%. This bus passed this section of the test.

For the Performance test, ballast weight equivalent of the roof mount battery packs was removed to represent the four-pack battery configuration per the Federal Transit Administration determination letter. Therefore, the seated load weight used was 36,960 lbs. for this Performance tests.

PERFORMANCE DATA FORM

Page 1 of 1

Bus Number: 1906		Date: 09/10/2020	
Personnel: J.S. & S.I.			
Temperature (°F): 75.7		Humidity (%): 85	
Barometric Pressure (inHg): 29.0			
			INITIALS:
Air Conditioning - OFF	✓Checked		J.S.
Ventilation fans - ON HIGH	N/A		N/A
Heater pump motor - OFF	N/A		N/A
Defroster - OFF	✓ Checked		J.S.
Exterior and interior lights - ON	✓ Checked		J.S.
Windows and doors - CLOSED	✓ Checked		J.S.
ACCELERATION, GRADEABILITY, TOP SPEED			
Recorded Interval Times			
Speed	Run 1	Run 2	Run 3
10 mph	1.9	0.9	2.2
20 mph	2.7	1.7	3.1
30 mph	4.3	3.3	4.7
40 mph	9.4	8.4	7.7
50 mph	15.9	15.0	16.2
60 mph	25.9	25.0	26.4
70 mph	N/A	N/A	N/A

Maximum Speed (mph): 64.2 (maximum governed speed reached)

PERFORMANCE SUMMARY SHEET

Bus Number: 1906	Date: 09/10/2020
Personnel: J.S. & S.I.	

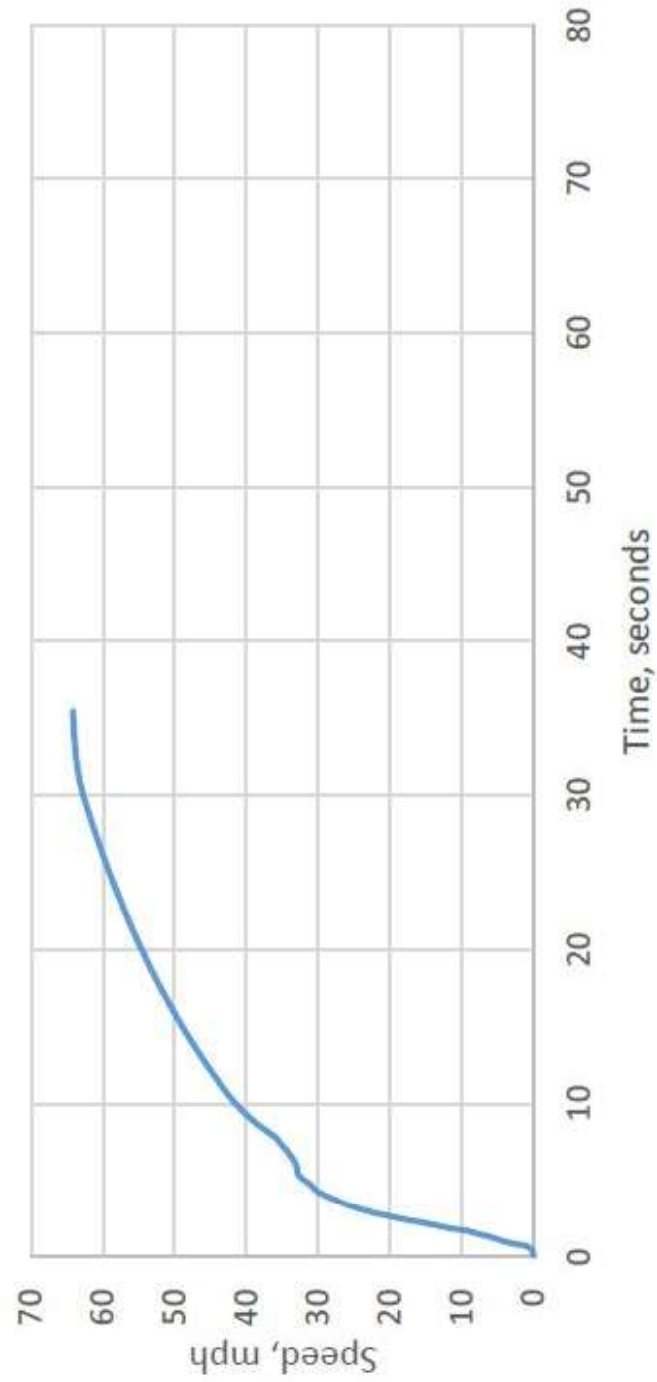
Test Conditions:

Temperature (°F): 75.7	Humidity (%): 85
Barometric Pressure (inHg): 29.0	

Test Results:

Vehicle Speed (MPH)	Time (SEC)	Acceleration (FT/SEC^2)	Max. Grade (%)
1.0	0.6	7.57	23.5
5.0	1.1	11.57	35.9
10.0	1.7	14.60	45.3
15.0	2.1	15.17	47.1
20.0	2.6	13.61	42.3
25.0	3.2	9.92	30.8
30.0	4.2	5.09	15.8
35.0	7.2	2.86	8.9
40.0	9.2	3.35	10.4
45.0	12.1	2.18	6.8
50.0	15.8	1.79	5.6
55.0	20.3	1.44	4.5
60.0	26.0	1.14	3.4
64.2	35.5	Maximum Speed	

Proterra Bus 1906



5.2 STRUCTURAL STRENGTH AND DISTORTION TESTS - STRUCTURAL DISTORTION

5.2-I. TEST OBJECTIVE

The objective of this test is to observe the operation of the bus subsystems when the bus is placed in a longitudinal twist simulating operation over a curb or through a pothole.

5.2-II. TEST DESCRIPTION

With the bus loaded to GVW, each wheel of the bus was raised (one at a time) to simulate operation over a curb and the following were inspected:

1. Body
2. Windows
3. Doors
4. Roof vents
5. Special seating
6. Undercarriage
7. Engine
8. Service doors
9. Escape hatches
10. Steering mechanism

Each wheel was then lowered (one at a time) to simulate operation through a pothole and the same items inspected.

5.2-III. DISCUSSION

The test sequence was repeated ten times. The first and last test is with all wheels level. The other eight tests are with each wheel 6 inches higher and 6 inches lower than the other three wheels.

All doors, windows, escape mechanisms, engine, steering and ADA accessible devices operated normally throughout the test. The undercarriage and body indicated no deficiencies. No water leakage was observed during the test. The results of this test are indicated on the following data forms. This bus passed this section of the test.

DISTORTION TEST INSPECTION FORM

(Note: Ten copies of this data sheet are required)

Page 1 of 10

Bus Number: 1906	Date: 04/15/19
Personnel: S.R., T.S., E.D., E.L. & P.D.	Temperature(°F): 50

Wheel Position: (check one)		
All wheels level	<input checked="" type="checkbox"/> before	<input type="checkbox"/> after
Left front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies.
Front Doors	No Deficiencies.
Rear Doors	No Deficiencies.
Escape Mechanisms/ Roof Vents	No Deficiencies.
Engine	No Deficiencies.
ADA Accessible/ Special Seating	No Deficiencies.
Undercarriage	No Deficiencies.
Service Doors	No Deficiencies.
Body	No Deficiencies.
Windows/ Body Leakage	No Deficiencies.
Steering Mechanism	No Deficiencies.

DISTORTION TEST INSPECTION FORM

(Note: Ten copies of this data sheet are required)

Page 2 of 10

Bus Number: 1906	Date: 04/15/19
Personnel: S.R., T.S., E.D., E.L. & P.D.	Temperature(°F): 50

Wheel Position: (check one)		
All wheels level	<input type="checkbox"/> before	<input type="checkbox"/> after
Left front	<input checked="" type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies.
Front Doors	No Deficiencies.
Rear Doors	No Deficiencies.
Escape Mechanisms/ Roof Vents	No Deficiencies.
Engine	No Deficiencies.
ADA Accessible/ Special Seating	No Deficiencies.
Undercarriage	No Deficiencies.
Service Doors	No Deficiencies.
Body	No Deficiencies.
Windows/ Body Leakage	No Deficiencies.
Steering Mechanism	No Deficiencies.

DISTORTION TEST INSPECTION FORM

(Note: Ten copies of this data sheet are required)

Page 3 of 10

Bus Number: 1906	Date: 04/15/19
Personnel: S.R., T.S., E.D., E.L. & P.D.	Temperature(°F): 50

Wheel Position: (check one)		
All wheels level	<input type="checkbox"/> before	<input type="checkbox"/> after
Left front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right front	<input checked="" type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies.
Front Doors	No Deficiencies.
Rear Doors	No Deficiencies.
Escape Mechanisms/ Roof Vents	No Deficiencies.
Engine	No Deficiencies.
ADA Accessible/ Special Seating	No Deficiencies.
Undercarriage	No Deficiencies.
Service Doors	No Deficiencies.
Body	No Deficiencies.
Windows/ Body Leakage	No Deficiencies.
Steering Mechanism	No Deficiencies.

DISTORTION TEST INSPECTION FORM

(Note: Ten copies of this data sheet are required)

Page 4 of 10

Bus Number: 1906	Date: 04/15/19
Personnel: S.R., T.S., E.D., E.L. & P.D.	Temperature(°F): 50

Wheel Position: (check one)		
All wheels level	<input type="checkbox"/> before	<input type="checkbox"/> after
Left front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right rear	<input checked="" type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies.
Front Doors	No Deficiencies.
Rear Doors	No Deficiencies.
Escape Mechanisms/ Roof Vents	No Deficiencies.
Engine	No Deficiencies.
ADA Accessible/ Special Seating	No Deficiencies.
Undercarriage	No Deficiencies.
Service Doors	No Deficiencies.
Body	No Deficiencies.
Windows/ Body Leakage	No Deficiencies.
Steering Mechanism	No Deficiencies.

DISTORTION TEST INSPECTION FORM

(Note: Ten copies of this data sheet are required)

Page 5 of 10

Bus Number: 1906	Date: 04/15/19
Personnel: S.R., T.S., E.D., E.L. & P.D.	Temperature(°F): 50

Wheel Position: (check one)		
All wheels level	<input type="checkbox"/> before	<input type="checkbox"/> after
Left front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left rear	<input checked="" type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies.
Front Doors	No Deficiencies.
Rear Doors	No Deficiencies.
Escape Mechanisms/ Roof Vents	No Deficiencies.
Engine	No Deficiencies.
ADA Accessible/ Special Seating	No Deficiencies.
Undercarriage	No Deficiencies.
Service Doors	No Deficiencies.
Body	No Deficiencies.
Windows/ Body Leakage	No Deficiencies.
Steering Mechanism	No Deficiencies.

DISTORTION TEST INSPECTION FORM
 (Note: Ten copies of this data sheet are required)
 Page 6 of 10

Bus Number: 1906	Date: 04/15/19
Personnel: S.R., T.S., E.D., E.L. & P.D.	Temperature(°F): 50

Wheel Position: (check one)		
All wheels level	<input type="checkbox"/> before	<input type="checkbox"/> after
Left front	<input type="checkbox"/> 6 in higher	<input checked="" type="checkbox"/> 6 in lower
Right front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies.
Front Doors	No Deficiencies.
Rear Doors	No Deficiencies.
Escape Mechanisms/ Roof Vents	No Deficiencies.
Engine	No Deficiencies.
ADA Accessible/ Special Seating	No Deficiencies.
Undercarriage	No Deficiencies.
Service Doors	No Deficiencies.
Body	No Deficiencies.
Windows/ Body Leakage	No Deficiencies.
Steering Mechanism	No Deficiencies.

DISTORTION TEST INSPECTION FORM

(Note: Ten copies of this data sheet are required)

Page 7 of 10

Bus Number: 1906	Date: 04/15/19
Personnel: S.R., T.S., E.D., E.L. & P.D.	Temperature(°F): 50

Wheel Position: (check one)		
All wheels level	<input type="checkbox"/> before	<input type="checkbox"/> after
Left front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right front	<input type="checkbox"/> 6 in higher	<input checked="" type="checkbox"/> 6 in lower
Right rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies.
Front Doors	No Deficiencies.
Rear Doors	No Deficiencies.
Escape Mechanisms/ Roof Vents	No Deficiencies.
Engine	No Deficiencies.
ADA Accessible/ Special Seating	No Deficiencies.
Undercarriage	No Deficiencies.
Service Doors	No Deficiencies.
Body	No Deficiencies.
Windows/ Body Leakage	No Deficiencies.
Steering Mechanism	No Deficiencies.

DISTORTION TEST INSPECTION FORM

(Note: Ten copies of this data sheet are required)

Page 8 of 10

Bus Number: 1906	Date: 04/15/19
Personnel: S.R., T.S., E.D., E.L. & P.D.	Temperature(°F): 50

Wheel Position: (check one)		
All wheels level	<input type="checkbox"/> before	<input type="checkbox"/> after
Left front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right rear	<input type="checkbox"/> 6 in higher	<input checked="" type="checkbox"/> 6 in lower
Left rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies.
Front Doors	No Deficiencies.
Rear Doors	No Deficiencies.
Escape Mechanisms/ Roof Vents	No Deficiencies.
Engine	No Deficiencies.
ADA Accessible/ Special Seating	No Deficiencies.
Undercarriage	No Deficiencies.
Service Doors	No Deficiencies.
Body	No Deficiencies.
Windows/ Body Leakage	No Deficiencies.
Steering Mechanism	No Deficiencies.

DISTORTION TEST INSPECTION FORM

(Note: Ten copies of this data sheet are required)

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Bus Number: 1906	Date: 04/15/19
Personnel: S.R., T.S., E.D., E.L. & P.D.	Temperature(°F): 50

Wheel Position: (check one)		
All wheels level	<input type="checkbox"/> before	<input type="checkbox"/> after
Left front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left rear	<input type="checkbox"/> 6 in higher	<input checked="" type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies.
Front Doors	No Deficiencies.
Rear Doors	No Deficiencies.
Escape Mechanisms/ Roof Vents	No Deficiencies.
Engine	No Deficiencies.
ADA Accessible/ Special Seating	No Deficiencies.
Undercarriage	No Deficiencies.
Service Doors	No Deficiencies.
Body	No Deficiencies.
Windows/ Body Leakage	No Deficiencies.
Steering Mechanism	No Deficiencies.

DISTORTION TEST INSPECTION FORM

(Note: Ten copies of this data sheet are required)

Page 10 of 10

Bus Number: 1906	Date: 04/15/19
Personnel: S.R., T.S., E.D., E.L. & P.D.	Temperature(°F): 50

Wheel Position: (check one)		
All wheels level	<input type="checkbox"/> before	<input checked="" type="checkbox"/> after
Left front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right front	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left rear	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Right center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower
Left center	<input type="checkbox"/> 6 in higher	<input type="checkbox"/> 6 in lower

	Comments
Windows	No Deficiencies.
Front Doors	No Deficiencies.
Rear Doors	No Deficiencies.
Escape Mechanisms/ Roof Vents	No Deficiencies.
Engine	No Deficiencies.
ADA Accessible/ Special Seating	No Deficiencies.
Undercarriage	No Deficiencies.
Service Doors	No Deficiencies.
Body	No Deficiencies.
Windows/ Body Leakage	No Deficiencies.
Steering Mechanism	No Deficiencies.

5.2 STRUCTURAL DISTORTION TEST



RIGHT REAR WHEEL SIX INCHES HIGHER



LEFT FRONT WHEEL SIX INCHES LOWER

5.3 STRUCTURAL STRENGTH AND DISTORTION TESTS - STATIC TOWING TEST

5.3-I. TEST OBJECTIVE

The objective of this test is to determine the characteristics of the bus towing mechanisms under static loading conditions.

5.3-II. TEST DESCRIPTION

Utilizing a load-distributing yoke, a hydraulic cylinder was used to apply a static tension load equal to 1.2 times the bus curb weight. The load was applied to both the front and rear, if applicable, towing fixtures at an angle of 20 degrees with the longitudinal axis of the bus, first to one side then the other in the horizontal plane, and then upward and downward in the vertical plane. Any permanent deformation or damage to the tow eyes or adjoining structure was recorded.

5.3-III. DISCUSSION

The load-distributing yoke was incorporated as the interface between the Static Tow apparatus and the test bus tow hook/eyes. The test was performed to the full target test weight of 40,032 lb. (1.2 x 33,360 lb. CW). No damage or deformation was observed during all four pulls of the test.

STATIC TOWING TEST DATA FORM

Page 1 of 1

Bus Number: 1906	Date: 08/14/2020
Personnel: S.R., E.L. & P.D.	Temperature (°F): 84

Inspect right front tow eye and adjoining structure.
Comments: No damage or deformation.
Check the torque of all bolts attaching tow eye and surrounding structure.
Comments: None noted.
Inspect left front tow eye and adjoining structure.
Comments: No damage or deformation.
Check the torque of all bolts attaching tow eye and surrounding structure.
Comments: None noted.
Inspect right rear tow eye and adjoining structure.
Comments: N/A
Check the torque of all bolts attaching tow eye and surrounding structure.
Comments: N/A
Inspect left rear tow eye and adjoining structure.
Comments: N/A
Check the torque of all bolts attaching tow eye and surrounding structure.
Comments: N/A
General comments of any other structure deformation or failure:
Per manufacturer's recommendation no rear pull was performed.
No damage, deformation or failure noted at any point during each of the four, front pulls.

5.3 STATIC TOWING TEST



20° UPWARD PULL



20° DOWNWARD PULL

5.4 STRUCTURAL STRENGTH AND DISTORTION TESTS - DYNAMIC TOWING TEST

5.4-I. TEST OBJECTIVE

The objective of this test is to verify the integrity of the towing fixtures and determine the feasibility of towing the bus under manufacturer specified procedures.

5.4-II. TEST DESCRIPTION

This test required the bus to be towed at curb weight using the specified equipment and instructions provided by the manufacturer and a heavy-duty wrecker. The bus was towed for 5 miles at a speed of 20 mph for each recommended towing configuration. After releasing the bus from the wrecker, the bus was visually inspected for any structural damage or permanent deformation. All doors, windows and passenger escape mechanisms were inspected for proper operation.

5.4-III. DISCUSSION

The bus was towed using a heavy-duty wrecker. The towing interface was accomplished by incorporating a hydraulic under-lift. A front lift tow was performed. No problems, deformation, or damage was noted during testing. This bus passed this section of the test.

DYNAMIC TOWING TEST DATA FORM

Page 1 of 1

Bus Number: 1906	Date: 10/30/19
Personnel: T.S. & E.D.	

Temperature (°F): 60	
Wind Direction: calm	Wind Speed (mph): 0

Inspect tow equipment-bus interface.
Comments: No problems encountered.
Inspect tow equipment-wrecker interface.
Comments: No problems encountered.
Towing Comments: The towing test was performed successfully using a
Hydraulic underlift wrecker.
Description and location of any structural damage:
None noted.
General Comments:
None noted.

5.4 DYNAMIC TOWING TEST



TOWING INTERFACE



TEST BUS IN TOW

5.5 STRUCTURAL STRENGTH AND DISTORTION TESTS – JACKING TEST

5.5-I. TEST OBJECTIVE

The objective of this test is to inspect for damage due to the deflated tire and determine the feasibility of jacking the bus with a portable hydraulic jack to a height sufficient to replace a deflated tire.

5.5-II. TEST DESCRIPTION

With the bus at curb weight, the tire(s) at one corner of the bus were replaced with deflated tire(s) of the appropriate type. A portable hydraulic floor jack was then positioned in a manner and location specified by the manufacturer and used to raise the bus to a height sufficient to provide 3-in clearance between the floor and an inflated tire. The deflated tire(s) were replaced with the original tire(s) and the jack was lowered. Any structural damage or permanent deformation was recorded on the test data sheet. This procedure was repeated for each corner of the bus.

5.5-III. DISCUSSION

With the tires deflated during the test, the jacking point clearances ranged from 4.0 inches to 9.2 inches. No deformation or damage was observed during testing. A complete listing of jacking point clearances is provided in the Jacking Test Data Form. This bus passed this section of the test.

JACKING CLEARANCE SUMMARY

Condition	Frame Point Clearance
Front axle – one tire flat	5.3
Rear axle – one tire flat	8.2
Rear axle – two tires flat	5.1

JACKING TEST DATA FORM

Page 1 of 1

Bus Number: 1906	Date: 04/11/19
Personnel: E.D., E.L. & S.R.	Temperature (°F):

Record any permanent deformation or damage to bus as well as any difficulty encountered during jacking procedure.

I= Inflated D= Deflated

Deflated Tire	Jacking Pad Clearance Body/Frame (in)	Jacking Pad Clearance Axle/Suspension (in)	Comments
Right front	8.2"I 5.5"D	8.7"I 4.0" D	Body & Suspension
Left front	8.8"I 5.3"D	7.3"I 4.9"D	Body & Suspension
Right rear—outside	8.9"I 8.4"D	9.8"I 9.2"D	Body & Suspension
Right rear—both	8.9"I 5.1"D	9.8"I 5.6"D	Body & Suspension
Left rear—outside	9.0"I 8.2"D	9.9"I 9.1"D	Body & Suspension
Left rear—both	9.0"I 5.2"D	9.9"I 5.6"D	Body & Suspension
Right middle or tag—outside	N/A	N/A	N/A
Right middle or tag—both	N/A	N/A	N/A
Left middle or tag—outside	N/A	N/A	N/A
Left middle or tag—both	N/A	N/A	N/A
Additional comments of any deformation or difficulty during jacking:			
None noted.			

5.5 JACKING TEST



JACK IN PLACE – FRONT



JACK IN PLACE – REAR

5.6 STRUCTURAL STRENGTH AND DISTORTION TESTS - HOISTING TEST

5.6-I. TEST OBJECTIVE

The objective of this test is to determine possible damage or deformation caused by the jack/stands.

5.6-II. TEST DESCRIPTION

With the bus at curb weight, the front end of the bus was raised to a height sufficient to allow manufacturer-specified placement of jack stands under the axles or jacking pads independent of the hoist system. The bus was checked for stability on the jack stands and for any damage to the jacking pads or bulkheads. The procedure was repeated for the tag/middle axles (if equipped), and rear end of the bus. The procedure was then repeated for the front, tag/middle (if equipped) axles, and rear simultaneously.

5.6-III. DISCUSSION

The test was conducted using four posts of a six-post electric lift and 19-inch jack stands. The bus was hoisted from the front wheels and then from the rear wheels, and then from the front and rear wheels simultaneously and placed on jack stands.

The bus accommodated the placement of the vehicle lifts and jack stands and the procedure was performed without any instability noted. This bus passed this section of the test.

HOISTING TEST DATA FORM

Page 1 of 1

Bus Number: 1906	Date: 04/11/19
Personnel: E.D. & S.R.	Temperature (°F): 70

Comments of any structural damage to the jacking pads or axles while both the front wheels are supported by the jack stands:
None noted.
Comments of any structural damage to the jacking pads or axles while both the rear wheels are supported by the jack stands:
None noted.
Comments of any structural damage to the jacking pads or axles while both the tag axle wheels are supported by the jack stands:
N/A
Comments of any structural damage to the jacking pads or axles while the front, tag axle and rear wheels are supported by the jack stands:
None noted.
Comments of any problems or interference placing wheel hoists under wheels:
None noted.

5.6 HOISTING TEST



REAR JACK STANDS IN PLACE



FRONT AND REAR JACK STANDS IN PLACE

5.7 STRUCTURAL DURABILITY TEST

5.7-I. TEST OBJECTIVE

The objective of this test is to perform an accelerated durability test that approximates 25 percent of the service life of the vehicle.

5.7-II. TEST DESCRIPTION

The test vehicle was driven a total of 15,069 miles; approximately 12,500 miles on the LTI Durability Test Track and approximately 2,500 miscellaneous other miles. The test was conducted with the bus operated under three different loading conditions. The first segment consisted of approximately 6,250 miles with the bus operated at GVW. The second segment consisted of approximately 2,500 miles with the bus operated at SLW. The remainder of the test, approximately 6,250 miles, was conducted with the bus loaded to CW. The loads on both axles and GVW were within their ratings with the bus loaded as specified by the manufacturer. All subsystems were running during these tests in their normal operating modes. All manufacturer-recommended servicing was followed and noted on the vehicle maintainability log. Servicing items accelerated by the durability tests were compressed by 10:1; all others were done on a 1:1 mi/mi basis. Unscheduled breakdowns and repairs were recorded on the same log as are any unusual occurrences as noted by the driver. Once a week the test vehicle was washed down and thoroughly inspected for any signs of failure.

5.7-III. DISCUSSION

The Structural Durability Test was started on April 16, 2019 and was conducted until August 03, 2020. The first 6,250 miles were performed at a GVW of 43,640 lb. and completed on August 28, 2019. The next 2,500-mile SLW segment was performed at 39,550 lb. and completed on October 28, 2019 and the final 6,250-mile segment was performed at a CW of 33,360 lb. and completed on August 03, 2020.

The following mileage summary presents the accumulation of miles during the Structural Durability Test. The driving schedule is included, showing the operating duty cycle. A detailed plan view of the LTI Test Track Facility and Durability Test Track are attached for reference. Also, a durability element profile detail shows all the measurements of the different conditions. Finally, photographs illustrating some of the failures that were encountered during the Structural Durability Test are included. This bus passed this section of the test, as there were no uncorrected Class 1 or Class 2 failures and the unscheduled maintenance of 94.6 hours was less than 125 hours.

During the Structural Durability testing the bus experienced periodic instances of mileage loss by the odometer. The issues appeared to be resolved after a software update. Mileage accumulation was tracked secondarily on a hub-odometer to ensure accuracy. Late in the test, the bus developed an intermittent shifting problem in the rear axle. The manufacturer traced a contributor to the problem to be contamination in the air line actuating the pneumatic shift valves. The manufacturer stated that the contamination was caused by a degradation of the grease used during the shifter mechanism assembly and the issue would be resolved in the production process.

Proterra Bus # 1906

MILEAGE DRIVEN/RECORDED FROM DRIVER'S LOGS

DATE	TOTAL DURABILITY TRACK	TOTAL OTHER MILES	TOTAL
04/15/19 TO 04/21/19	179.00	60.00	239.00
04/22/19 TO 04/28/19	136.00	6.00	142.00
04/29/19 TO 05/05/19	262.00	41.00	303.00
05/06/19 TO 05/12/19	292.00	16.00	308.00
05/13/19 TO 05/19/19	218.00	10.00	228.00
05/20/19 TO 05/26/19	113.00	5.00	118.00
05/27/19 TO 06/02/19 TO	297.00	13.00	310.00
06/03/19 TO 06/09/19	197.00	14.00	211.00
06/10/19 TO 06/16/19	319.00	16.00	335.00
06/17/19 TO 06/23/19	450.00	25.00	475.00
06/24/19 TO 06/30/19	294.00	14.00	308.00
07/01/19 TO 07/07/19	438.00	22.00	460.00
07/08/19 TO 07/14/19	0.00	0.00	0.00
07/15/19 TO 07/21/19	0.00	0.00	0.00
07/22/19 TO 07/28/19	222.00	11.00	233.00

MILEAGE DRIVEN/RECORDED FROM DRIVER'S LOGS

DATE	TOTAL DURABILITY TRACK	TOTAL OTHER MILES	TOTAL
07/29/19 TO 08/04/19	406.00	18.00	424.00
08/05/19 TO 08/11/19	257.00	11.00	268.00
08/12/19 TO 08/18/19	526.00	26.00	552.00
08/19/19 TO 08/25/19	640.00	27.00	667.00
08/26/19 TO 09/01/19	344.00	42.00	386.00
09/02/19 TO 09/08/19	369.00	110.00	479.00
09/09/19 TO 09/15/19	161.00	8.00	169.00
09/16/19 TO 09/22/19	284.00	12.00	296.00
09/23/19 TO 09/29/19	376.00	685.00	1061.00
09/30/19 TO 10/06/19	15.00	62.00	77.00
10/07/19 TO 10/13/19	0.00	0.00	0.00
10/14/19 TO 10/20/19	127.00	11.00	138.00
10/21/19 TO 10/27/19	328.00	68.00	396.00
10/28/19 TO 11/03/19	437.00	122.00	559.00
11/04/19 TO 11/10/19	185.00	7.00	192.00

Proterra Bus # 1906

MILEAGE DRIVEN/RECORDED FROM DRIVER'S LOGS

DATE	TOTAL DURABILITY TRACK	TOTAL OTHER MILES	TOTAL
11/11/19 TO 11/17/19	61.00	3.00	64.00
11/18/19 TO 11/24/19	676.00	29.00	705.00
11/25/19 TO 12/01/19	390.00	17.00	407.00
12/02/19 TO 12/08/19	487.00	23.00	510.00
12/09/19 TO 12/15/19	551.00	24.00	575.00
12/16/2019 TO 12/22/19	429.00	20.00	449.00
12/23/19 TO 12/29/19	0.00	0.00	0.00
12/30/19 TO 01/05/20	0.00	0.00	0.00
01/06/20 TO 01/12/20	252.00	12.00	264.00
01/13/20 TO 01/19/20	558.00	26.00	584.00
01/20/20 TO 01/26/20	102.00	15.00	117.00
01/27/20 TO 02/02/20	518.00	25.00	543.00
02/03/20 TO 02/09/20	604.00	430.00	1034.00
02/10/20 TO 02/16/20	0.00	196.00	196.00
02/17/20 TO 02/23/20	0.00	0.00	0.00

Proterra Bus # 1906
MILEAGE DRIVEN/RECORDED FROM DRIVER'S LOGS

DATE	TOTAL DURABILITY TRACK	TOTAL OTHER MILES	TOTAL
02/24/20 TO 03/01/20	0.00	0.00	0.00
03/02/20 TO 03/08/20	0.00	31.00	31.00
03/09/20 TO 03/15/20	0.00	0.00	0.00
03/16/20 TO 03/22/20	0.00	117.00	117.00
ALL TESTING AT THE ALTOONA BUS TESTING CENTER WAS SUSPENDED FROM 03/26/20 TO 07/21/20 DUE TO THE COVID-19 PANDEMIC			
07/20/20 TO 07/26/20	0.00	0.00	0.00
07/27/20 TO 08/02/20	0.00	54.00	54.00
08/03/20 TO 08/09/20	0.00	85.00	85.00
Total	12500.00	2569.00	15069.00

Driving Schedule for Bus Operation on the Durability Test Track.

STANDARD OPERATING SCHEDULE

Monday through Friday

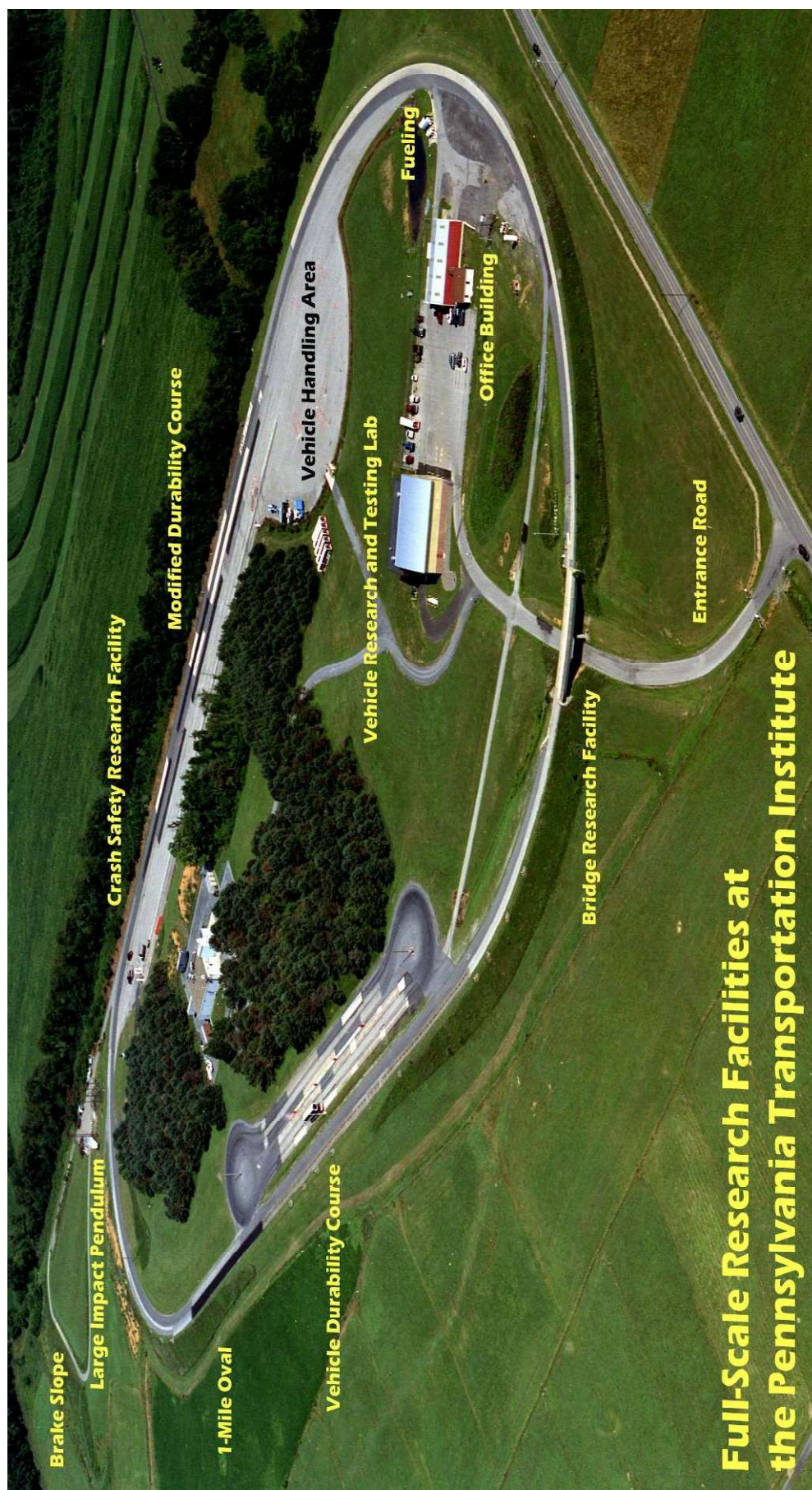
	HOUR	ACTION
Shift 1	midnight	D
	1:40 am	C
	1:50 am	B
	2:00 am	D
	3:35 am	C
	3:45 am	B
	4:05 am	D
	5:40 am	C
	5:50 am	B
	6:00 am	D
	7:40 am	C
	7:50 am	F
Shift 2	8:00 am	D
	9:40 am	C
	9:50 am	B
	10:00 am	D
	11:35 am	C
	11:45 am	B
	12:05 pm	D
	1:40 pm	C
	1:50 pm	B
	2:00 pm	D
	3:40 pm	C
	3:50 pm	F
Shift 3	4:00 pm	D
	5:40 pm	C
	5:50 pm	B
	6:00 pm	D
	7:40 pm	C
	7:50 pm	B
	8:05 pm	D
	9:40 pm	C
	9:50 pm	B
	10:00 pm	D
	11:40 pm	C
	11:50 pm	F

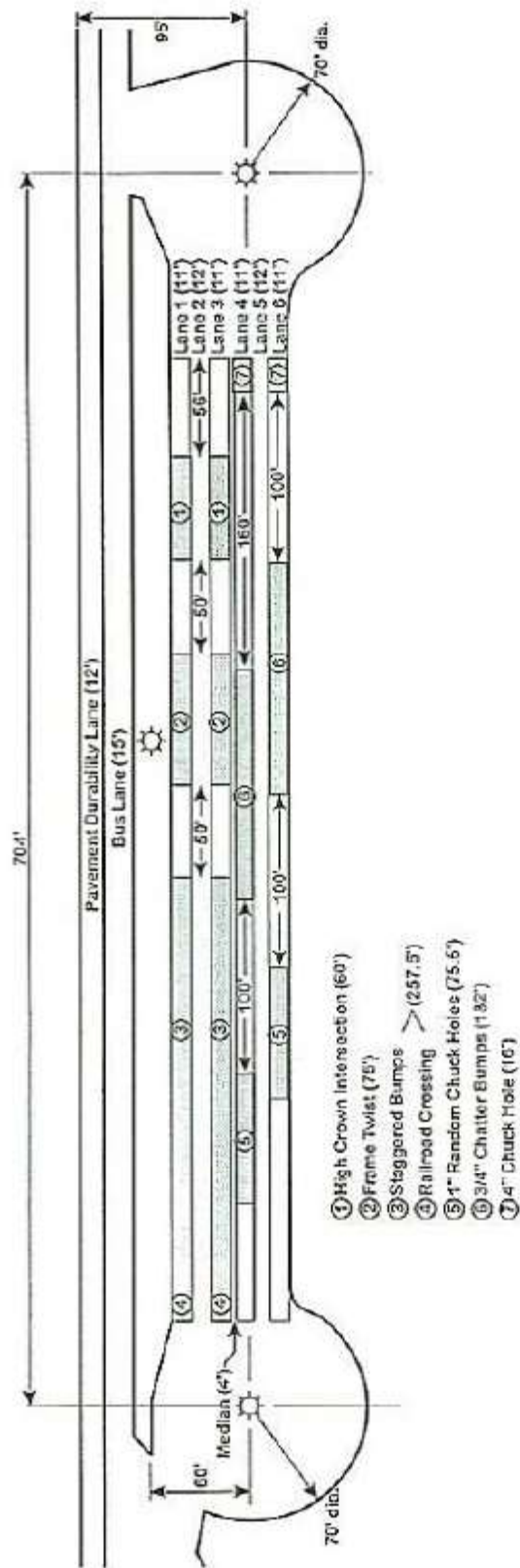
B—Break

C—Cycle all systems five times, visual inspection, driver's log entries

D—Drive bus as specified by procedure

F—Fuel bus, complete driver's log shift entries





Plan View

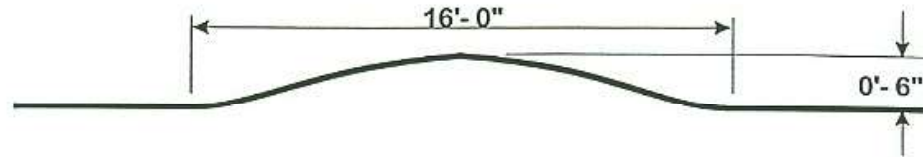
Vehicle Durability Test Track

Track 1 (Track 2 has similar layout)

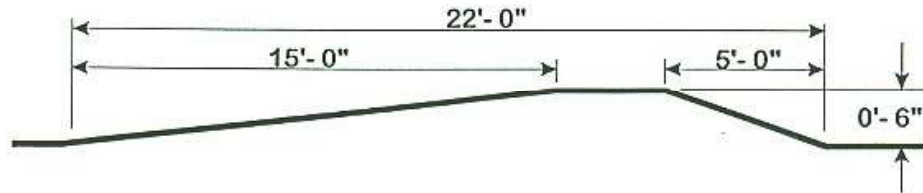
The Larson Transportation Institute

Penn State

Staggered
Bumps
(10 mph)



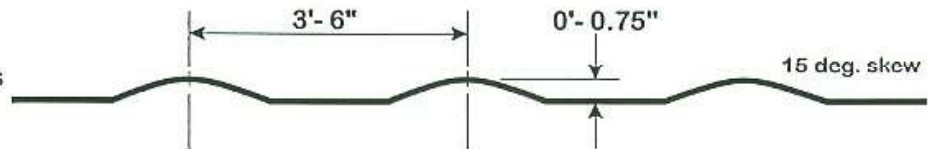
Railroad
Crossing
(8 mph)



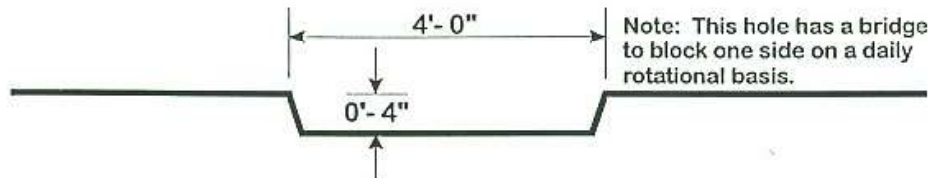
1" Random
Chuck Holes
(20 mph)



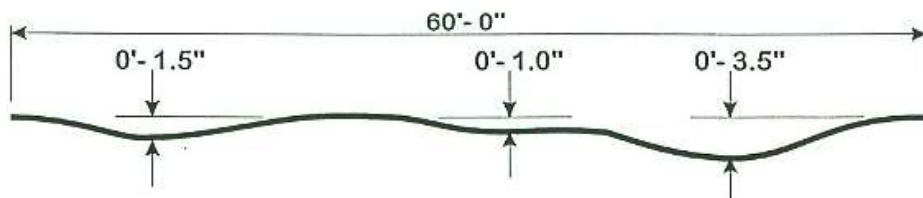
Chatter Bumps
(20 mph)



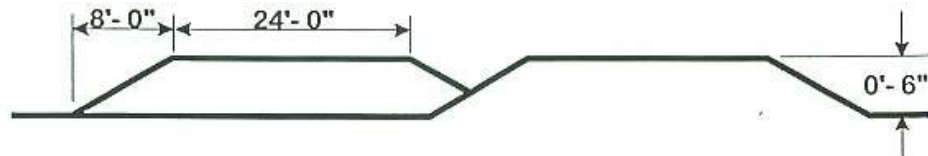
4" Chuck Hole
(5 mph)



High Crown
Intersection
(20 mph)



Frame Twist
(10 mph)



Durability Element Profiles

The Pennsylvania Transportation Institute
Penn State

**Unscheduled Maintenance
Bus Proterra Bus# 1906
(Page 1 of 11)**

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
04/17/19	239	Bus stopped/shut down on durability track. Red "stop" light came on. Cycled 24V batteries. Bus will start to boot up but powers off as soon as boot up is complete. Bus is stopped on the track.	Ground wire repair included powertrain cover removal, wiring troubleshooting, wire repair/zip tie addition, systems check and power train cover installation.	1.25	Electrical	2
04/25/19	381	Trunk latch is broken.	Trunk latch was replaced and bracket was adjusted.	0.50	Body	3
04/25/19	381	Coolant is leaking from bus.	Replaced coolant line clamps on DCDC unit.	0.25	Coolant (Motor and Battery)	3
04/25/19	381	Bus stalled during brake testing and had to be towed from point of failure.	New software installed. This software improved the ability to interpret sensor data under certain fault conditions.	0.25	Software/ Electrical	2
04/26/19	381	Fault code from bus stalling during brake test did not clear after update and low voltage power reset.	Further investigation found water in the Vehicle Electrical Center (VEC) at the rear of the bus. A small leak path was found in one of the plugs. The original VEC was removed and a new VEC was installed.	1.00	Electrical	3
05/02/19	681	Worn air compressor isolator bolt found during inspection.	A new air compressor isolator bolt was installed.	0.25	Body	3
05/03/19	681	The low voltage (LV) battery tray slides broken due to loose retaining bolt.	A new LV battery tray and slides were installed.	2.50	Electrical / Body	3
05/03/19	681	Curbside mirror bolts loose. Mirror broke at pivot arm.	A new mirror was installed.	0.75	Body	3

**Unscheduled Maintenance
Bus Proterra Bus# 1906
(Page 2 of 11)**

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
05/06/19 To 05/15/19	755 To 1,087	Loose cover on rear axle. Rear, streetside bulkhead cover for rear drive motors is broken. The welds broke on both ends of rear front cover crossmember.	Drivetrain covers were removed and replaced with modified 2-piece covers.	2.00	Drivetrain	3
05/10/19	992	Oil pump bolts are loose. Original oil pump installation did not have isolators installed.	The rear inspection cover and skid plate were removed and wire harness and hoses were disassembled. The oil pump was removed and reinstalled with new bolts and isolators. Reconnection of wiring harness and hoses and reinstallation of rear inspection covers and skid plate.	4.50	Drivetrain	3
05/10/15	992	While on the durability course the driver noted that the speedometer and odometer were no longer working and that a yellow light had illuminated.	Tachograph mounting bracket found loose. Replaced tachograph.	1.00	Electrical	3
05/15/19 To 07/05/19	1,087	After crossing the chatter bumps, the bus had a red gear symbol light come on and it lost drive power. The batteries were cycled and the bus restarted but shut down again as it exited the chatter bumps. Bus would not restart and had to be towed to garage.	Inspected drivetrain harness and found broken wire. Repaired drivetrain harness assembly and installed updated harness securements.	2.50	Electrical	2
05/20/19	1,220	The drivers noted that the front destination sign was making noise.	Destination sign bracket bolts were loose. Tightened bolts.	1.00	Body	3
05/20/19	1,220	Bus will not level and is leaning to the streetside. Bus hitting on 10 mph frame twists.	Worn shocks causing rear streetside leveling sensor linkage to invert. Corrected linkage. Shocks were replaced as part of scheduled maintenance.	0.50	Suspension	3

**Unscheduled Maintenance
Bus Proterra Bus# 1906
(Page 3 of 11)**

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
05/22/19	1,231	Drivetrain oil pump manifold bolts broken.	The bolt and isolator combination installed on May 10 was modified with the addition of a larger bushing and additional snub washer. The bolt class was also changed from a 12.9 to a 10.9.	4.00	Hardware	3
05/29/19 To 05/30/19	1,517 To 1,609	Bus shut off on durability track. Had a symbol of bus with a slash through it. A yellow caution light and a red gear light also came on.	Tightened grounding strap for drive axle.	0.75	Electrical	3
06/03/19	1,648	Air compressor bracket is broken.	Missing bolt on air compressor vertical support bracket caused the isolator bracket to fatigue and crack. Replaced bolt and air compressor bracket.	2.50	Body	3
06/05/19	1,652	Curbside transmission thermistor is unresponsive.	Replaced curbside transmission thermistor.	1.00	Electrical	3
06/06/19	1,744	Red caution light and red "gear" light came on on dash.	Fixed two shift position sensor connectors.	1.50	Electrical	3
06/06/19	1,744	Curbside mirror is loose and will not stay adjusted.	Mirror bolts were tightened.	0.08	Body	4
06/11/19	2,049	Bus had yellow caution light and yellow gear symbol light on.	Bus manufacturer's representative looked at the codes, cycled 24V batteries and cleared codes.	0.08	Electrical	3
06/11/19	2,049	Yellow caution and yellow temperature light came on to indicate that there is an issue with the power electronics coolant loop temperature sensor.	Discovered broken wires at sensor. Drained coolant, replaced sensor refilled coolant	1.00	Electrical	3

**Unscheduled Maintenance
Bus Proterra Bus# 1906
(Page 4 of 11)**

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
06/12/19	2,085	The hub seal on the rear, streetside wheel was found to be leaking.	The vendor arrived on site to investigate and fix the issue. The root cause was found to be loose mounting hardware for the interior gearset. A new hub seal was installed. The vendor is working to correct the issue for future axles.	2.00	Drivetrain	3
06/17/19	2,285	Bus is leaning hard to the curbside and will not level.	The curbside, rear leveling arm was found inverted. The inverted linkage was corrected.	0.50	Suspension	3
06/17/19	2,285	Bus is leaning hard to the curbside and will not level.	The curbside, rear leveling arm was found inverted. The inverted linkage was corrected.	0.50	Suspension	3
06/17/19	2,285	The rear door is coming open while on the durability track, causing the bus to stop.	Rear door hardware is worn out. Hardware was replaced.	1.00	Electrical/ Body	2
06/18/19	2,302	Bus is leaning hard to the curbside and will not level.	The curbside, rear leveling arm was found inverted. The inverted linkage was corrected. Recalibration of ride height.	0.50	Suspension	3
06/18/19	2,359	Bus stopped running on durability track two times. Symbol of bus on hill came on. Red caution light came on.	The CAN-H wire to the inverter was found to be broken and intermittently connecting. This was driving a red level fault on the vehicle that required a reset. The wire was corrected with a splice.	0.50	Electrical	3
06/19/19	2,421	The streetside, rear of bus is making contact on frame twist obstacle.	Rear leveling arm found inverted. Corrected linkage length/alignment to be within specification. Recalibrated ride height.	1.00	Suspension	3
06/21/19	2,593	The wheel well box on the curbside is coming loose.	The mounting screws were tightened and the wheel well box was reinstalled.	1.00	Body	3

**Unscheduled Maintenance
Bus Proterra Bus# 1906
(Page 5 of 11)**

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
06/21/19	2,669	Bus will not charge.	DC cable going to the DuoPower rear axle was damaged at the support clamp where it is secured to the top of the axle. Power cable and cable support clamps were replaced.	2.00	Electrical	3
07/02/19	2,957	Yellow "air compressor" light on dash.	Replaced air compressor thermistor.	0.50	Electrical	3
06/26/19 To 10/18/19	2,757 To 8,187	HVAC not working.	The root cause was found to be that the high-pressure refrigerant line had cracked/failed. On 10/18/19 the HVAC vendor installed updated flex line which is an implemented design change.	2.00	HVAC	4
07/08/19 To 07/19/19	3,437	Coolant was leaking under rear, streetside of bus. Checked coolant level, but could not see coolant in one sight glass.	Replaced both power electronic coolant pumps.	0.75	Electrical / Motor & Battery Cooling	3
07/19/19	3,437	Rear hatch hinge and rear hatch latch are broken.	Replaced rear hatch hinge and rear latch with new assembly.	0.50	Body	3
07/25/19	3,612	Bolts are loose on axle cover.	Cover was redesigned to split the support bar in the middle so that it did not span the width of the axle. Added thread locking compound on bolts for inspection plate cover.	0.50	Drivetrain	3
07/29/19	3,682	Vehicle will not charge on Port A.	The root cause was a broken wire with a ring terminal. The ring terminal was replaced and additional securement added to the new wire.	0.25	Electrical	3
08/02/19	4,094	Rear passenger door keeps opening while running durability.	Adjusted rear door actuator. Tightened door actuator joint in order to prevent movement causing door to trigger an "open" sensor.	0.25	Body	3

**Unscheduled Maintenance
Bus Proterra Bus# 1906
(Page 6 of 11)**

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
07/31/19 To 08/05/19	3,874 To 4,130	Battery tray retaining bar and left side battery hold down mount is broken.	Installed a new restraining bracket on the LV battery tray box.	0.25	Electrical	3
08/06/19 To 08/12/19	4,292 To 4,392	Red caution light and red gear symbol light came on and bus lost throttle. When bus was restarted lights would go out and bus would run. This happened multiple times.	Drivetrain LV harness had an improperly installed zip tie which caused a connector to unlock. This cause an intermittent connection in the harness. Zip tie was moved.	0.50	Electrical	3
08/13/19	4,529	Curbside mirror is loose.	Mirror was tightened.	0.20	Body	3
08/13/19 To 08/15/19	4,529 To 4,730	Caution light and HV light flashing.	Turned bus off and back on from driver's area. Lights went out.	0.10	Electrical	3
08/20/19	5,180	Air filter support mount on air compressor is broken.	Repaired broken air filter support mount on air compressor.	1.00	Coach Air Compressor	4
08/23/19	5,581	Red caution light and red gear symbol came on and bus lost throttle.	Cycled batteries.	0.08	Electrical	3
09/04/19	6,265	Incorrect mileage on odometer.	Bus manufacturer's representative updated software to correct odometer mileage. Continued monitoring vehicle to determine root cause.	0.10	Software	3
09/06/19 To 09/10/19	6,446 To 6,494	Fiberglass is starting to delaminate at two different points above the front door.	The area was repaired by installing a new mounting bracket.	3.25	Body	3

**Unscheduled Maintenance
Bus Proterra Bus# 1906
(Page 7 of 11)**

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
09/06/19 To 09/10/19	6,446 To 6,494	ADA ramp is non-functioning. One of the mounting brackets has become de-bonded.	The ADA ramp bracket was re-bonded to the vehicle.	1.00	Body	3
09/06/19 To 09/10/19	6,446	ADA ramp is non-functioning.	ADA ramp controller ground wire found chaffed on interior panel screw. Replaced instrument panel harness.	0.50	Electrical	3
09/11/19	6,511	Rear door is intermittently tripping its circuit breaker.	Low voltage wiring to door found damaged due to contact with door actuator. Repaired wiring and routed harness properly.	0.20	Electrical	3
09/11/19	6,511	Drivers noted that there was an air leak.	Leaking airline for front door found chaffing on interior panel screw. Air line replaced and routed to prevent reoccurrence	0.25	Compressed Air System	3
09/12/19	6,615	Red caution light came on after disconnecting from charger and would not engage into gear. The bus displayed yellow faults on dash.	Power cables for DuoPower axle were chaffing where they were secured. Damaged cables were replaced. At the location of damage, water was able to leak into the drivetrain inverter.	2.85	Electrical	2
09/20/19	6,911	Rear axle inspection cover under rear of bus is loose and rattling due to missing bolts.	Bolts were replaced and tightened.	0.50	Drivetrain	3
09/24/19 To 10/16/19	7,132 To 8,187	Yellow caution and "gear" symbols came on dashboard. On 09/30/19, the red caution light came on and throttle went into de-rate. Once the bus slowed to below 15 mph the throttle started working again.	Motor resolver had intermittent connection. Bracket added to prevent intermittent wiring connection with inverter.	2.00	Software/ Electrical	3
09/25/19 To 09/26/19	7,302 To 7,527	Bus leaned hard to the curbside and the bus would not relevel. Bus lost ride height, all airbags.	Inverted leveling arm was corrected and ride height sensor was adjusted.	0.50	Suspension	3

**Unscheduled Maintenance
Bus Proterra Bus# 1906
(Page 8 of 11)**

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
10/29/19	8,754	Red "Door" light and caution light came on while running durability. Used interlock override to drive bus back to the garage.	Rear door actuator hardware became loose causing actuation mechanism to disconnect. Repositioned bracket and tightened hardware.	0.25	Body	3
10/31/19 To 11/06/19	9,098 To 9,305	Rear door is coming open while running durability.	Rear door actuator hardware became loose causing actuation mechanism to disconnect. Additional bolt was added and mechanism was replaced to prevent problem.	0.75	Body	3
11/07/19	9,334	While exiting the 4" pothole, the 24V battery box broke and fell onto the track.	Per the manufacturer, the root cause was determined to be an improper torque spec and hardware combination which lead to a loss of clamp load on the fasteners. Battery box was reinstalled with updated hardware.	3.00	Electrical/ Body	2
11/15/19	9,398	The bushings in the front suspension upper arms are worn out.	Both front-upper arm assemblies were replaced. Both front air bags had wear from contacting the inner wheel well. Both air bags replaced.	12.00	Suspension	3
11/18/19	9,461	Yellow caution light and "gear" light came on in 1" chatter bump area of the durability track.	Intermittent electrical issue. Not resolved. Will continue to monitor problem.	---	Electrical	4
11/18/19 to 12/05/19	10,103 To 10,901	Yellow caution light and "gear" light came on in 1" chatter bump area of the durability track. Had to stop multiple times to reset regenerative braking.	Issue was monitored until software update. Bus manufacturer's representative updated SOC software on 12/05/19. Software update to address earlier issues with caution lights, "gear" lights, regen and SOC.	0.25	Software/ Electrical	3
11/27/19	10,510	Streetside mirror will not stay adjusted.	Bolts were tightened.	0.08	Body	3

**Unscheduled Maintenance
Bus Proterra Bus# 1906
(Page 9 of 11)**

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
12/04/19	10,783	Symbol of yellow bus and up and down arrows and yellow caution lights are coming on.	Cycled bus, but lights are still on. Fault was cleared. Will continue to monitor.	0.08	Electrical	3
12/04/19	10,783	Side mount for the air compressor and power steering variable frequency drive (VFD) was broken.	Repaired broken mount.	1.25	Electrical	3
12/04/19	10,783	The two latches retaining the rear hatch on the bus are worn.	Replaced broken latches.	0.50	Body	3
12/13/19 To 01/30/20	11,595 To 13,267	The "drive" and "neutral" indicator lights are not working in the driver's gear selection.	Situation being monitored. See repairs on 01/30/2020.	---	Electrical	4
12/17/19	11,803	The bracket isolating the air compressor from the frame of the vehicle was found to have fractures.	The air compressor bracket was replaced.	2.50	Body	3
01/02/20	12,044	Red caution light came on.	Faulty lock motor on the Port-A charge port failed. Replaced lock motor.	0.25	Electrical	3
01/08/20	12,044	The Battery Thermal Management System (BTMS) pump #2 stopped functioning.	Replaced pump and worn isolators.	0.50	Battery Coolant	3
01/15/20	12,598	Air compressor bracket is cracked.	Replaced air compressor and air compressor bracket.	2.50	Body	3
01/20/20	12,999	Transmission is not shifting properly. Bus is losing power to a drive motor when exceeding 25 mph in second gear.	This is being monitored. See repair on 01/23/2020.	---	Drivetrain	3
01/20/20 To 01/22/20	12,999	Rear door interlock light came on. Driver had to use interlock override to drive bus back to the garage.	Rear door actuator bracket found worn. Replaced component.	1.00	Door	3

Unscheduled Maintenance
Bus Proterra Bus# 1906
(Page 10 of 11)

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
01/20/20	12,999	Loss of CAN communication to power electronics coolant loop (PECL) #2.	Replaced power electronics coolant loop pump.	0.50	Electrical	3
01/22/20 To 01/28/20	12,999 To 13,079	Cracks and delamination were noticed around rear door and rear door mounting bracket.	Rear door mounting bracket area was repaired and rear door mounting bracket was replaced and re-bonded to vehicle.	7.50	Body	3
01/23/20	12,999	Drivers noted that the transmission caution light showed on the dash when the vehicle shifted from 2 nd to 1 st gear.	The curbside shift solenoid was found with contamination in the exhaust ports and corrosion on electrical connections. Solenoid was replaced.	1.00	Electrical	3
01/30/20	13,267	The latch for the rear hatch was found broken.	Replaced latch.	0.25	Body	3
01/30/20	13,267	Front passenger entry door will not open/close when using door switch in driver's area.	Wire connection to the door request button found broken. Wires for gear selection button lights also found broken. Wires were repaired. Replaced all buttons.	0.25	Electrical	3
02/03/20	13,644	The ADA ramp became unsecured from the vehicle on the durability course.	The root cause was determined to be missing hardware which secures the ADA ramp assembly to the vehicle brackets. Some mounting bolts came loose and some were sheared off. Required thread locking compound was not used in the ADA ramp repair performed on 09/10. The ramp was reinstalled per installation procedure.	1.25	ADA Ramp	1
02/07/20 To 08/03/20	14,587 To 15,151	Front passenger entry door will not open. Driver must enter and exit through the rear door.	Missing screw in air sweep causing door to jam when opening. Screw was replaced.	0.25	Body	4
02/10/20	14,782	Left side of 12/24V battery box and left side flange for the battery box is broken.	Battery box was replaced.	1.50	Body	3

**Unscheduled Maintenance
Bus Proterra Bus# 1906
(Page 11 of 11)**

Date	Test Miles	Issue	Action	Labor Hours	Sub-system	Class
ALL TESTING AT THE ALTOONA BUS TESTING CENTER WAS SUSPENDED FROM 03/26/20 TO 07/16/20 DUE TO THE COVID-19 PANDEMIC						
07/21/20	14,930	Transmission is not shifting properly.	Replaced both the streetside and curbside shift solenoids.	1.00	Electrical	3

UNSCHEDULED MAINTENANCE

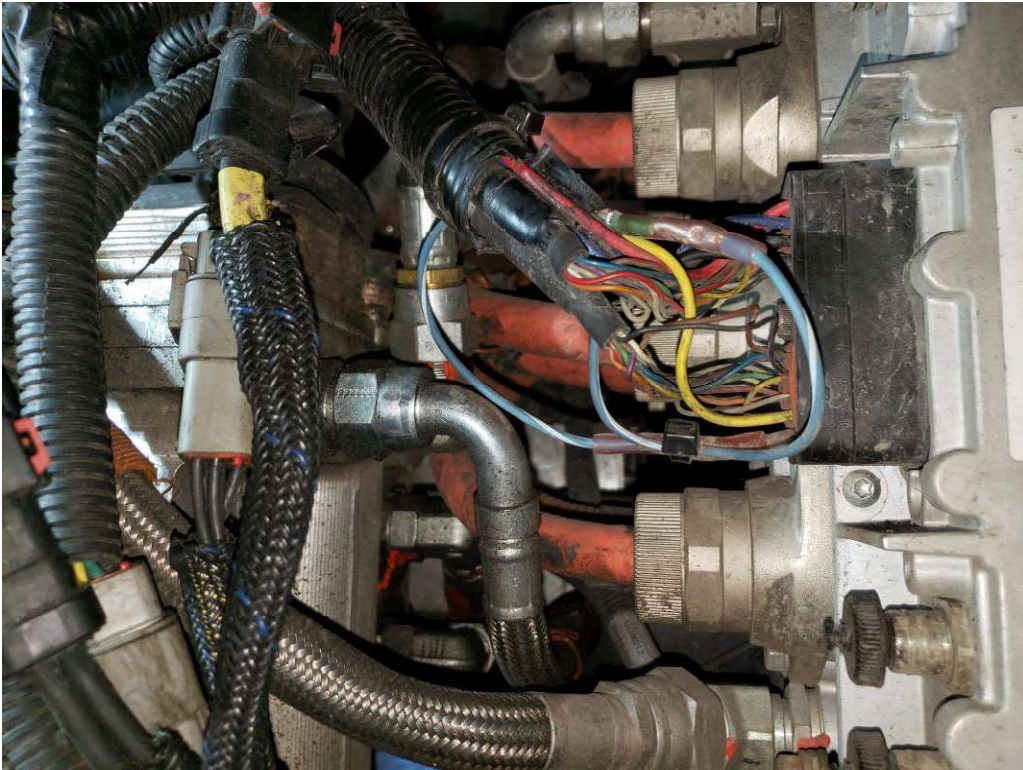


**CURBSIDE MIRROR ARM SNAPPED
(681 TEST MILES)**



**BOLTS LOOSE ON REAR AXLE COVER
(755 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**CAN-L WIRE TO DUOPOWER INVERTER IS BROKEN
(1,087 TEST MILES)**



**AIR COMPRESSOR BRACKET IS BROKEN
(1,648 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**SHIFT POSITION SENSOR WIRE IS BROKEN
(1,648 TEST MILES)**



**CURBSIDE REAR LEVELING ARM IS INVERTED
(2,285 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**DAMAGED DC CABLE GOING TO DUOPOWER AXLE
(2,669 TEST MILES)**



**DAMAGED FRONT DOOR HAT BRACKET
(6,494 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.

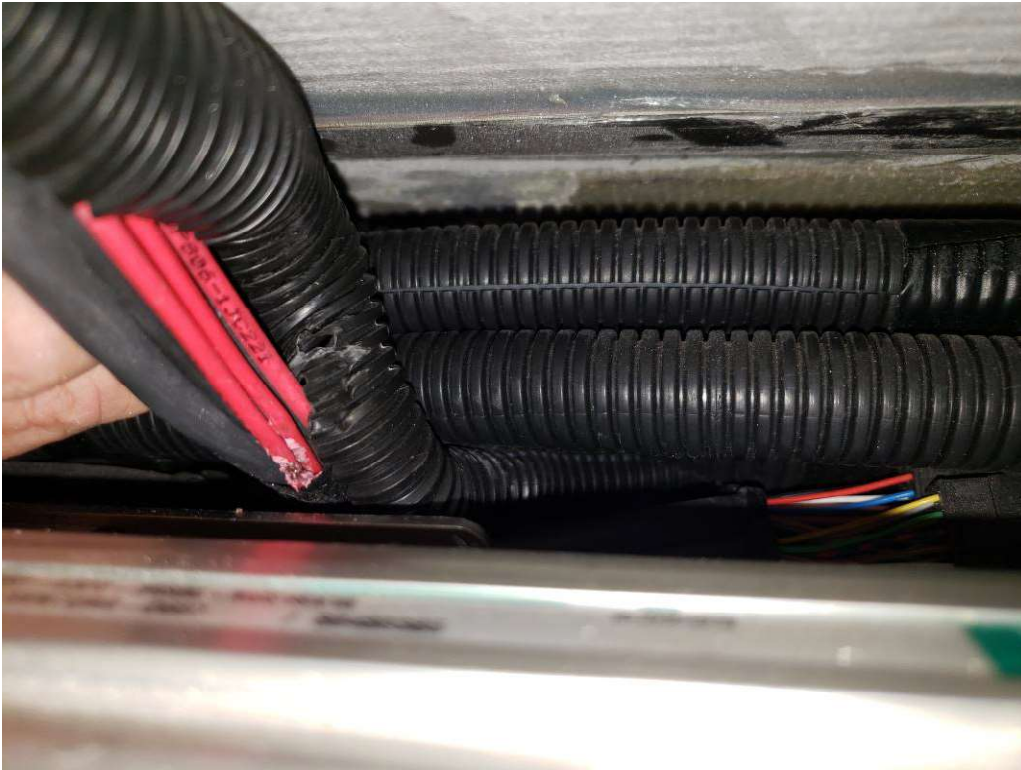


**FRONT DOOR HAT BRACKET REPAIR
(6,494 TEST MILES)**



**WIRES BEHIND DASH FOR ADA RAMP ARE WORN
(6,494 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**REAR DOOR LOW VOLTAGE HARNESS IS CHAFFING
(6,511 TEST MILES)**



**PHASE CABLE FOR CURBSIDE MOTOR IS CHAFFING
(6,615 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**24 VOLT BATTERY BOX FELL OUT
(9,334 TEST MILES)**



**AIR COMPRESSOR BRACKET IS CRACKED
(12,598 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.

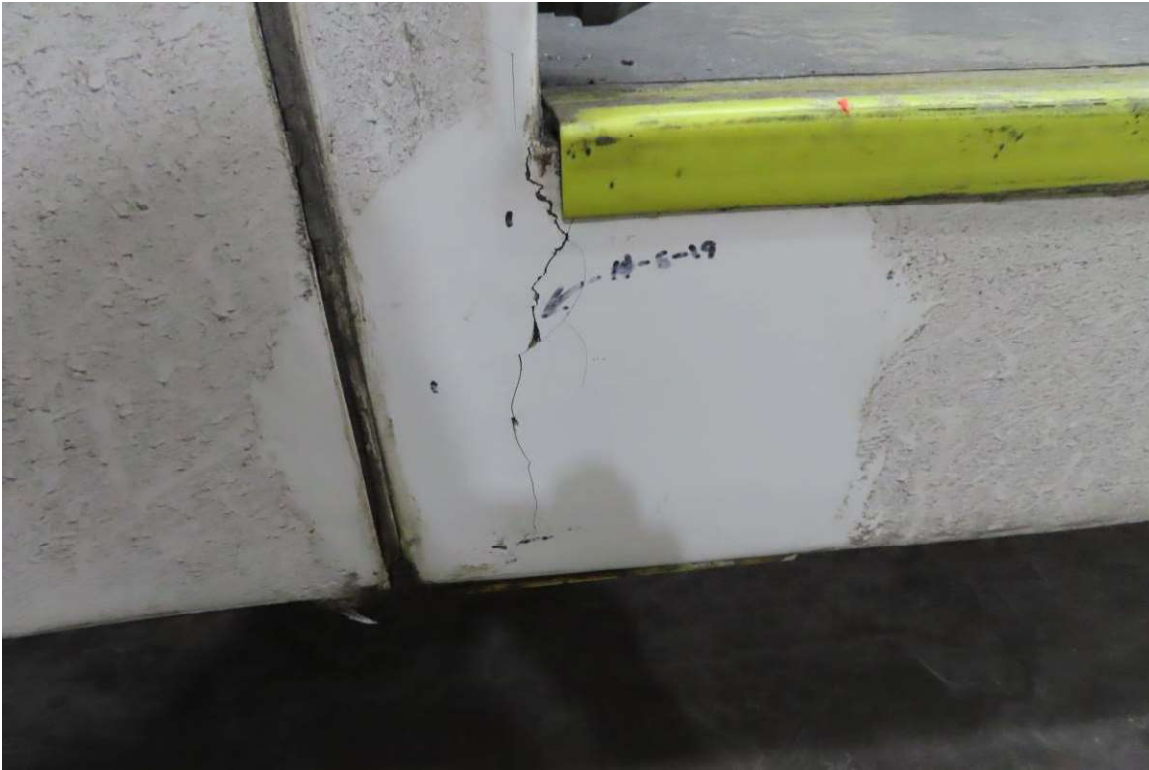


**CRACKS AROUND REAR DOOR
(12,999 TEST MILES)**



**CRACKS AROUND REAR DOOR
(12,999 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**ADDITIONAL CRACKS AROUND REAR DOOR
(12,999 TEST MILES)**



**REAR DOOR HAT BRACKET REPAIR
(12,999 TEST MILES)**

UNSCHEDULED MAINTENANCE CONT.



**ADA RAMP BECAME UNSECURED FROM BUS
(13,644 TEST MILES)**



**ADA RAMP BECAME UNSECURED FROM BUS
(13,644 TEST MILES)**

6. ENERGY ECONOMY AND RANGE TEST – AN ENERGY CONSUMPTION AND RANGE TEST FOR BATTERY ELECTRIC BUSES USING APPROPRIATE OPERATING CYCLES

6-I. TEST OBJECTIVE

The objective of this test is to provide accurate comparable energy consumption data on battery electric transit buses produced by different manufacturers. This energy economy test bears no relation to the calculations done by the Environmental Protection Agency (EPA) to determine levels for the Corporate Average Fuel Economy Program. EPA's calculations are based on tests conducted under laboratory conditions intended to simulate city and highway driving. This energy economy test, as designated here, is a measurement of the energy consumed by a vehicle traveling a specified test operating profile, under specified operating conditions that are typical of transit bus operation. The results of this test will not represent actual energy usage but will provide data that can be used by FTA Grantees to compare buses tested using this procedure.

6-II. TEST DESCRIPTION

This test is performed in the emissions bay of the LTI Vehicle Testing Laboratory. The Laboratory is equipped with a Schenk Pegasus 300 HP, large-roll (72 inch diameter) chassis dynamometer suitable for heavy-vehicle emissions testing. The driving cycles are the Manhattan cycle, a low average speed, highly transient urban cycle (Figure 1), the Orange County Bus Cycle which consists of urban and highway driving segments (Figure 2), and the EPA HD-UDDS Cycle (Figure 3). This test is conducted at seated load weight.

This test is conducted generally as per the methods described in the SAE standard J 1634-2017. The light-duty test cycles specified in this standard are replaced by transit bus test cycles mentioned above.

The Multi-Cycle test (MCT) procedure is adopted for this bus. The end of test is determined when the bus cannot keep up with the speed trace of the test cycle, as recommended by the bus manufacturer. The battery system is recharged to full SOC at the end of the test, following procedures specified in SAE J 1634-2017. During the recharge, the DC energy (into the battery system) and the AC energy (into the charger) are recorded. From these data, the average AC energy consumption, the charger efficiency (DC Energy, kWh/AC Energy, kWh) and range (miles) for each test cycle is calculated.

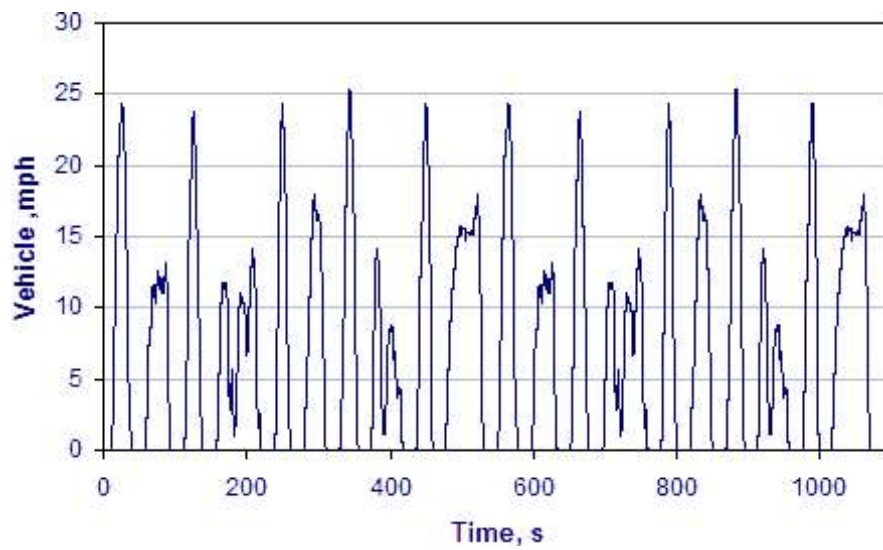


Figure 1. Manhattan Driving Cycle (duration 1089 sec, Maximum speed 25.4 mph, average speed 6.8 mph)

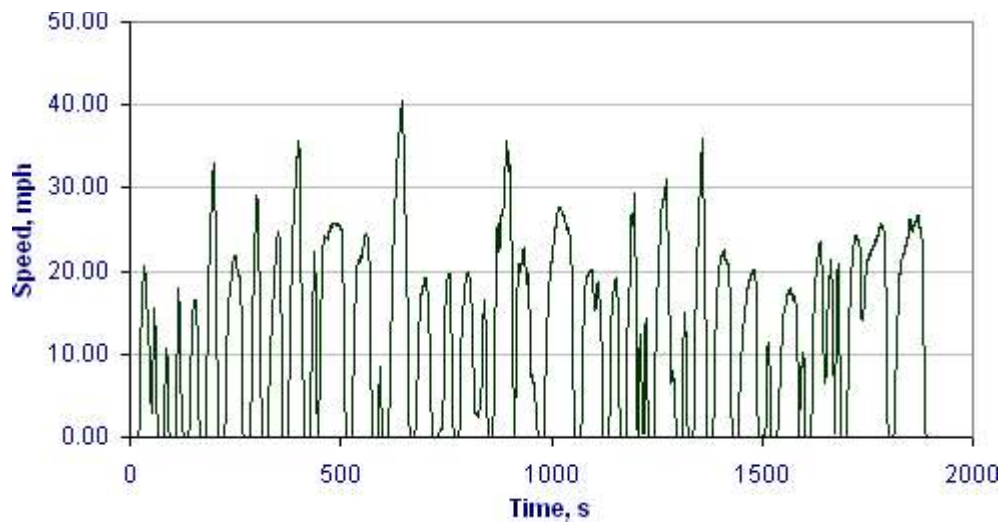


Figure 2. Orange County Bus Cycle (Duration 1909 Sec, Maximum Speed 41 mph, Average Speed 12 mph).

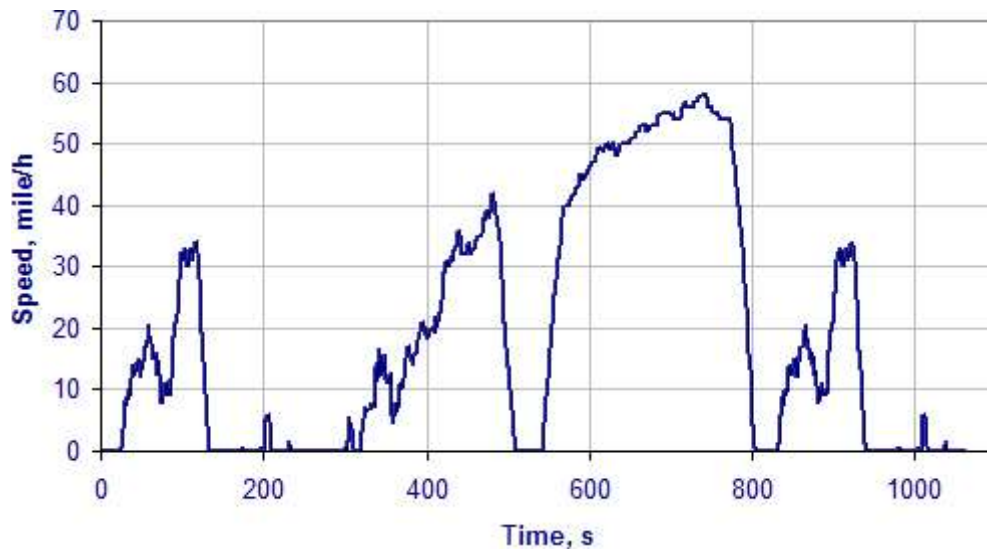


Figure 3. HD-UDDS Cycle (duration 1060 seconds, Maximum Speed 58 mph, Average Speed 18.86 mph).

6-III. DISCUSSION

The driving cycle consists of three simulated transit driving cycles: Manhattan, Orange County Bus Cycle and the HD-UDDS, as described in 6-II.

An extensive pretest maintenance check is conducted including the replacement of all lubrication fluids, if applicable. The details of the pretest maintenance are given in the first three Pretest Maintenance Forms. The fourth sheet shows the Pretest Inspection Form. Finally, the summary sheet provides the average energy consumption and range of bus for the three test cycles. The test was conducted at a seated load weight of 36,960 lbs. The average AC energy consumption for the Manhattan, OCBC and the HD-UDDS were 2,582 Wh/mile, 2,155 Wh/mile and 1,955 Wh/mile respectively. The average DC energy consumption for the Manhattan, OCBC and the HD-UDDS were 2,217 Wh/mile, 1,850 Wh/mile and 1,678 Wh/mile respectively. The range for the three driving cycles were 142 miles, 170 miles and 187 miles respectively.

This bus was tested using the Manhattan, Orange County and UDDS driving cycles. The energy economy and range results for buses tested using these cycles are not directly comparable to buses tested under the earlier protocol that uses the CBD, Arterial and Commuter driving cycles.

For the Energy Economy Tests, ballast weight equivalent of the roof mount battery packs was removed to represent the four-pack battery configuration per the Federal Transit Administration determination letter. Therefore, the seated load weight used was 36,960 lbs. for this Fuel Economy test.

ENERGY ECONOMY PRE-TEST MAINTENANCE FORM

Page 1 of 3

Bus Number: 1906	Date: 02/08/2020	SLW (lb.): 36,960
Personnel: T.S., S.R. & E.D.		

ENERGY SYSTEM	OK
Install fuel measurement system	✓
Remarks: None noted.	
BRAKES/TIRES	OK
Inspect hoses	✓
Inspect brakes	✓
Check tire inflation pressures (mfg. specs.)	✓
Check tire wear (less than 50%)	✓
Remarks: None noted.	
BATTERY COOLING SYSTEM	OK
Check hoses and connections	✓
Check system for coolant leaks	✓
Remarks: None noted.	

ENERGY ECONOMY PRE-TEST MAINTENANCE FORM

Page 2 of 3

Bus Number: 1906	Date: 02/08/2020
Personnel: T.S., S.R. & E.D.	
ELECTRICAL SYSTEM	OK
Check battery	✓
Inspect wiring	✓
Inspect terminals	✓
Check lighting	✓
Remarks: None noted.	
DRIVE SYSTEM	OK
Drain transmission fluid – Drive Motor	✓
Replace filter/gasket	Done by MFG
Check hoses and connections	✓
Replace transmission fluid	Done by MFG
Check for fluid leaks	✓
Remarks: Done by manufacturer to specs	
LUBRICATION	OK
Lube all chassis grease fittings	✓
Lube universal joints	✓
Replace differential lube including axles	N/A
Remarks: None noted.	

ENERGY ECONOMY PRE-TEST MAINTENANCE FORM

Page 3 of 3

Bus Number: 1906	Date: 02/08/2020
Personnel: T.S., S.R. & E.D.	
OTHER ITEMS	OK
Replace air filter	N/A
Inspect air compressor and air system	✓
Inspect vacuum system, if applicable	N/A
Check and adjust all drive belts	N/A
Remarks: None noted	
STEERING SYSTEM	OK
Check power steering hoses and connectors	✓
Service fluid level	✓
Check power steering operation	✓
Remarks: None noted	
	OK
Ballast bus to seated load weight*	✓
*see note on weight in discussion	
TEST DRIVE	OK
Check brake operation	✓
Check transmission operation – Drive Motor	✓
Remarks: None noted.	

ENERGY ECONOMY PRE-TEST INSPECTION FORM

Page 1 of 1

Bus Number: 1906	Date: 02/08/2020
Personnel: T.S., S.R. & E.D.	
PRE-WARM-UP	If OK, Initial
Energy Economy Pre-Test Maintenance Form is complete	E.D.
Cold tire pressure (psi): Front <u>130</u> Middle <u>N/A</u> Rear <u>130</u>	E.D.
Energy economy instrumentation installed and working properly.	T.S.
Bus is loaded to SLW during coast down	E.D.
WARM-UP	If OK, Initial
Interior and exterior lights on	J.S.
Air conditioner off	J.S.
Defroster off	J.S.
Windows and doors closed	J.S.
Do not drive with left foot on brake	J.S.

ENERGY ECONOMY DATA FORM (Battery Electric Buses)

Page 1 of 1

Bus Number: 1906	Manufacturer: Proterra	Date: 09/10/2020
Fuel Type: Electric	Personnel: J.S. & S.I.	
Temperature (°F): 84.9	Humidity (%): 84.8	Barometric Pressure (inHg): 29.0
SLW (lb.): 36,960	Charger: Proterra 60kW	

	Manhattan	Orange County	UDDS
DC Energy (Wh/mile)	2,217	1,850	1,678
AC Energy (Wh/mile)	2,582	2,155	1,955
Range (miles)	142	170	187

Comments: Bus lost drive to one wheel motor twice during the test. Manufacturer's representative resolved the problem and the test continued.

ENERGY ECONOMY TEST CONT.



**BUS TESTED ON CHASSIS DYNAMOMETER FOR
PERFORMANCE AND ENERGY ECONOMY**

7. NOISE

7.1 INTERIOR NOISE AND VIBRATION TESTS

7.1-I. TEST OBJECTIVE

The objective of these tests is to measure and record interior noise levels and check for audible vibration under various operating conditions.

7.1-II. TEST DESCRIPTION

During this series of tests, the interior noise level was measured at several locations with the bus operating under the following three conditions:

1. With the bus stationary, a white noise generating system provided a uniform sound pressure level equal to 80 dB(A) on the left, exterior side of the bus. The engine and all accessories were switched off and all openings including doors and windows were closed. This test was performed at the LTI Test Track Facility.
2. The bus was accelerated at full throttle from a standing start to 35 mph on a level pavement. All openings were closed and all accessories were operating during the test. This test was performed on the track at the LTI Test Track Facility.
3. The bus was operated at various speeds from 0 to 55 mph with and without the air conditioning and accessories on. Any audible vibration or rattles were noted. This test was performed on the test segment between the LTI Test Track and the Bus Testing Center.

All tests were performed in an area free from extraneous sound-making sources or reflecting surfaces. The ambient sound level as well as the surrounding weather conditions were recorded in the test data.

7.1-III. DISCUSSION

For the first part, the overall average of the six measurements was 49.4 dB(A); ranging from 48.6 dB(A) in line with the front speaker to 50.2 dB(A) in line with the rear speaker. The interior ambient noise level for this test was less than 30 dB(A).

For the second part, the interior noise level ranged from 71.1 dB(A) at the driver's seat to 74.0 dB(A) at the middle passenger seats. The overall average was 72.6 dB(A). The interior ambient noise level for this test was less than 30 dB(A).

No vibrations or rattles were noted during the third part of this test. This bus passed this section of the test.

INTERIOR NOISE TEST DATA FORM

Test Condition 1: 80 dB(A) Stationary White Noise

Page 1 of 3

Bus Number: 1906	Date: 10/29/19
Personnel: T.S. & E.D.	
Temperature (°F): 58	Humidity (%): 72
Wind Speed (mph): 6	Wind Direction: S
Barometric Pressure (inHg): 30.24	
Interior Ambient Noise Level dB(A): less than 30	Exterior Ambient Noise Level dB(A): 43.1
Microphone Height During Testing (in): 46.4	

Reading Location	Measured Sound Level dB(A)
Driver's Seat	49.4
Front Passenger Seats	49.1
In Line with Front Speaker	48.6
In Line with Middle Speaker	48.8
In Line with Rear Speaker	50.2
Rear Passenger Seats	50.0

Comments: None noted.

INTERIOR NOISE TEST DATA FORM **Test Condition 2: 0 to 35 mph Acceleration Test**

Page 2 of 3

Bus Number: 1906	Date: 08/30/19
Personnel: S.R., E.D., E.L. & J.S.	
Temperature (°F): 75	Humidity (%): 64
Wind Speed (mph): Steady at 6; gust to 11	Wind Direction: SW
Barometric Pressure (inHg): 30.01	
Interior Ambient Noise Level dB(A): less than 30	Exterior Ambient Noise Level dB(A): 42.6
Microphone Height During Testing (in): 46.4	

Reading Location	Measured Sound Level dB(A)
Driver's Seat	71.1
Front Passenger Seats	71.8
Middle Passenger Seats	74.0
Rear Passenger Seats	73.4

Comments: None noted.

INTERIOR NOISE TEST DATA FORM

Test Condition 3: Audible Vibration Test

Page 3 of 3

Bus Number: 1906	Date: 09/03/19
Personnel: T.S., E.L. & M.R.	
Temperature (°F): 75	

Describe the following possible sources of noise and give the relative location on the bus.

Source of Noise	Location	Description of Noise
Engine and Accessories	N/A	N/A
Windows and Doors	None noted.	None noted.
Seats and Wheelchair lifts	None noted.	None noted.
Other	None noted.	None noted.

Comment on any other vibration or noise source which may have occurred that is not described above: None noted.
Comments: None noted.

7.1 INTERIOR NOISE TEST



**TEST BUS SET-UP FOR 80 dB(A)
INTERIOR NOISE TEST**

7.2 EXTERIOR NOISE TESTS

7.2-I. TEST OBJECTIVE

The objective of this test is to record exterior noise levels when a bus is operated under various conditions.

7.2-II. TEST DESCRIPTION

In the exterior noise tests, the bus was operated at a SLW in three different conditions using a smooth, straight and level roadway:

1. Accelerating at full throttle from a constant speed starting from 35 mph.
2. Accelerating at full throttle from standstill.
3. Stationary, with the engine at low idle, high idle, and wide-open throttle, where applicable. In addition, the bus was tested with and without the air conditioning operating.

The test site is at the Larson Transportation Institute Test Track and the test procedures were performed in accordance with SAE Standards SAE J366b, Exterior Sound Level for Heavy Trucks and Buses. The test site is an open space free of large reflecting surfaces. A noise meter placed at a specified location outside the bus was used to measure the noise level.

During the test, special attention was paid to:

1. The test site characteristics regarding parked vehicles, signboards, buildings, or other sound-reflecting surfaces
2. Proper usage of all test equipment including set-up and calibration
3. The ambient sound level

7.2-III. DISCUSSION

The Exterior Noise Test determines the noise level generated by the vehicle under different driving conditions, and at stationary with and without air conditioning and accessories operating. The test site is a large, level, bituminous paved area with no reflecting surfaces nearby.

With an outside ambient noise level of 49.2 dB(A), the average of the two highest readings obtained while accelerating from a constant speed was 70.0 dB(A) on the right side and 69.0 dB(A) on the left side.

When accelerating from a standstill with an exterior ambient noise level of 49.2 dB(A), the average of the two highest readings obtained were 68.2 dB(A) on the right side and 68.6 dB(A) on the left side.

With the vehicle stationary and the engine, accessories, and air conditioning on, the measurements averaged 50.2 dB(A). With the accessories and air conditioning off, the readings averaged 49.0 dB(A). The exterior ambient noise level measured during this test was 49.2 dB(A). This bus passed this section of the test.

EXTERIOR NOISE TEST DATA FORM

Accelerating from Constant Speed

Page 1 of 3

Bus Number: 1906		Date: 09/03/19	
Personnel: T.S., E.L. & E.D.			
Temperature (°F): 68		Humidity (%): 76	
Wind Speed (mph): 0		Wind Direction: Calm	
Barometric Pressure (inHg): 30			
Verify that microphone height is 4 feet, wind speed is less than 12 mph and ambient temperature is between 30°F and 90°F: ✓			
Initial Sound Level Meter Calibration: 94.0 dB(A)			
Exterior Ambient Noise Level: 49.2 dB(A)			
Accelerating from Constant Speed Curb (Right) Side		Accelerating from Constant Speed Street (Left) Side	
Run #	Measured Noise Level dB(A)	Run #	Measured Noise Level dB(A)
1	70.6	1	69.9
2	67.7	2	67.0
3	69.4	3	68.0
4	68.5	4	68.0
5	69.1	5	68.1
6	N/A	6	N/A
7	N/A	7	N/A
8	N/A	8	N/A
9	N/A	9	N/A
10	N/A	10	N/A
Average of two highest actual noise levels = 70.0 dB(A)		Average of two highest actual noise levels = 69.0 dB(A)	
Final Sound Level Meter Calibration Check: 94.0 dB(A)			
Comments: None noted.			

EXTERIOR NOISE TEST DATA FORM

Accelerating from Standstill

Page 2 of 3

Bus Number: 1906		Date: 09/03/19	
Personnel: E.D. & E.L.			
Temperature (°F): 73		Humidity (%): 65	
Wind Speed (mph): 0		Wind Direction: calm	
Barometric Pressure (inHg):			
Verify that microphone height is 4 feet, wind speed is less than 12 mph and ambient temperature is between 30°F and 90°F: ✓			
Initial Sound Level Meter Calibration: 94.0 dB(A)			
Exterior Ambient Noise Level: 49.2 dB(A)			
Accelerating from Standstill Curb (Right) Side		Accelerating from Standstill Street (Left) Side	
Run #	Measured Noise Level dB(A)	Run #	Measured Noise Level dB(A)
1	68.1	1	67.9
2	67.8	2	67.0
3	68.2	3	67.8
4	67.9	4	69.2
5	67.9	5	66.9
6	N/A	6	N/A
7	N/A	7	N/A
8	N/A	8	N/A
9	N/A	9	N/A
10	N/A	10	N/A
Average of two highest actual noise levels = 68.2 dB(A)		Average of two highest actual noise levels = 68.6 dB(A)	
Final Sound Level Meter Calibration Check: 94.0 dB(A)			
Comments: None noted.			

EXTERIOR NOISE TEST DATA FORM

Stationary

Page 3 of 3

Bus Number: 1906		Date: 09/03/19	
Personnel: E.D. & E.L.			
Temperature (°F): 73		Humidity (%): 65	
Wind Speed (mph): 0		Wind Direction: Calm	
Barometric Pressure (inHg): 30.10			
Initial Sound Level Meter Calibration: 94.0 dB(A)			
Exterior Ambient Noise Level: 49.2 dB(A)			
Air Conditioning ON			
Throttle Position	Engine RPM	Curb (Right) Side dB(A)	Street (Left) Side db(A)
		Measured	Measured
Low Idle	N/A	49.3	51.1
High Idle	N/A	N/A	N/A
Wide Open Throttle	N/A	N/A	N/A
Air Conditioning OFF			
Throttle Position	Engine RPM	Curb (Right) Side dB(A)	Street (Left) Side db(A)
		Measured	Measured
Low Idle	N/A	48.1	49.8
High Idle	N/A	N/A	N/A
Wide Open Throttle	N/A	N/A	N/A
Final Sound Level Meter Calibration Check: 94.0 dB(A)			
Comments: Electric bus – no high idle or full throttle			

7.2 EXTERIOR NOISE TESTS



TEST BUS UNDERGOING EXTERIOR NOISE TESTING



Depot Charging Equipment

Headquarters

1815 Rollins Road, Burlingame, CA 94010

East Coast Manufacturing

1 Whitlee Court, Greenville, SC 29607

West Coast Manufacturing

383 Cheryl Lane, City of Industry, CA 91789

www.proterra.com

RELIABLE DC FAST CHARGING FOR FLEETS

The Proterra Industrial Series charging system is designed explicitly for fleet applications.

Available in 60kW, 90kW, 120kW, 150kW and 180kW configurations.

Charge up to 4 vehicles from the same charger with automated, multi-dispenser configurations, including up to 4 single-cable dispensers or 2 dual-cable dispensers.

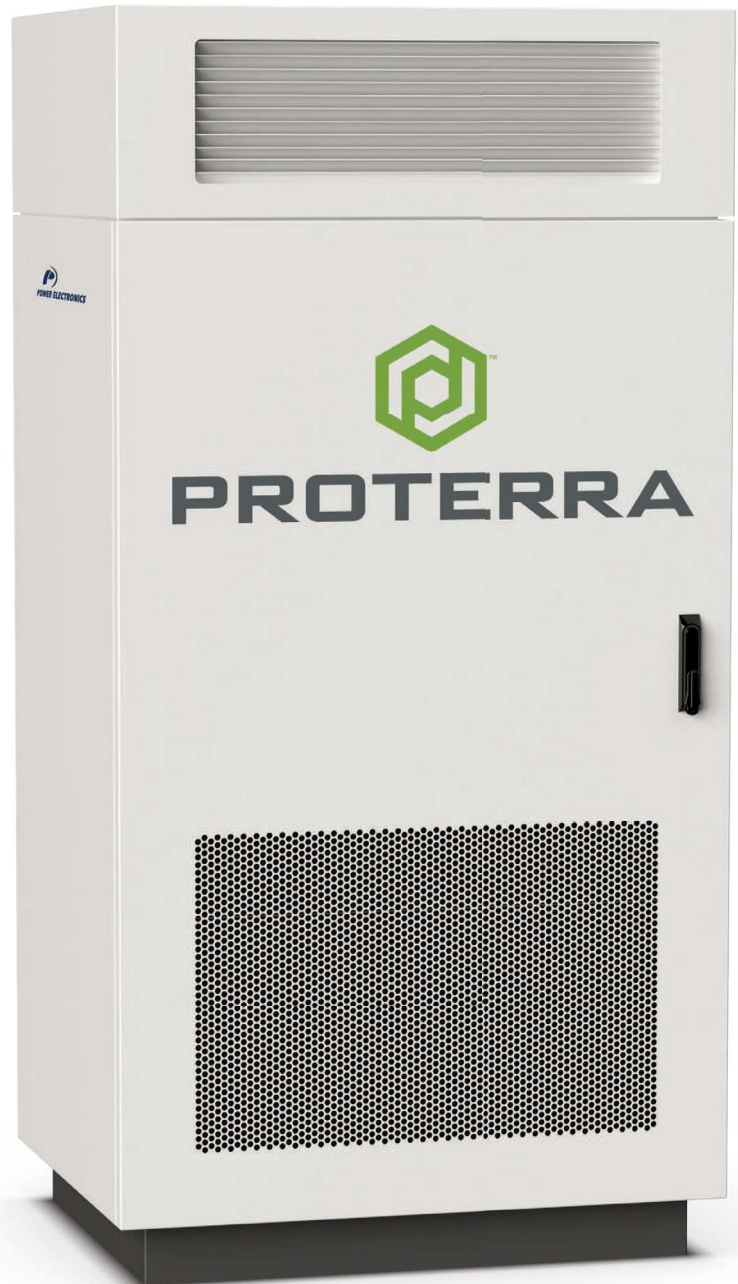
Dispensers can be sited separately (up to 500 feet away) from the charging cabinet, enabling greater flexibility in design and configuration for fleets.

Remote monitoring, intelligent diagnostics and a modular design allows for quick issue resolution and efficient field service.

Broad voltage range (up to 1000VDC) ensures compatibility with both today's and next generation electric vehicles.

- **OCPP compliant and 4G enabled**
- **Small footprint**
- **Multi-dispenser option**
- **Supports CCS1 and pantograph options**
- **3 Year Standard Warranty with extensions available**

INDUSTRIAL SERIES



Proterra charging systems are compliant with Federal DOT Buy America requirements.

MODEL	PC-060-PI	PC-090-PI	PC-120-PI	PC-150-PI	PC-180-PI
ELECTRICAL OUTPUT					
Continuous DC Output Power	60 kW	90 kW	120 kW	150 kW	180 kW
DC Output Voltage	150-1000 VDC				
Continuous DC Output Current	200 A, 500 A Pantograph (Optional)			300 A, 500 A Pantograph (Optional)	
ELECTRICAL INPUT					
AC Input Power	63 kVA	95 kVA	126 kVA	158 kVA	189 kVA
AC Input Current	76 A	114 A	152 A	190 A	227 A
AC Input Voltage	480V +/- 10%				
AC Input Topology	5-wire WYE (3ph + N + GND)				
AC Input Frequency	60 Hz				
Current THD% at full power	<3%				
Power Factor	>0.99				
Efficiency	95%				
MECHANICAL					
Cooling	Integrated air cooling				
Weight	825 lbs	880 lbs	935 lbs	990 lbs	1056 lbs
Dimensions (D x W x H)	31.2 in x 39.6 in x 79.2 in 80 cm x 100 cm x 200 cm				
Required side doork clearance	None				
Required Front and Rear Clearance	1000 mm				
ENVIRONMENTAL					
Environmental Rating	NEMA 3R				
Maximum Altitude	3000m 9800 ft (power derates above 2000m 6500 ft)				
Operating temperature	-22°F to 122°F -30°C to 50°C				
Operating Humidity	4-95%				
MISC					
Approved charger-to-vehicle interfaces	CCS1 Industrial dispenser J3105-1 Infrastructure-Down Pantograph				
Approved number of dispensers per power cabinet	Up to 2 Dual Cable Dispensers or Up to 4 Single Cable Dispensers				
Sequential Charging Capabilities	1 @ 60 kW	1 @ 90 kW	1 @ 120 kW	1 @ 150 kW	1 @ 180 kW
Simultaneous Charging Capabilities	-	-	2 @ 60 kW	-	3 @ 60 kW
Power Cabinet to dispenser or pantograph control box communications	Modbus TCP via fiber optic				
Max Distance between Power Cabinet and Dispenser	500 ft 152.4 m (fiber optics)				
Management Communications	OCPP 1.6 control via 4G Cellular (standard) Supports WiFi, Ethernet (optional)				
Certifications	UL 2231, UL 2202 (pending)				
Warranty	3 year standard, 5 year extended warranty (optional)				

PURPOSE-BUILT CHARGING HARDWARE

Compliant with SAE universal standards, the Proterra 120 kW Charging System offers plug-in charging at a higher power rate, and also has the added flexibility to be configured as an overhead charger. This charging system can charge one vehicle at a time at 120 kW or two vehicles simultaneously at 60 kW, and can be paired with up to 4 dispensers. With high power, fast charging capabilities, the Proterra 120 kW Charging System can fully charge a Proterra ZX5+ electric transit bus in less than 3 hours*.

- **Standardized and Interoperable**
- **Modular and Scalable**
- **Multi-dispenser Capable**
- **Intelligent and Automated**



*Subject to change based on operating, environmental and other conditions.



Open source
communications
protocol



Smart grid ready



Telematics-
enabled



Developed in partnership with Power Electronics, Proterra charging systems build on Proterra's experience delivering charging infrastructure while leveraging Power Electronics' 30+ years of experience in solar, energy storage, and electric mobility.

120 kW

PROTERRA® CHARGING SYSTEM

PROTERRA
ENERGY™
FLEET SOLUTIONS

ELECTRICAL OUTPUT

Continuous DC Output Power	120 kW
DC Output Voltage	150-1000 VDC
Continuous DC Output Current	160A

ELECTRICAL INPUT

AC Input Power	160 kW
AC Input Current	152A
AC Input Voltage	480V +/- 10%
AC Input Topology	5-wire WYE (3ph + N + GND)
AC Input Frequency	60 Hz
Current THD% at full power	<3%
Power Factor	>0.99
Efficiency	94%

MECHANICAL

Cooling	Integrated air cooling
Weight	1336 lb 606 kg
Dimensions (D x W x H)	27.6 in x 39.4 in x 74.8 in 70 cm x 100 cm x 190 cm
Required side and back clearance	None
Required Door Clearance	1000 mm

ENVIRONMENTAL

Environmental Rating	NEMA 3R
Maximum Altitude	3000m 9800 ft (power derates above 2000m 6500 ft)
Operating temperature	-13°F to 122°F -25°C to 50°C (standard) -22°F to 122°F -30°C to 50°C (optional)
Operating Humidity	4-95%

MISC

Approved charger-to-vehicle interfaces	CCS1 Industrial dispenser J3105-1 Infrastructure-Down Pantograph
Approved number of dispensers per power cabinet	Supports simultaneous charging with up to 2 dispensers, and sequential charging with up to 4 vehicles.
Approved number of pantograph interfaces per power cabinet	1
Power Cabinet to dispenser or pantograph control box communications	Modbus TCP via Ethernet (standard) Modbus TCP via fiber optic (optional)
Max Distance between Power Cabinet and Dispenser	300 ft 91.4 m (ethernet) 500 ft 152.4 m (fiber optics)
Management Communications	OCPP 1.6 control via 4G Cellular (standard) Supports WiFi, Ethernet (optional)
Certifications	UL 2231, UL 2202 (pending)
Warranty	3 year standard, 5 year extended warranty options available

STANDARDIZED TECHNOLOGY

Proterra® charging systems utilize industry-standard charging technology so your heavy-duty electric vehicles, utility vehicles, and cars can share the same standardized chargers.

COMPATIBLE CONNECTIONS

UNIVERSAL PLUG-IN



PANTOGRAPH



Proterra charging systems are compliant with Federal DOT Buy America requirements.



proterra.com/energy-services

PURPOSE-BUILT CHARGING HARDWARE

Compliant with SAE universal standards, the Proterra 180 kW Charging System offers plug-in charging at a higher power rate, and also has the added flexibility to be configured as an overhead charger. With high power, fast charging capabilities, the Proterra 180 kW Charging System can fully charge a Proterra ZX5+ electric transit bus in less than 3 hours*.

- **Standardized and Interoperable**
- **Modular and Scalable**
- **Multi-dispenser Capable**
- **Intelligent and Automated**



*Subject to change based on operating, environmental and other conditions.



Open source
communications
protocol



Smart grid ready



Telematics-
enabled



Developed in partnership with Power Electronics, Proterra charging systems build on Proterra's experience delivering charging infrastructure while leveraging Power Electronics' 30+ years of experience in solar, energy storage, and electric mobility.

180 kW

PROTERRA® CHARGING SYSTEM

PROTERRA
ENERGY™
FLEET SOLUTIONS

ELECTRICAL OUTPUT

Continuous DC Output Power	180 kW
DC Output Voltage	150-1000 VDC
Continuous DC Output Current	240A (May be vehicle interface limited)

ELECTRICAL INPUT

AC Input Power	189 kW
AC Input Current	232A
AC Input Voltage	480V +/- 10%
AC Input Topology	5-wire WYE (3ph + N + GND)
AC Input Frequency	60 Hz
Current THD% at full power	<3%
Power Factor	>0.99
Efficiency	94%

MECHANICAL

Cooling	Integrated air cooling
Weight	1336 lb 606 kg
Dimensions (D x W x H)	31.5 in x 59.1 in x 78.7 in 80 cm x 150 cm x 200 cm
Required side and back clearance	None
Required Door Clearance	1000 mm

ENVIRONMENTAL

Environmental Rating	NEMA 3R
Maximum Altitude	3000m 9800 ft (power derates above 2000m 6500 ft)
Operating temperature	-13°F to 122°F -25°C to 50°C (standard) -22°F to 122°F -30°C to 50°C (optional)
Operating Humidity	4-95%

MISC

Approved charger-to-vehicle interfaces	CCS1 Industrial dispenser J3105-1 Infrastructure-Down Pantograph
Approved number of dispensers per power cabinet	Supports simultaneous charging with up to 3 dispensers at 60 kW each, and sequential charging at 180 kW each with up to 4 vehicles.
Approved number of pantograph interfaces per power cabinet	3
Power Cabinet to dispenser or pantograph control box communications	Modbus TCP via Ethernet (standard) Modbus TCP via fiber optic (optional)
Max Distance between Power Cabinet and Dispenser	300 ft 91.4 m (ethernet) 500 ft 152.4 m (fiber optics)
Management Communications	OCPP 1.6 control via 4G Cellular (standard) Supports WiFi, Ethernet (optional)
Certifications	UL 2231, UL 2202 (pending)
Warranty	3 year standard, 5 year extended warranty options available

STANDARDIZED TECHNOLOGY

Proterra® charging systems utilize industry-standard charging technology so your heavy-duty electric vehicles, utility vehicles, and cars can share the same standardized chargers.

COMPATIBLE CONNECTIONS

UNIVERSAL PLUG-IN



PANTOGRAPH



Proterra charging systems are compliant with Federal DOT Buy America requirements.



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PURPOSE-BUILT CHARGING HARDWARE

Designed with large-scale electric vehicle fleets in mind, the Proterra 1.5 MW Charging System is customizable and can be configured to charge up to 40 vehicles. With high voltage capabilities, this system can connect directly to the grid and avoid the need for separate installation of a transformer, resulting in significant space savings and cost reduction.



Developed in partnership with Power Electronics, Proterra charging systems build on Proterra's experience delivering charging infrastructure while leveraging Power Electronics' 30+ years of experience in solar, energy storage, and electric mobility.



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communications
protocol



Bi-directional
V2G capability



Smart grid ready



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COMPATIBLE CONNECTIONS

UNIVERSAL PLUG-IN



PANTOGRAPH



Proterra[®] charging systems utilize industry-standard charging technology so your heavy-duty electric vehicles, utility vehicles, and cars can share the same standardized chargers.

1.5 MW

 PROTERRA®
**CHARGING
SYSTEM**
PROTERRA
ENERGY™
 FLEET SOLUTIONS

ELECTRICAL OUTPUT	1.5 MW System - 480V	1.5 MW System - MV
Charger Continuous DC Output Power	1500 kW	
DC Output Voltage	150-1000 VDC	
Continuous DC Output Current per dispenser	300A (May be vehicle interface limited)	
Continuous DC Output Current per Pantograph	1000A (May be vehicle interface limited)	
Max number of simultaneous DC outputs	20	
Continuous DC Output Power per Pantograph	up to 750 kW	
ELECTRICAL INPUT		
AC Input Power	1613 kW	
AC Input Current	2,156A	*dependent on MV value
AC Input Voltage	480V +/- 10%	4.16kV to 34.5kV
AC Input Topology	4-wire WYE (3ph + GND)	4-wire WYE (3ph + GND)
AC Input Frequency	60 Hz	
Current THD% at full power	<3%	
Power Factor	>0.99	
Efficiency	93%	
MECHANICAL		
Cooling	Integrated air cooling	
Weight	17,857 lbs 8100 kg	32,187 lbs 14,600 kg
Dimensions (D x W x H)	219.7 in x 89 in x 79.5 in 558 cm x 226 cm x 202 cm	335.4 in x 89 in x 79.5 in 852 cm x 226 cm x 202 cm
Wall Clearance (front, back)	48 in 120cm	
Wall Clearance (sides)	60 in 150 cm	63 in 160 cm
ENVIRONMENTAL		
Environmental Rating	NEMA 3R	
Maximum Altitude	3000m 9800 ft (power derates above 2000m 6500 ft)	
Operating temperature	-13°F to 122°F -25°C to 50°C (standard) -22°F to 122°F -30°C to 50°C (optional)	
Operating Humidity	4-95%	
MISC		
Approved charger-to-vehicle interfaces	CCS1 Industrial dispenser J3105-1 Infrastructure-down Pantograph	
Max number of dispensers per 1.5MW Charger	Supports simultaneous charging with 20 dispensers. Optionally supports charging up to 40 vehicles with two CCS1 cables per dispenser charging sequentially.	
Max number of pantographs per 1.5MW Charger	Supports simultaneous charging on 2 pantographs (standard) Can support 2x pantographs or 1x pantograph and up to 10 dispensers	
1.5MW Charger to dispenser or pantograph control box communications	Modbus TCP via Ethernet (standard) Modbus TCP via fiber optic (optional)	
Max Distance between 1.5MW Charger and Dispenser	300 ft 91.4 m (ethernet) 500 ft 152.4 m (fiber optics)	
V2G Capable	Yes (optional)	
Management Communications	OCPP 1.6 control via 4G Cellular (standard) Supports WiFi, Ethernet (optional)	
Certifications	UL 2231, UL 2202, UL 1741SA, IEEE 1547 (pending)	
Warranty	3 year standard, 5 year extended warranty options available	

RELIABLE DC FAST CHARGING FOR FLEETS

The Proterra Industrial dispenser is designed explicitly for fleet applications.

Charge up to 4 vehicles from the same charger with automated, multi-dispenser configurations, including up to 4 single-cable dispensers or 2 dual-cable dispensers.

Dispensers can be sited separately (up to 500 feet away) from the charging cabinet, enabling greater flexibility in design and configuration for fleets.

Remote monitoring, intelligent diagnostics and a modular design allows for quick issue resolution and efficient field service.

Broad voltage range (up to 1000VDC) ensures compatibility with both today's and next generation electric vehicles.

- **OCPP compliant and 4G enabled**
- **200A and 300A cables available**
- **Supports CCS1**
- **3 Year Standard Warranty with extensions available.**

INDUSTRIAL SERIES



Proterra charging systems are compliant with Federal DOT Buy America requirements.

MODEL	PD-200-1-PI	PD-300-1-PI
ELECTRICAL OUTPUT		
DC Output Voltage	150-1000 VDC	
Max Continuous DC Output Current	200A	300A
MECHANICAL		
Cooling	Integrated air cooling	
Weight w/o pedestal (wall mounted)	130 lbs 59 kg	
Weight with pedestal	183 lbs 83 kg	
Dimensions w/o pedestal (wall mounted) (D x W x H)	12 in x 24 in x 31.5 in 30.5 cm x 61 cm x 80 cm	
Dimensions w pedestal (D x W x H)	12 in x 24 in x 56.7 in 30.5 cm x 61 cm x 145 cm	
Required side clearance	40 in 1 m	
Required back clearance	None	
Required door Clearance	24 in 61 cm	
ENVIRONMENTAL		
Environmental Rating	NEMA 3R	
Maximum Altitude	3000m, power derates above 2000m	
Operating temperature	-22°F to 122°F -30°C to 50°C	
Operating Humidity	4-95%	
MISC		
Approved charger-to-vehicle interfaces	J1772 CCS Type 1 Universal Plug-in	
CCS Cable Lengths	18, 25 ft (optional)	
Number of CCS output cables per industrial dispenser	1 CCS1 Cable (standard) 2 CCS1 Cables (optional, sequential operation) 2 CCS1 Cables (optional, simultaneous operation)	
Approved number of dispensers per power cabinet	single dispensers or 2 double dispensers, 4 operating sequentially	
Power Cabinet to dispenser or pantograph control box communications	Modbus TCP via fiber optic	
Max Distance between Power Cabinet and Dispenser	500 ft 152.4 m (fiber optics)	
V2G Capable	Yes (optional)	
Management Communications	OCPP 1.6 control via 4G Cellular (standard) Supports WiFi, Ethernet (optional)	
User Interface	Stop session button, Emergency stop button, Status LED	
Certifications	UL 2231, UL 2202, UL 1741SA, IEEE 1547 (pending)	
Warranty	3 year standard, 5 year extended warranty options available	



On Route Charging Equipment
Note: Spec Sheets provided
are preliminary and subject to
change

PURPOSE-BUILT CHARGING HARDWARE

The Proterra 240 kW Charging System is designed for fleets requiring faster charge times, and is only available for overhead or plug-in charging. This high-power charging system is modular and allows for simplified scalability as your electric fleet grows. The Proterra 240 kW Charging System can charge a Proterra ZX5+ electric transit bus in approximately 2 hours*.

- **Standardized and Interoperable**
- **Modular and Scalable**
- **Intelligent and Automated**
- **High Reliability**



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communications
protocol



Bi-directional
V2G capability



Smart grid ready



Telematics-
enabled

*Subject to change based on operating, environmental and other conditions.



Developed in partnership with Power Electronics, Proterra charging systems build on Proterra's experience delivering charging infrastructure while leveraging Power Electronics' 30+ years of experience in solar, energy storage, and electric mobility.

240 kW

PROTERRA® CHARGING SYSTEM

PROTERRA
ENERGY™
FLEET SOLUTIONS

ELECTRICAL OUTPUT

Continuous DC Output Power	240 kW
DC Output Voltage	150-1000 VDC
Continuous DC Output Current	750A (May be vehicle interface limited)

ELECTRICAL INPUT

AC Input Power	266 kW
AC Input Current	355A
AC Input Voltage	480V +/- 10%
AC Input Topology	5-wire WYE (3ph + N + GND)
AC Input Frequency	60 Hz
Current THD% at full power	<3%
Power Factor	>0.99
Efficiency	95%

MECHANICAL

Cooling	Integrated air cooling
Weight	2094 lb 950 kg
Dimensions (D x W x H)	31.5 in x 63 in x 78.7 in 80 cm x 160 cm x 200 cm
Required side and back clearance	None
Required Door Clearance	1600 mm

ENVIRONMENTAL

Environmental Rating	NEMA 3R
Maximum Altitude	3000m 9800 ft (power derates above 2000m 6500 ft)
Operating temperature	-13°F to 122°F -25°C to 50°C (standard) -22°F to 122°F -30°C to 50°C (optional)
Operating Humidity	4-95%

MISC

Approved charger-to-vehicle interfaces	J3105-1 Infrastructure-Down Pantograph, CCS1 Industrial Dispenser
Approved number of dispensers per power cabinet	Supports simultaneous charging with up to 3 dispensers, and sequential charging with up to 6 vehicles
Approved number of pantograph interfaces per power cabinet	1
Power Cabinet to dispenser or pantograph control box communications	Modbus TCP via Ethernet (standard) Modbus TCP via fiber optic (optional)
Max Distance between Power Cabinet and Dispenser	300 ft 91.4 m (ethernet) 500 ft 152.4 m (fiber optics)
V2G Capable	Yes (optional)
Management Communications	OCPP 1.6 control via 4G Cellular (standard) Supports WiFi, Ethernet (optional)
Certifications	UL 2231, UL 2202, UL 1741SA, IEEE 1547 (pending)
Warranty	3 year standard, 5 year extended warranty options available

STANDARDIZED TECHNOLOGY

Proterra® charging systems utilize industry-standard charging technology so your heavy-duty electric vehicles, utility vehicles, and cars can share the same standardized chargers.

COMPATIBLE CONNECTIONS

UNIVERSAL PLUG-IN



PANTOGRAPH



Proterra charging systems are compliant with Federal DOT Buy America requirements.



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PURPOSE-BUILT CHARGING HARDWARE

The Proterra 480 kW Charging System is designed for fleets requiring faster charge times and is available for over-head or plug-in charging. This high-power charging system is modular and allows for simplified scalability as your electric fleet grows. Suitable for depot charging or on-route charging, the Proterra 480 kW Charging System can replenish enough energy in just 10 minutes to provide approximately 33 miles* of range for a Proterra ZX5+ transit bus, or can be configured to fully charge a ZX5+ in 2 hours*.

- **Standardized and Interoperable**
- **Modular and Scalable**
- **Intelligent and Automated**
- **High Reliability**



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Bi-directional
V2G capability



Smart grid ready



Telematics-
enabled



Developed in partnership with Power Electronics, Proterra charging systems build on Proterra's experience delivering charging infrastructure while leveraging Power Electronics' 30+ years of experience in solar, energy storage, and electric mobility.

480_{kW}

PROTERRA® CHARGING SYSTEM

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FLEET SOLUTIONS

ELECTRICAL OUTPUT

Continuous DC Output Power	500 kW
DC Output Voltage	150-1000 VDC
Continuous DC Output Current	1000A (May be vehicle interface limited)

ELECTRICAL INPUT

AC Input Power	532 kW
AC Input Current	710A
AC Input Voltage	480V +/- 10%
AC Input Topology	5-wire WYE (3ph + N + GND)
AC Input Frequency	60 Hz
Current THD% at full power	<3%
Power Factor	>0.99
Efficiency	94%

MECHANICAL

Cooling	Integrated air cooling
Weight	4188 lb 1900 kg
Dimensions (D x W x H)	31.5 in x 126 in x 78.7 in 80 cm x 320 cm x 200 cm
Required side and back clearance	None
Required Door Clearance	1600 mm

ENVIRONMENTAL

Environmental Rating	NEMA 3R
Maximum Altitude	3000m 9800 ft (power derates above 2000m 6500 ft)
Operating temperature	-13°F to 122°F -25°C to 50°C (standard) -22°F to 122°F -30°C to 50°C (optional)
Operating Humidity	4-95%

MISC

Approved charger-to-vehicle interfaces	J3105-1 Infrastructure-Down Pantograph, CCS1 Industrial Dispenser
Approved number of dispensers per power cabinet	Supports simultaneous charging with up to 6 dispensers, and sequential charging with up to 12 vehicles
Approved number of pantograph interfaces per power cabinet	1
Power Cabinet to dispenser or pantograph control box communications	Modbus TCP via Ethernet (standard) Modbus TCP via fiber optic (optional)
Max Distance between Power Cabinet and Dispenser	300 ft 91.4 m (ethernet) 500 ft 152.4 m (fiber optics)
V2G Capable	Yes (optional)
Management Communications	OCPP 1.6 control via 4G Cellular (standard) Supports WiFi, Ethernet (optional)
Certifications	UL 2231, UL 2202, UL 1741SA, IEEE 1547 (pending)
Warranty	3 year standard, 5 year extended warranty options available

STANDARDIZED TECHNOLOGY

Proterra® charging systems utilize industry-standard charging technology so your heavy-duty electric vehicles, utility vehicles, and cars can share the same standardized chargers.

COMPATIBLE CONNECTIONS

UNIVERSAL PLUG-IN



PANTOGRAPH



Proterra charging systems are compliant with Federal DOT Buy America requirements.



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Performance Reporting (TS 89.3)

Proterra's fleet management software has several options for vehicle and charger monitoring. A standard monitoring subscription is included with Proterra vehicles. This includes the ability to access information about vehicle and charger performance such as status and current activity. More advanced reporting capabilities are available at a higher subscription level to provide insights into charging sessions, energy usage, alerts and diagnostics, and operational efficiencies. If an agency is interested in advanced reporting capabilities, Proterra would be happy to provide pricing on an annual subscription basis.



Exportable Power Supply (TS 90)

Proterra has done preliminary work with our vehicles to prepare them to be capable of discharging power from the bus when it is stationary. In addition, Proterra has developed advanced vehicle-to-grid (V2G) and vehicle-to-building (V2B) capabilities with our chargers and fleet integration software to allow energy from Proterra batteries in vehicles to be accessed in the future. However, the international communications protocol standard, ISO 15118-20, that governs vehicle to grid communication for bi-directional charging/discharging of electric vehicles, has not yet been finalized. This standard, which applies to charging software within the bus, is planned to be completed in late 2021 or 2022. Proterra expects to be able to more broadly support these types of capabilities once changes in this new standard are fully incorporated. These features will be optional and not standard on the vehicle and additional pricing will apply. Proterra can work with the Agency during the contracting period to incorporate these types of features if/when the communications standard is finalized, and a timeline is available.



PROTERRA

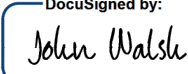
Pinellas Suncoast Transit Authority

3. Acknowledgment of Addenda

RFP 21-980369

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.:	1	Dated: 7/29/2021	Addendum No.:	5
			Date: 9/1/2021	
Addendum No.:	2	Dated: 8/5/2021	Addendum No.:	6
			Date: 9/10/2021	
Addendum No.:	3	Dated: 8/17/2021	Addendum No.:	7
			Date: 9/15/2021	
Addendum No.:	4	Dated: 8/30/2021	Addendum No.:	8
			Date: 9/20/2021	
Proposer: Proterra Operating Company, Inc. Name: Devin Ikenberry Title: Sr. Business Engagement Manager Phone: (256) 499-5696 Street address: 1815 Rollins Rd. City, state, ZIP: Burlingame, CA 94010				
<div style="display: flex; justify-content: space-between; align-items: flex-end;"> <div style="text-align: left;"> <p>DocuSigned by:</p>  <p>190E3CD36916412...</p> <p>Authorized signature</p> </div> <div style="text-align: right;"> <p>September 20, 2021</p> <p>Date</p> </div> </div>				



PROTERRA

Pinellas Suncoast Transit Authority

4. Contractor Service & Parts Support Data

CER 4. Contractor Service and Parts Support Data

Location of nearest Technical Service Representative to Agency

Name: Ian Sherman Jeremy Clemens William Bramley
 Address: Miami, FL Orlando, FL Fort Lauderdale, FL
 Telephone: (864) 438-0000

Describe technical services readily available from said representative:

Ian, Jeremy, and William will provide full technical support to ensure successful product launch and operation. They will also have access to Proterra's complete Customer Service Team as needed.

Location of nearest Parts Distribution Center to Agency:

Name: Proterra Operating Company, Inc.
 Address: 1 Whitlee Ct. Greenville, SC 29607
 Telephone: (864) 438-0000

Describe the extent of parts available at said center:

This Proterra location is where the buses for Pinellas Suncoast Transit Authority will be manufactured, and will house all parts required to maintain and support Proterra buses.

Policy for delivery of parts and components to be purchased for service and maintenance:

Regular method of shipment: UPS / FedEx ground for normal circumstances; Priority Shipping can be arranged as needed

Cost to Agency: During warranty period, all shipping is covered by Proterra. After warranty period, cost will vary based on actual shipping cost due to size, weight and shipping method



PROTERRA

Pinellas Suncoast Transit Authority

5. Form for Proposal Deviation

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: None			
Rationale (pros and cons):			



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Pinellas Suncoast Transit Authority

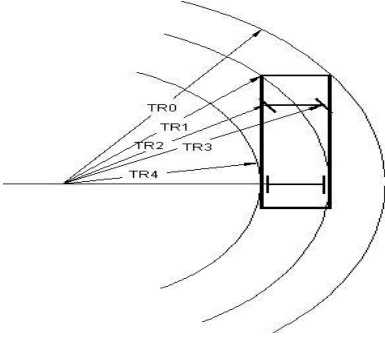
6. Vehicle Questionnaire

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:	Proterra Inc				
Bus model:	ZX5				
Understructure manufacturer:	Proterra Inc				
Model number:	ZX5+				
Size/Type of Bus	35' Transit Bus				
Basic Body Construction					
Type:	Composite Monocoque				
Tubing or frame member thickness and dimensions					
Overstructure	N/A				
Understructure	N/A				
Skin thickness and material					
Roof	1.38 inch, Composite Laminate				
Sidewall	0.94 inch, Composite Laminate				
Skirt panel	1.00 inch, Composite Laminate				
Front end	1.30 inch, Composite Laminate				
Rear end	0.90 inch, Composite Laminate				
Dimensions					
Overall length	Over bumpers	36	ft	11	in.
	Over body	35	ft	10	in.
Overall width	Over body excluding mirrors	8	ft	6	in.
	Over body including mirrors—driving position	10	ft	0	in.
	Over tires front axles	8	ft	3	in.
	Over tires center axle	N/A	ft	N/A	in.
	Over tires rear axles	8	ft	3	in.
Overall height (maximum)		10	ft	9	in.
Overall height (main roof line)		10	ft	9	in.
Angle of approach					
	9.3	deg			
Breakover angle					
	9.4	deg			
Breakover angle (rear)					
	N/A	deg			
Angle of departure					
	9.3	deg			

Doorway Dimensions										
Front			Rear							
Width between door posts	43.2	in.	49.1	in.						
Door width between panels	33.2	in.	49.1	in.						
Clear door width	33.2	in.	39	in.						
Doorway height	75	in.	75	in.						
Knuckle clearance	1.625	in.	1.625	in.						
Step height from ground measured at center of doorway										
		Front doorway, empty			Ramp angle			Rear Doorway, empty		
Kneeled	a.	13	in.	R1	10	deg	a.	14.4	in.	
Unkneeled	b.	15.7	in.	R2	15	deg	b.	17.1	in.	
Interior head room (center of aisle)										
Front axle location	90	in.								
Center axle location	N/A	in.								
Rear axle location	75	in.								
Aisle width between transverse seats										
		25.8	in.							
Floor height above ground (centerline of bus)										
At front door	17.1	in.								
At front axle	18.1	in.								
At drive axle	34.1	in.								
At rear door	18.1	in.								
Minimum ground clearance (between bus and ground, with bus unkneeled)										
Excluding axles	9	in.								
Including axles	6	in.								

Horizontal turning envelope (see diagram below)											
Outside body turning radius, TR0 (including bumper)				38	ft	7.2	in.				
Front inner corner radius, TR1				33	ft	8.4	in.				
Front wheel inner turning radius, TR2				27	ft	0	in.				
Front wheel outer turning radius, TR3				33	ft	3.6	in.				
Inside Body Turning Radius innermost point, TR4 (including bumper)				17	ft	9.6	in.				
											
Wheel base											
Front	20.2	ft.									
Rear	N/A	ft.									
Overhang, centerline of axle over bumper											
Front	8.58	in.									
Rear	7.9	in.									
Floor											
Interior length			32	ft	0	in.					
Interior width (excluding coving)			7	ft	9	in.					
Total standee area (approximately)			33.4	sq ft							
Minimum distance between wheelhouses:			Front		35.3	in.					
			Rear		23.6	in.					
			Center		N/A	in.					
Maximum interior floor slope (from horizontal)			1.5	deg							
Passenger capacity provided											
Total maximum seating		29									
Standee capacity		22									
Minimum hip to knee room		26	in.								
Minimum foot room		14	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	0	6,680	6,680	13,360	N/A	N/A	N/A	8,625	8,625	17,250	30,610
Fully seated, full fuel and farebox	30	7,467	7,468	14,935	N/A	N/A	N/A	10,087	10,088	20,175	35,110
Fully loaded standee and fully seated, full fuel and farebox	52	8,292	8,293	16,585	N/A	N/A	N/A	10,912	10,913	21,825	38,410
Crush load (1.5x fully loaded)	78	9,267	9,268	18,535	N/A	N/A	N/A	11,887	11,888	23,775	42,310
GVWR	-	-	-	-	N/A	N/A	N/A	-	-	-	43,650
GAWR	-	-	-	18,078	N/A	N/A	N/A	-	-	28,660	

Energy Storage

Batteries – low voltage

Manufacturer	X2Power		
Type	Group 31 AGM		
Model number	SLI31AGMDPM		
Cold Cranking Amps	1150	Amps	

Cranking Amps	-	Amps
Reserve Capacity	-	Amps

Batteries – high voltage

Manufacturer	Proterra
Type	Lithium Ion
Model Number	Proterra HV Pack
Total Battery Capacity (kWh)	452
Standard Charge Time	2 hrs (overhead), 2.9 hrs (plug-in)
Charging Capacity	TBD
Operating Temperature Range	-4 to 131 deg F
Cooling/Heating System	Valeo

Performance

Fuel Economy (w/full passenger load, HVAC, and all electric accessories in use)	**	kWh	<i>**Please refer to simulation report (SIM-R2021-038A-PSTA)</i>
Fuel Economy (w/full passenger load, HVAC, and all electric accessories in use)	**	MPGE	<i>**Please refer to simulation report (SIM-R2021-038A-PSTA)</i>
Max Gradeability	34	%	
Top Speed	65	MPH	
Battery Range	**	Miles	<i>**Please refer to simulation report (SIM-R2021-038A-PSTA)</i>
Acceleration (20 MPH)	7.3	Seconds	
Acceleration (40 MPH)	22.7	Seconds	
Top Speed (stated above)	62.9	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

*****Please refer to simulation report (SIM-R2021-038A-PSTA) for performance graphs***

Traction Motor/Drive Motor

Manufacturer	Parker				
Type	GVM310				
Speeds	6,000 RPM max				
Traction motor horsepower rating	N/A				
Type ventilation/cooling	Glycol/water 50/50%				
Gear ratios	Forward:	Competition Sensitive	Reverse:	Competition Sensitive	

Voltage Equalizer

Manufacturer	Vanner
Model	70-60 CAN

Auxiliary Inverter (120/240)

Manufacturer	Lenze
Model	EMDDAG23003303U00000
Inverter Technology	TBD
Output Voltage	220 V

Traction/Drive Motor			
Manufacturer	Parker		
Type	Brushless, permanent magnet synchronous motor		
Model	GVM310		
Quantity	1		
Torque Rating	850 N-m @ 3000 rpm		
kWh Rating	240 kW @ 3000 rpm		
Air compressor			
Manufacturer	Hydrovane		
Type	Rotary Vane		
Rated capacity	8.96	CFM	
Capacity at idle (approximately)	N/A	CFM	
Capacity at maximum speed (engine)	N/A	CFM	
Maximum warranted speed	2800	rpm	
Speed idle	Electric	rpm	
Drive type	N/A		
Governor:			
Cut-in pressure	110	psi	
Cut-out pressure	130	psi	
Axles			
First			
Manufacturer	ZF		
Type	Independent, double A-arm		
Model number	RL-82EC		
Gross axle weight rating	18,078	lb	
Axle load	17,067	lb	
Second			
Manufacturer	ZF		
Type	Drop Portal		
Model number	AV-133/90		
Gross axle weight rating	28,660	lb	
Axle load	22,135	lb	
Third			
Manufacturer	N/A		
Type	N/A		
Model number	N/A		
Gross axle weight rating	N/A	lb	

Axle load	N/A	lb
Axle ratio	TBD	
Suspension system		
Manufacturer	ZF	
Type:	First:	Heavy-duty Independent Front Suspension (IFS), Model RL-82EC
	Second:	H-Frame Beam Rear, Model AV-133/90
	Third:	N/A
Springs:	First:	Firestone, Model 1T1SL-4
	Second:	Firestone, Model 1T1SL-4
	Third:	N/A
Joint		
Manufacturer	N/A	
Type	N/A	
Model number	N/A	
Wheels and tires		
Wheels		
Make	Alcoa	
Size	22.5 x 9"	
Capacity	9,090 lbs	
Material	Aluminum	
Tires		
Manufacturer	TBD	
Type	Leased	
Size	Leased	
Load range/air pressure	TBD	psi
Steering, power		
Pump		
Manufacturer and model number	Eaton, Vickers V10	
Type	Hydraulic Vane Pump	
Relief pressure	2100	psi
Booster/gear box		
Manufacturer and model number	TRW, TAS85153A	
Type	Fully integral, recirculating ball	
Ratio	21:1	
Power steering fluid capacity		
Power steering fluid capacity	2	gal
Maximum effort at steering wheel	20	lb (unloaded stationary coach on dry asphalt pavement)
Steering wheel diameter	18	in.

Brakes			
Make of fundamental brake system		Knorr-Bremse	
Brake chambers vendor size and part number:		First:	Type 24
		Second:	Type 24/24
		Third:	N/A
Brake operation effort	75 lbs		
Slack adjuster's vendor's type and part numbers			
First:	Right:	N/A	
	Left:	N/A	
Second:	Right:	N/A	
	Left:	N/A	
Third:	Right:	N/A	
	Left:	N/A	
Length:	First take-up:	N/A	
	Second take-up:	N/A	
	Third take-up:	N/A	
Brake _____ Drums <input checked="" type="checkbox"/> Discs (Place X denoting type)			
First:	Manufacturer	Knorr-Bremse	
	Part number	0501.316.953	
	Diameter	17	in.
Second:	Manufacturer	Knorr-Bremse	
	Part number	0501.316.953	
	Diameter	17	in.
Third:	Manufacturer	N/A	
	Part number	N/A	
	Diameter	N/A	in.
Brake lining/pad manufacturer		MAT Holdings	
Type		Premium Long Life	
Brake lining/pad identification			
First:	Forward	MAT 6900	
	Reverse	MAT 6900	
Second:	Forward	MAT 6900	
	Reverse	MAT 6900	
Third:	Forward	N/A	
	Reverse	N/A	
Brake linings per shoe			

First	N/A				
Second	N/A				
Third	N/A				
Brake lining widths					
First	3.23	in.			
Second	3.23	in.			
Third	N/A	in.			
Brake lining/pad lengths					
First	4.72	in.			
Second	4.72	in.			
Third	N/A	in.			
Brake lining thickness/pad					
Brake lining thickness/pad		0.83	in.		
Brake lining/pad per axle					
First	61	sq. in.			
Second	61	sq. in.			
Third	N/A	sq. in.			
Cooling system					
Radiator					
Manufacturer		Modine			
Type		Liquid to air heat exchanger			
Model number		1A021657000			
Number of tubes		88			
Tubes outer diameter		0.75	in./	N/A	in.
Fins per inch		88	fins		
Fin thickness		0.004	in.		
Total cooling and heating system capacity			*	gal *12 gal in power electronics loop; 13 gal in battery loop	
Radiator fan speed control		Electric			
Surge tank capacity		14.8	qt		
Thermostat temperature setting:		Initial opening (fully closed)		N/A	°F
		Fully open		N/A	°F
Overheat alarm temperature sending unit setting			320	°F	
Shutdown temperature setting		221	°F		
Air reservoir capacity					
Supply reservoir		18.30	cu in.		
Primary reservoir		1,848	cu in.		
Secondary reservoir		1,848	cu in.		

Packing reservoir	577.5	cu in.
Accessory reservoir	2x 1,848	cu in.
Other reservoir type	N/A	cu in.
Heating, ventilation and air conditioning equipment		
Heating system capacity	68,000	BTU/hr
Air conditioning capacity	102,000	BTU
Ventilating capacity	4,000*	CFM *(recirc, 10% of which is fresh air option)
Compressor		
Manufacturer	Sanyo	
Model	C-SWS225H00A	
Number of cylinders	N/A	
Drive ratio	Direct	
Maximum warranted speed	5,400	rpm
Operating speed	5,400	rpm (recommended)
Weight	99	lb
Oil capacity	Dry	0.42 gal
	Wet	TBD gal
Refrigerant:	Type	R407C lb
Condenser		
Manufacturer	Kayer	
Model	TBD	
Number of fins/in.	14	
Outer diameter of tube	3/8	in.
Fin thickness	0.008	in.
Condenser fan		
Manufacturer	Spal	
Model	TBD	
Fan diameter	12	in.
Speed maximum	4100	rpm
Flow rate (maximum)	2200	CFM
Receiver		
Manufacturer	Valeo Supply	
Model	TBD	
Capacity	0.5 approx.	lb
Condenser fan drive motors		
Manufacturer	Spal	

Model	TBD		
Type	Centrifugal		
Horsepower	2	hp	
Operating speed	TBD	rpm	
Evaporator fan drive motors			
Manufacturer	Spal		
Model	TBD		
Type	Centrifugal		
Horsepower	2	hp	
Operating speed	TBD	rpm	
Evaporator(s)			
Manufacturer	Kayer		
Model	TBD		
Number of rows	4		
Number of fins/in.	14		
Outer diameter of tube	3/8	in.	
Fin thickness	0.008	in.	
Number of evaporators	2		
Expansion valve			
Manufacturer	Danfoss		
Model	TBD		
Filter-drier			
Manufacturer	Valeo, integrated with receiver		
Model	TBD		
Heater cores			
Manufacturer	PTC Heater		
Model	TBD		
Capacity	68,000	Btu/hr	
Number of rows	N/A		
Number of fins/in.	N/A		
Outer diameter of tube	N/A	in.	
Fin thickness	N/A	in.	
Number of heater cores	N/A		
Floor heater blowers			
Front	N/A		
Rear	N/A		

Controls			
Manufacturer	Valeo		
Model	SC600, CAN Controlled		
Driver's heater			
Manufacturer	TBD		
Model	TBD		
Capacity	TBD	Btu/hr	
Ventilation system			
Type	In HVAC		
Coolant heater			
Make	TBD		
Model	TBD		
Capacity	TBD	Btu	
Interior lighting			
Manufacturer	Pretoria		
Type	LED		
Number of fixtures	N/A	Lights are built into the overhead system with covers)	
Size of fixtures	N/A		
Power pack	TBD		
Doors			
Front			
Manufacturer of operating equipment		Ventura	
Type of door		In-swinging	
Type of operating equipment		Pneumatic	
Rear			
Manufacturer of operating equipment		Ventura	
Type of door		In-swinging	
Type of operating equipment		Pneumatic	
Passenger windows			
Front			
Manufacturer	Arow		
Model	Storm-Tite		
Type	Flush-mount, Fixed		
Number:	Side	13	

	Rear	1			
Sizes:	(13) 46" x 39"		(1) 50.45" x 20.32"		
Glazing:	Type	Tempered			
	Thickness	5 mm			
	Color of tint	Gray			
	Light transmission	13%			
Mirrors					
	Size	Type	Manufacturer	Part no.	Model no.
Right side exterior	9 x 13"	Cast Steel	SafeFleet	M15CS001-TS	M15CS001-TS
Left side exterior	9 x 13"	Cast Steel	SafeFleet	PR01024-TS	PR01024-TS
Center rearview	16" x 8-14"	Flat	Hadley	A1706-1	A1706-1
Front entrance area	N/A	N/A	N/A	N/A	N/A
Upper-right corner	Ø 8.5"	Flat	Hadley	A1708NF	A1708NF
Rear exit area	Ø 12"	Convex	Hadley	A1712NF-1	A1712NF-1
Seats					
Passenger					
Manufacturer	USSC				
Model	Gemini				
Type	Cantilever				
Operator					
Manufacturer	Recaro				
Model and part number	Ergo Metro M384				
Type	Pneumatic Suspension				
Paint					
Manufacturer	TBD				
Type	TBD				
Wheelchair ramp equipment					
Manufacturer	Lift-U				
Model number	LU18				
Capacity	1,000	lb			
Width of platform	30	in.			
Length of platform	48	in.			
System fluid capacity	N/A	qt			
Type of fluid used	N/A				
Operating hydraulic pressure	N/A	psi			
Hydraulic cylinders:	Size	N/A			

	Number	N/A	
Wheelchair securement equipment			
Manufacturer	Q'Straint		
Model number	4pt - Floor Mounted		
Destination signs			
Manufacturer	Luminator		
Type	Smart Series III		
Character length			
Front destination	160	in.	
Front route	N/A	in.	
Curbside destination	112	in.	
Rear route	48	in.	
Character height			
Front destination	16	in.	
Front route	N/A	in.	
Curbside destination	14	in.	
Rear route	16	in.	
Number of characters			
Front destination	TBD		
Front route	TBD		
Curbside destination	TBD		
Rear route	TBD		
Message width			
Front destination	16 x 160"	in.	
Front route	N/A	in.	
Curbside destination	14 x 112"	in.	
Rear route	16 x 48"	in.	
Electrical			
Multiplex system			
Manufacturer	Continental		
Model number	ZR32-B		
Batteries			
Manufacturer	X2Power		
Model number	SLI31AGMDPM		

Type	Group 31 AGM		
Communication system			
GPS			
Manufacturer	TBD		
Model number	TBD		
PA system			
	Manufacturer	Model number	Number
Amplifier	TBD	TBD	TBD
Microphone	TBD	TBD	TBD
Internal speakers	TBD	TBD	TBD
External speaker	TBD	TBD	TBD
Energy storage			
Type	Lithium Ion		
Number of cells	3.6	V	
Battery pack voltage	648	V	
Weight	1587*	lb	*weight per pack
Security camera system			
Manufacturer	TBD		
Model number	TBD		
Number of cameras	TBD		
Storage capacity	TBD		
Bike racks			
Manufacturer	TBD		
Model number	TBD		
Fire detection system			
Manufacturer	Amerex		
Model number	V25		
Fire detectors	350F Detection Sensors		
Type (thermal or optical)	Thermal		
Number of detectors	4		
Automatic voice annunciator system			
Manufacturer	TBD		
Model and part number	TBD		

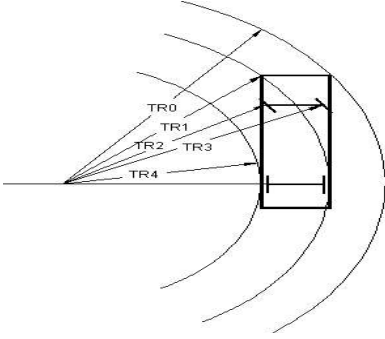
Annunciator LED sign			
Number of signs	TBD		
Housing dimensions	TBD		
Character length	TBD	in.	
Character height	TBD	in.	
Character width	TBD	in.	
GPS antenna			
Manufacturer	TBD		
Model and part number	TBD		
Automatic passenger counter			
Manufacturer	TBD		
Model and part number	a.	TBD	
	b.	TBD	
	c.	TBD	
Sensor type	TBD		
Real-time bus arrival prediction system			
	Manufacturer		Model number
Router	TBD		TBD
Cellular modem	TBD		TBD
Charge protection	TBD		TBD
<p>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.</p>			

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:	Proterra Inc				
Bus model:	ZX5				
Understructure manufacturer:	Proterra Inc				
Model number:	ZX5+				
Size/Type of Bus	40' Transit Bus				
Basic Body Construction					
Type:	Composite Monocoque				
Tubing or frame member thickness and dimensions					
Overstructure	N/A				
Understructure	N/A				
Skin thickness and material					
Roof	1.38 inch, Composite Laminate				
Sidewall	0.94 inch, Composite Laminate				
Skirt panel	1.00 inch, Composite Laminate				
Front end	1.30 inch, Composite Laminate				
Rear end	0.90 inch, Composite Laminate				
Dimensions					
Overall length	Over bumpers	42	ft	6	in.
	Over body	41	ft	5	in.
Overall width	Over body excluding mirrors	8	ft	6	in.
	Over body including mirrors—driving position	9	ft	8	in.
	Over tires front axles	6	ft	3	in.
	Over tires center axle	N/A	ft	N/A	in.
	Over tires rear axles	6	ft	3	in.
Overall height (maximum)					
		10	ft	9	in.
Overall height (main roof line)					
		10	ft	9	in.
Angle of approach					
	9.3	deg			
Breakover angle					
	7.8	deg			
Breakover angle (rear)					
	N/A	deg			
Angle of departure					
	9.3	deg			

Doorway Dimensions									
	Front				Rear				
Width between door posts	43.2	in.		49.1	in.				
Door width between panels	33.2	in.		49.1	in.				
Clear door width	33.2	in.		39	in.				
Doorway height	75	in.		75	in.				
Knuckle clearance	1.625	in.		1.625	in.				
Step height from ground measured at center of doorway									
	Front doorway, empty			Ramp angle			Rear Doorway, empty		
Kneeled	a.	13	in.	R1	10	deg	a.	14.4	in.
Unkneeled	b.	15.7	in.	R2	15	deg	b.	17.1	in.
Interior head room (center of aisle)									
Front axle location	90	in.							
Center axle location	N/A	in.							
Rear axle location	75	in.							
Aisle width between transverse seats									
	25.8	in.							
Floor height above ground (centerline of bus)									
At front door	17.1	in.							
At front axle	18.1	in.							
At drive axle	34.1	in.							
At rear door	18.1	in.							
Minimum ground clearance (between bus and ground, with bus unkneeled)									
Excluding axles	9	in.							
Including axles	6	in.							

Horizontal turning envelope (see diagram below)											
Outside body turning radius, TR0 (including bumper)				42	ft	0	in.				
Front inner corner radius, TR1				37	ft	2.4	in.				
Front wheel inner turning radius, TR2				36	ft	2.4	in.				
Front wheel outer turning radius, TR3				30	ft	2.4	in.				
Inside Body Turning Radius innermost point, TR4 (including bumper)				17	ft	9.6	in.				
											
Wheel base											
Front	24.7	ft.									
Rear	N/A	ft.									
Overhang, centerline of axle over bumper											
Front	8.58	in.									
Rear	9.25	in.									
Floor											
Interior length			32	ft	6	in.					
Interior width (excluding coving)			7	ft	8	in.					
Total standee area (approximately)			47.3	sq ft							
Minimum distance between wheelhouses:			Front		35.3	in.					
			Rear		23.6	in.					
			Center		N/A	in.					
Maximum interior floor slope (from horizontal)			1.5	deg							
Passenger capacity provided											
Total maximum seating		40									
Standee capacity		30									
Minimum hip to knee room		26	in.								
Minimum foot room		14	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	0	6,981	6,981	13,962	N/A	N/A	N/A	8,195	8,195	16,390	30,352
Fully seated, full fuel and farebox	41	7,903	7,904	15,807	N/A	N/A	N/A	10,347	10,348	20,695	36,502
Fully loaded standee and fully seated, full fuel and farebox	71	9,028	9,029	18,057	N/A	N/A	N/A	11,472	11,473	22,945	41,002
Crush load (1.5x fully loaded)	106	10,341	10,341	20,682	N/A	N/A	N/A	12,785	12,785	25,570	46,252
GVWR	-	-	-	-	N/A	N/A	N/A	-	-	-	43,650
GAWR	-	-	-	18,078	N/A	N/A	N/A	-	-	28,660	

Energy Storage

Batteries – low voltage

Manufacturer	X2Power		
Type	Group 31 AGM		
Model number	SLI31AGMDPM		
Cold Cranking Amps	1150	Amps	

Cranking Amps	-	Amps
Reserve Capacity	-	Amps

Batteries – high voltage

Manufacturer	Proterra
Type	Lithium Ion
Model Number	Proterra HV Pack
Total Battery Capacity (kWh)	452
Standard Charge Time	2 hrs (overhead), 2.9 hrs (plug-in)
Charging Capacity	TBD
Operating Temperature Range	-4 to 131 deg F
Cooling/Heating System	Valeo

Performance

Fuel Economy (w/full passenger load, HVAC, and all electric accessories in use)	**	kWh	<i>**Please refer to simulation report (SIM-R2021-037A-PSTA)</i>
Fuel Economy (w/full passenger load, HVAC, and all electric accessories in use)	**	MPGE	<i>**Please refer to simulation report (SIM-R2021-037A-PSTA)</i>
Max Gradeability	35	%	
Top Speed	65	MPH	
Battery Range	**	Miles	<i>**Please refer to simulation report (SIM-R2021-037A-PSTA)</i>
Acceleration (20 MPH)	7.4	Seconds	
Acceleration (40 MPH)	23.4	Seconds	
Top Speed (stated above)	65.6	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

*****Please refer to simulation report (SIM-R2021-037A-PSTA) for performance graphs***

Traction Motor/Drive Motor

Manufacturer	Parker				
Type	GVM310				
Speeds	6,000 RPM max				
Traction motor horsepower rating	N/A				
Type ventilation/cooling	Glycol/water 50/50%				
Gear ratios	Forward:	Competition Sensitive	Reverse:	Competition Sensitive	

Voltage Equalizer

Manufacturer	Vanner
Model	70-60 CAN

Auxiliary Inverter (120/240)

Manufacturer	Lenze
Model	EMDDAG23003303U00000
Inverter Technology	TBD
Output Voltage	220 V

Traction/Drive Motor			
Manufacturer	Parker		
Type	Brushless, permanent magnet synchronous motor		
Model	GVM310		
Quantity	1		
Torque Rating	850 N-m @ 3000 rpm		
kWh Rating	240 kW @ 3000 rpm		
Air compressor			
Manufacturer	Hydrovane		
Type	Rotary Vane		
Rated capacity	8.96	CFM	
Capacity at idle (approximately)	N/A	CFM	
Capacity at maximum speed (engine)	N/A	CFM	
Maximum warranted speed	2800	rpm	
Speed idle	Electric	rpm	
Drive type	N/A		
Governor:			
Cut-in pressure	110	psi	
Cut-out pressure	130	psi	
Axles			
First			
Manufacturer	ZF		
Type	Independent, double A-arm		
Model number	RL-82EC		
Gross axle weight rating	18,078	lb	
Axle load	17,067	lb	
Second			
Manufacturer	ZF		
Type	Drop Portal		
Model number	AV-133/90		
Gross axle weight rating	28,660	lb	
Axle load	22,135	lb	
Third			
Manufacturer	N/A		
Type	N/A		
Model number	N/A		
Gross axle weight rating	N/A	lb	

Axle load	N/A	lb
Axle ratio	TBD	
Suspension system		
Manufacturer	ZF	
Type:	First:	Heavy-duty Independent Front Suspension (IFS), Model RL-82EC
	Second:	H-Frame Beam Rear, Model AV-133/90
	Third:	N/A
Springs:	First:	Firestone, Model 1T1SL-4
	Second:	Firestone, Model 1T1SL-4
	Third:	N/A
Joint		
Manufacturer	N/A	
Type	N/A	
Model number	N/A	
Wheels and tires		
Wheels		
Make	Alcoa	
Size	22.5 x 9"	
Capacity	9,090 lbs	
Material	Aluminum	
Tires		
Manufacturer	TBD	
Type	Leased	
Size	Leased	
Load range/air pressure	TBD	psi
Steering, power		
Pump		
Manufacturer and model number	Eaton, Vickers V10	
Type	Hydraulic Vane Pump	
Relief pressure	2100	psi
Booster/gear box		
Manufacturer and model number	TRW, TAS85153A	
Type	Fully integral, recirculating ball	
Ratio	21:1	
Power steering fluid capacity	2	gal
Maximum effort at steering wheel	20	lb (unloaded stationary coach on dry asphalt pavement)
Steering wheel diameter	18	in.

Brakes			
Make of fundamental brake system		Knorr-Bremse	
Brake chambers vendor size and part number:		First:	Type 24
		Second:	Type 24/24
		Third:	N/A
Brake operation effort	75 lbs		
Slack adjuster's vendor's type and part numbers			
First:	Right:	N/A	
	Left:	N/A	
Second:	Right:	N/A	
	Left:	N/A	
Third:	Right:	N/A	
	Left:	N/A	
Length:	First take-up:	N/A	
	Second take-up:	N/A	
	Third take-up:	N/A	
Brake _____ Drums <input checked="" type="checkbox"/> Discs (Place X denoting type)			
First:	Manufacturer	Knorr-Bremse	
	Part number	0501.316.953	
	Diameter	17	in.
Second:	Manufacturer	Knorr-Bremse	
	Part number	0501.316.953	
	Diameter	17	in.
Third:	Manufacturer	N/A	
	Part number	N/A	
	Diameter	N/A	in.
Brake lining/pad manufacturer		MAT Holdings	
Type		Premium Long Life	
Brake lining/pad identification			
First:	Forward	MAT 6900	
	Reverse	MAT 6900	
Second:	Forward	MAT 6900	
	Reverse	MAT 6900	
Third:	Forward	N/A	
	Reverse	N/A	
Brake linings per shoe			

First	N/A				
Second	N/A				
Third	N/A				
Brake lining widths					
First	3.23	in.			
Second	3.23	in.			
Third	N/A	in.			
Brake lining/pad lengths					
First	4.72	in.			
Second	4.72	in.			
Third	N/A	in.			
Brake lining thickness/pad		0.83	in.		
Brake lining/pad per axle					
First	61	sq. in.			
Second	61	sq. in.			
Third	N/A	sq. in.			
Cooling system					
Radiator					
Manufacturer	Modine				
Type	Liquid to air heat exchanger				
Model number	1A021657000				
Number of tubes	88				
Tubes outer diameter	0.75	in./	N/A	in.	
Fins per inch	88	fins			
Fin thickness	0.004	in.			
Total cooling and heating system capacity		*	gal *12 gal in power electronics loop; 13 gal in battery loop		
Radiator fan speed control	Electric				
Surge tank capacity	14.8	qt			
Thermostat temperature setting:		Initial opening (fully closed)		N/A	°F
		Fully open		N/A	°F
Overheat alarm temperature sending unit setting		320	°F		
Shutdown temperature setting		221	°F		
Air reservoir capacity					
Supply reservoir	18.30	cu in.			
Primary reservoir	1,848	cu in.			
Secondary reservoir	1,848	cu in.			

Packing reservoir	577.5	cu in.
Accessory reservoir	2x 1,848	cu in.
Other reservoir type	N/A	cu in.
Heating, ventilation and air conditioning equipment		
Heating system capacity	68,000	BTU/hr
Air conditioning capacity	102,000	BTU
Ventilating capacity	4,000*	CFM *(recirc, 10% of which is fresh air option)
Compressor		
Manufacturer	Sanyo	
Model	C-SWS225H00A	
Number of cylinders	N/A	
Drive ratio	Direct	
Maximum warranted speed	5,400	rpm
Operating speed	5,400	rpm (recommended)
Weight	99	lb
Oil capacity	Dry	0.42 gal
	Wet	TBD gal
Refrigerant:	Type	R407C - lb
Condenser		
Manufacturer	Kayer	
Model	TBD	
Number of fins/in.	14	
Outer diameter of tube	3/8	in.
Fin thickness	0.008	in.
Condenser fan		
Manufacturer	Spal	
Model	TBD	
Fan diameter	12	in.
Speed maximum	4100	rpm
Flow rate (maximum)	2200	CFM
Receiver		
Manufacturer	Valeo Supply	
Model	TBD	
Capacity	0.5 approx.	lb
Condenser fan drive motors		
Manufacturer	Spal	

Model	TBD		
Type	Centrifugal		
Horsepower	2	hp	
Operating speed	TBD	rpm	
Evaporator fan drive motors			
Manufacturer	Spal		
Model	TBD		
Type	Centrifugal		
Horsepower	2	hp	
Operating speed	TBD	rpm	
Evaporator(s)			
Manufacturer	Kayer		
Model	TBD		
Number of rows	4		
Number of fins/in.	14		
Outer diameter of tube	3/8	in.	
Fin thickness	0.008	in.	
Number of evaporators	2		
Expansion valve			
Manufacturer	Danfoss		
Model	TBD		
Filter-drier			
Manufacturer	Valeo, integrated with receiver		
Model	TBD		
Heater cores			
Manufacturer	PTC Heater		
Model	TBD		
Capacity	68,000	Btu/hr	
Number of rows	N/A		
Number of fins/in.	N/A		
Outer diameter of tube	N/A	in.	
Fin thickness	N/A	in.	
Number of heater cores	N/A		
Floor heater blowers			
Front	N/A		
Rear	N/A		

Controls			
Manufacturer	Valeo		
Model	SC600, CAN Controlled		
Driver's heater			
Manufacturer	TBD		
Model	TBD		
Capacity	TBD	Btu/hr	
Ventilation system			
Type	In HVAC		
Coolant heater			
Make	TBD		
Model	TBD		
Capacity	TBD	Btu	
Interior lighting			
Manufacturer	Pretoria		
Type	LED		
Number of fixtures	N/A	Lights are built into the overhead system with covers)	
Size of fixtures	N/A		
Power pack	TBD		
Doors			
Front			
Manufacturer of operating equipment		Ventura	
Type of door		In-swinging	
Type of operating equipment		Pneumatic	
Rear			
Manufacturer of operating equipment		Ventura	
Type of door		In-swinging	
Type of operating equipment		Pneumatic	
Passenger windows			
Front			
Manufacturer	Arow		
Model	Storm-Tite		
Type	Flush-mount, Fixed		
Number:	Side	13	

	Rear	1			
Sizes:	(13) 46" x 39"		(1) 50.45" x 20.32"		
Glazing:	Type	Tempered			
	Thickness	5 mm			
	Color of tint	Gray			
	Light transmission	13%			
Mirrors					
	Size	Type	Manufacturer	Part no.	Model no.
Right side exterior	9 x 13"	Cast Steel	SafeFleet	M15CS001-TS	M15CS001-TS
Left side exterior	9 x 13"	Cast Steel	SafeFleet	PR01024-TS	PR01024-TS
Center rearview	16" x 8-14"	Flat	Hadley	A1706-1	A1706-1
Front entrance area	N/A	N/A	N/A	N/A	N/A
Upper-right corner	Ø 8.5"	Flat	Hadley	A1708NF	A1708NF
Rear exit area	Ø 12"	Convex	Hadley	A1712NF-1	A1712NF-1
Seats					
Passenger					
Manufacturer	USSC				
Model	Gemini				
Type	Cantilever				
Operator					
Manufacturer	Recaro				
Model and part number	Ergo Metro M384				
Type	Pneumatic Suspension				
Paint					
Manufacturer	TBD				
Type	TBD				
Wheelchair ramp equipment					
Manufacturer	Lift-U				
Model number	LU18				
Capacity	1,000	lb			
Width of platform	30	in.			
Length of platform	48	in.			
System fluid capacity	N/A	qt			
Type of fluid used	N/A				
Operating hydraulic pressure	N/A	psi			
Hydraulic cylinders:	Size	N/A			

	Number	N/A	
Wheelchair securement equipment			
Manufacturer	Q'Straint		
Model number	4pt - Floor Mounted		
Destination signs			
Manufacturer	Luminator		
Type	Smart Series III		
Character length			
Front destination	160	in.	
Front route	N/A	in.	
Curbside destination	112	in.	
Rear route	48	in.	
Character height			
Front destination	16	in.	
Front route	N/A	in.	
Curbside destination	14	in.	
Rear route	16	in.	
Number of characters			
Front destination	TBD		
Front route	TBD		
Curbside destination	TBD		
Rear route	TBD		
Message width			
Front destination	16 x 160"	in.	
Front route	N/A	in.	
Curbside destination	14 x 112"	in.	
Rear route	16 x 48"	in.	
Electrical			
Multiplex system			
Manufacturer	Continental		
Model number	ZR32-B		
Batteries			
Manufacturer	X2Power		
Model number	SLI31AGMDPM		

Type	Group 31 AGM		
Communication system			
GPS			
Manufacturer	TBD		
Model number	TBD		
PA system			
	Manufacturer	Model number	Number
Amplifier	TBD	TBD	TBD
Microphone	TBD	TBD	TBD
Internal speakers	TBD	TBD	TBD
External speaker	TBD	TBD	TBD
Energy storage			
Type	Lithium Ion		
Number of cells	3.6	V	
Battery pack voltage	648	V	
Weight	1587*	lb	*weight per pack
Security camera system			
Manufacturer	TBD		
Model number	TBD		
Number of cameras	TBD		
Storage capacity	TBD		
Bike racks			
Manufacturer	TBD		
Model number	TBD		
Fire detection system			
Manufacturer	Amerex		
Model number	V25		
Fire detectors	350F Detection Sensors		
Type (thermal or optical)	Thermal		
Number of detectors	4		
Automatic voice annunciator system			
Manufacturer	TBD		
Model and part number	TBD		

Annunciator LED sign			
Number of signs	TBD		
Housing dimensions	TBD		
Character length	TBD	in.	
Character height	TBD	in.	
Character width	TBD	in.	
GPS antenna			
Manufacturer	TBD		
Model and part number	TBD		
Automatic passenger counter			
Manufacturer	TBD		
Model and part number	a.	TBD	
	b.	TBD	
	c.	TBD	
Sensor type	TBD		
Real-time bus arrival prediction system			
	Manufacturer		Model number
Router	TBD		TBD
Cellular modem	TBD		TBD
Charge protection	TBD		TBD
<p>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.</p>			



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Pinellas Suncoast Transit Authority

7. References and Non-Priced Information



Proterra References

1. Broward County Transit

1 N. University Dr. Suite 3100A
Plantation, FL 33324
James Fourcade – Director of Maintenance
garry.hurkens@edmonton.ca
(780) 496-4478



Fleet Information:

Broward County Transit Twelve (12) 40' ZX5 MAX buses that were delivered between August and September 2021.

2. City of Tallahassee – StarMetro

555 Appleyard Dr.
Tallahassee, FL 32304
Walter Kirkland – Supervisor of Equipment Services
Walter.kirklandjr@talgov.com
(850) 891-5183



Fleet Information:

StarMetro is a repeat customer whose first order of three (3) Proterra BE35 buses were accepted in late 2012. StarMetro's second order of thirteen (13) 35' Catalyst E2 buses were accepted in August 2019. Two additional orders for Proterra ZX5 buses are on order with an anticipated delivery in 2022.

3. GO Raleigh

4104 Poole Rd.
Raleigh, NC 27610
Byron Bryant – General Manager
byron.bryant@raleighnc.gov
(919) 996-3942



Fleet Information:

Go Raleigh has a diverse fleet of electric buses, that include Two (2) Proterra 40' ZX5 buses and three (3) Proterra Catalyst E2 buses.



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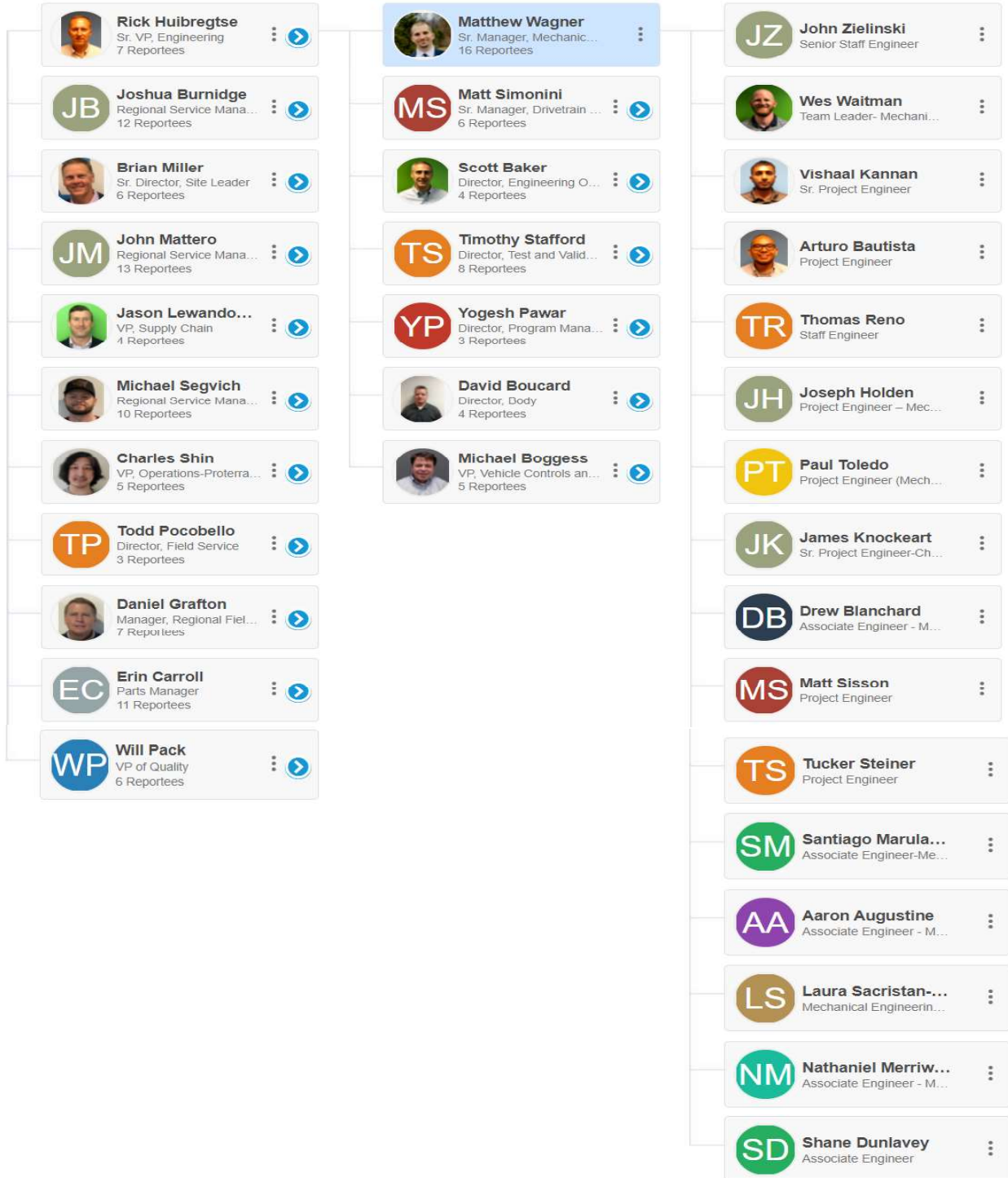
Pinellas Suncoast Transit Authority

8. Engineering Organization Chart, Engineering Change Control Procedure, and Field Modification Process



Engineering and Service Personnel

Engineering



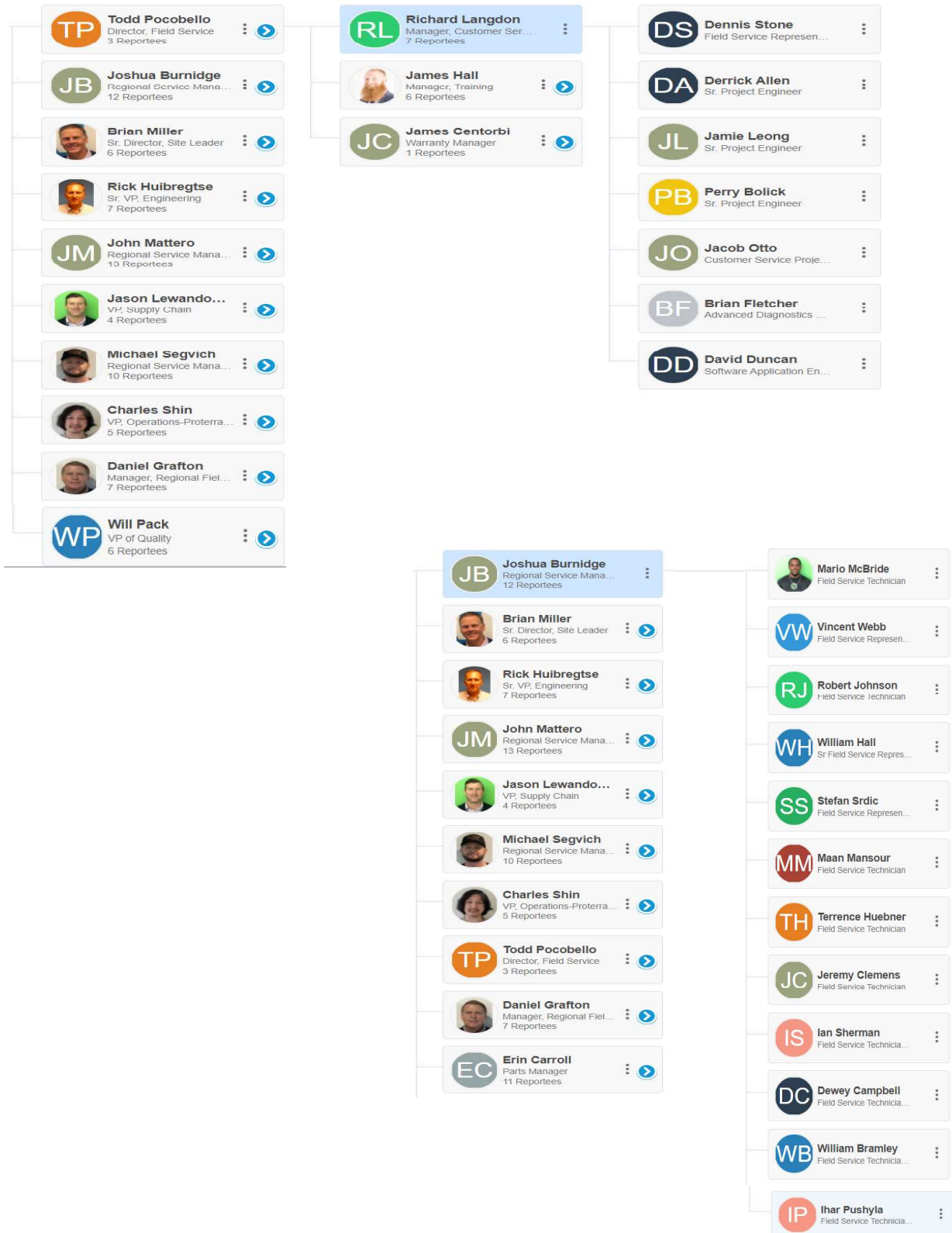
Headquarters
1815 Rollins Road, Burlingame, CA 94010

East Coast Manufacturing
1 Whitlee Court, Greenville, SC 29607

West Coast Manufacturing
383 Cheryl Lane, City of Industry, CA 91789



Service



Headquarters
1815 Rollins Road, Burlingame, CA 94010

East Coast Manufacturing
1 Whitlee Court, Greenville, SC 29607

West Coast Manufacturing
383 Cheryl Lane, City of Industry, CA 91789



Regional Support

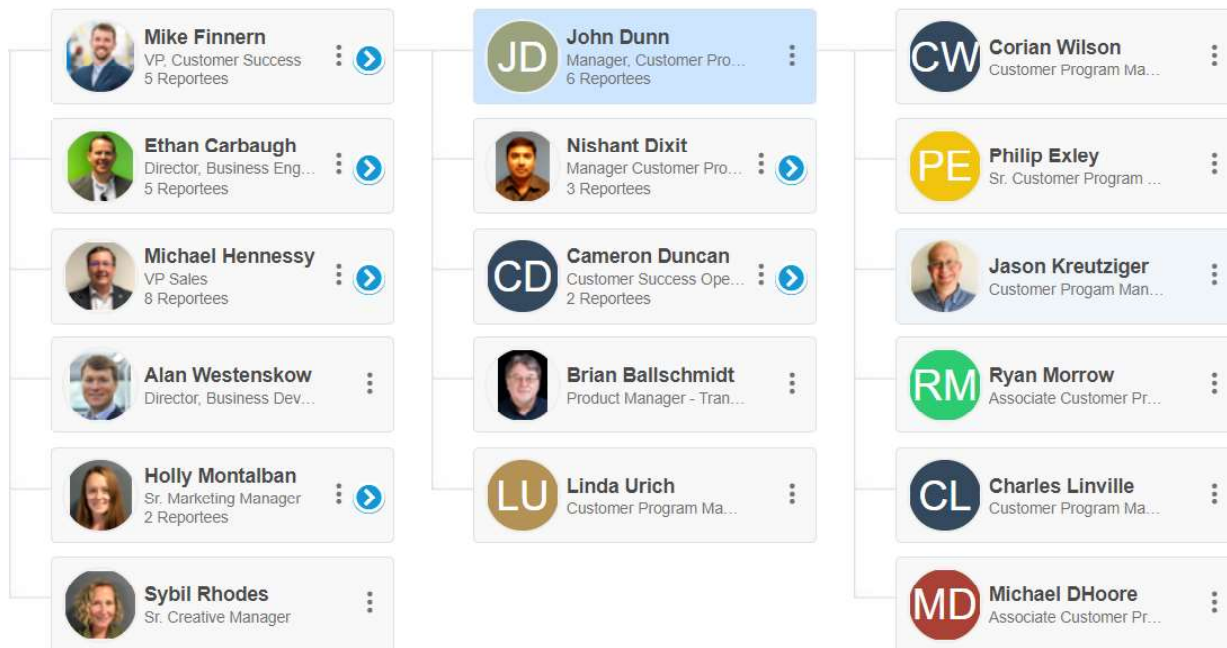
The Regional Field Service Representatives (FSRs) are assigned to a property to support the delivery of customer buses, assist with the training, and act as liaison between Proterra, our local dealer and the customer to ensure a perfect launch in to revenue service. The FSR will provide direct, on-site support for our dealer as well as remote telephonic support for the vehicles.

PROTERRA FIELD SERVICE REPS		PROTERRA	
	NORTHWEST Regional Service Manager: Dan Grafton Field Service Representatives: Stephen Lollis - TBD Joe Goins - Patterson, CA Ramon Barroso - Sparks, NV William Rogers - TBD Jonathon Thompson - Oak Harbor, WA Josiah Goins - Atwater, CA Leo LeBarre - Santa Cruz, CA	NORTHEAST Regional Service Manager: John Mattero Field Service Representatives: Thomas McDuffie - Munster, IL Lorand Moldovan - NY, NY David Karlin - Nottingham, PA Jason Patrick - Newfown, CT Justin O'Neill - Dover, DE Robert Galea - TBD Everth Zavala - Totowa, NJ Antonio Doe Santos Ronald Pare - Chicopee, MA Joshua Miller - Felton, DE Kevin Rumbaugh - TBD Kevin Lewallen - Dixon, IL James Williams - TBD	
	SOUTHWEST CENTRAL Regional Service Manager: Michael Segvich Field Service Representatives: Dan Brogan - Bedford, TX Juan Uco - Bakerfield, CA Armando Jimenez - TBD Mark Parriott - San Clemente, CA Philip Chiapa - Round Rock, TX Christian Vilareal - Park Ridge, IL John Woody - Ft. Worth, TX Clint Luft - West Jordan, UT Tadden Towery - Arvada, CO	SOUTHEAST Regional Service Manager: Joshua Burnidge Field Service Representatives: Mario McBride - TBD Vincent Webb - Williamston, SC Robert Johnson - Duncan, SC William Hall - Mcleansville, NC Stefan Sedic - TBD Maan Mansour - Washington, DC Terrence Huebner - TBD Jeremy Clemens - Orlando, FL Ian Sherman - Miami, FL Dewey Campbell - TBD William Bramley - Fort Lauderdale, FL Ihar Pushyla - TBD	

In addition, Proterra's staff of Customer Service Engineers provide technical support to our FSRs, our local dealer, or our customers directly. These skilled individuals constantly monitor field anomalies and, when appropriate, create and distribute service bulletins to enhance overall operation of the fleet. They work closely with vendor networks and FSRs to optimize preventative maintenance schedules to increase reliability and performance by utilizing data collected from the vehicle directly and feedback from the FSRs.



Customer Success Team



The above organization chart reflects the Customer Success team which consists of twelve (12) Customer Program Managers who report to the Vice President of Customer Success (Mike Finnern), who in turn reports to the Chief Commercial Officer (John Walsh). Mike Finnern is one of Proterra's longest tenured employees and has been helping customers successfully deploy their BEBs for over eleven (11) years. In fact, he has lead Proterra's Customer Service department for seven (7) years and has a unique perspective on the steps required during pre-production to ensure the downstream steps of production, inspection and acceptance, training, and entry into service are successful. He also chairs APTA's Clean Propulsion Committee, helping North American transit agencies implement best practices associated with the transition to BEBs and other clean propulsion technologies.

The Customer Success Department is also growing to ensure that our customers receive the necessary care and attention while they embark on their BEB journey.

Proterra Proprietary and Confidential



Customer Definition, Engineering Design, Procurement, Build, & Test

Proterra is deeply committed to the success of our partner agencies and takes a very hands-on partnership approach with all of our customers. With every successful procurement, Proterra assigns a dedicated Customer Program Manager (CPM) to the project once we receive notice of award. During the configuration definition process, the CPM will take the lead and coordinate the kick-off meeting and design overview meetings with PSTA. Once the design portion of the activity is complete, the CPM will work with PSTA to ensure the build process is smooth and meets the requirements of the contract and configuration.

As the internal customer champions, the CPM will conduct weekly internal meetings to ensure issues are resolved, questions answered, and open items closed in a timely manner.

Primary Tasks of the CPM

Once the contract is awarded the project can be defined by a series of tasks that break down as follows:


- Schedule and hold Kick-Off Meeting at PSTA
- Finalizing the bus configuration definition (configuration templates & option tracker)
- Schedule and hold design overview meetings
- Finalize the design with PSTA
- Coordinate development of Training Program

Once the design is finalized, the CPM will be responsible for completing the following tasks:

- Coordinating office requirements & familiarization training with CARTA's resident inspector
- Beginning Bus production
- Delivering Buses
- On-site acceptance testing at PSTA
- Assisting Proterra's customer service team with coordination / scheduling of training

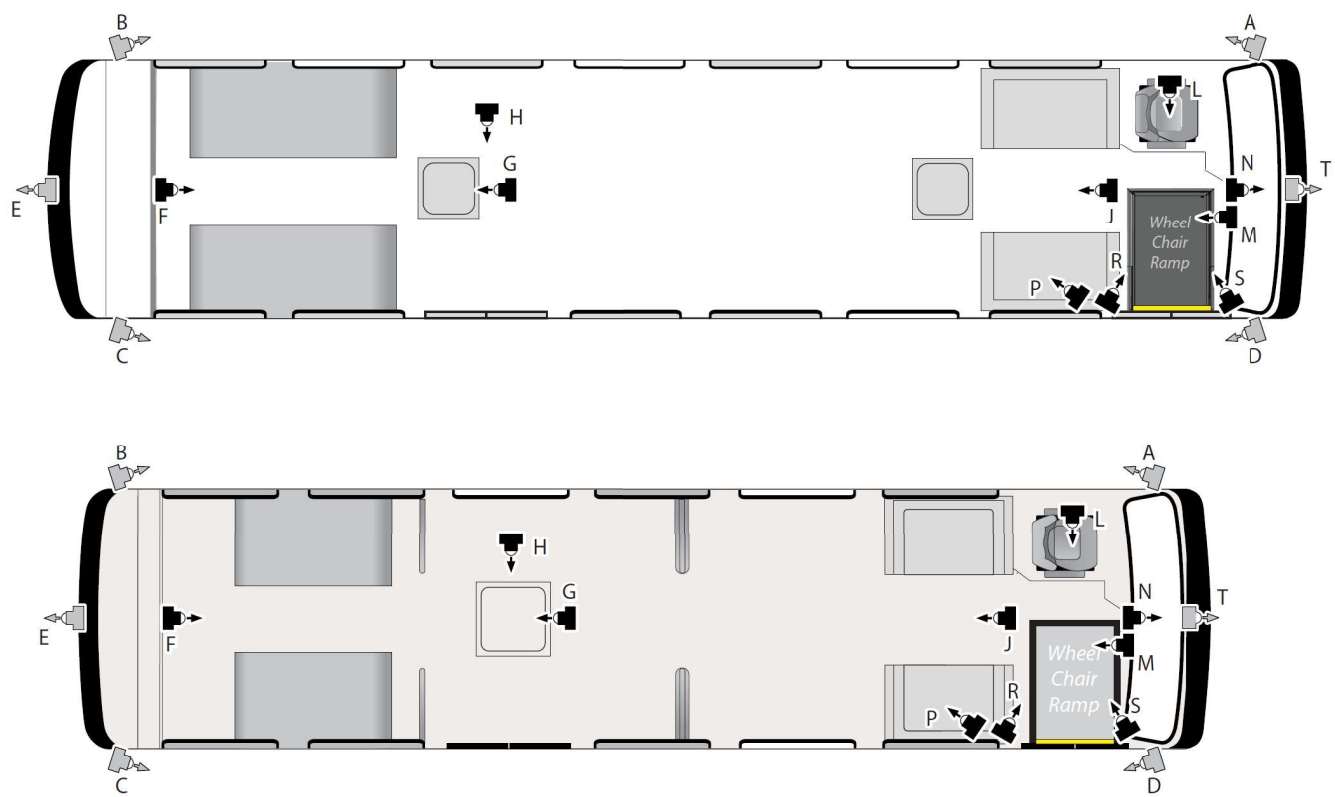
Configuration Templates

In 2017, Proterra's customer-facing Business Engagement team and Customer Engineering team began utilizing standardized templates as tools to confirm exact vehicle configurations well in advance of any design reviews. The CPM's will fill out the templates based on the information contained in the RFP technical specification and send them to their counterparts at PSTA for review and input. In total, there are seven (7) distinct configuration templates; two of which are shown on the next two pages (first page only):


 PROTERRA		Video Surveillance System - Heron	
Agency:			
Contract Program Manager:	CPM Name CPM@Proterra.com 001.864.214.7076	Dated:	
Agency Contact:	Contact Name Contact@Agency.gov 001.864.123.4567	Deadline:	

Agency Technical Contact	
Name:	
Phone:	
Email:	

Please indicate desired camera placements (40ft and 35ft layouts):



Note: If a desired location is not represented on the pictures above, please indicate a location on the picture and provide a brief description of the view in the table on the next page.

		Side Windows & Doors (35')	
Agency:			
Contract Program Manager:	CPM Name CPM@Proterra.com 001.864.214.7076	Dated:	
Agency Contact:	Contact Name Contact@Agency.gov 001.864.123.4567	Deadline:	

Agency Technical Contact	
Name:	
Phone:	
Email:	

Proterra 35ft Catalyst Side Windows

	Standard	Request
Driver's Window Light Transmittance	75% Green	
Side Window Light Transmittance	50% Gray	
Serviceability	Non-Serviceable	
Material	5mm Tempered Glass (Laminated Not Available for Tip-In)	
Misc. Non-Standard Requests	n/a	
Window Decal Location	If vandal shields are used, decals are attached to the vandal shield	

Note: Windows are manufactured by Arow Global Inc.

Proterra Representative:	(Print)(Sign)	Date:
Agency Representative:	(Print)(Sign)	Date:
<i>Note: This document is intended to provide information to minimize design changes at the formal Design Review and/or Pre-Production Review. Signature doesn't equate to design acceptance.</i>		



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Pinellas Suncoast Transit Authority

9. Manufacturing Facilities plant layout, Other Contracts, and Staffing



Manufacturing Facilities Plant Layouts & Staffing

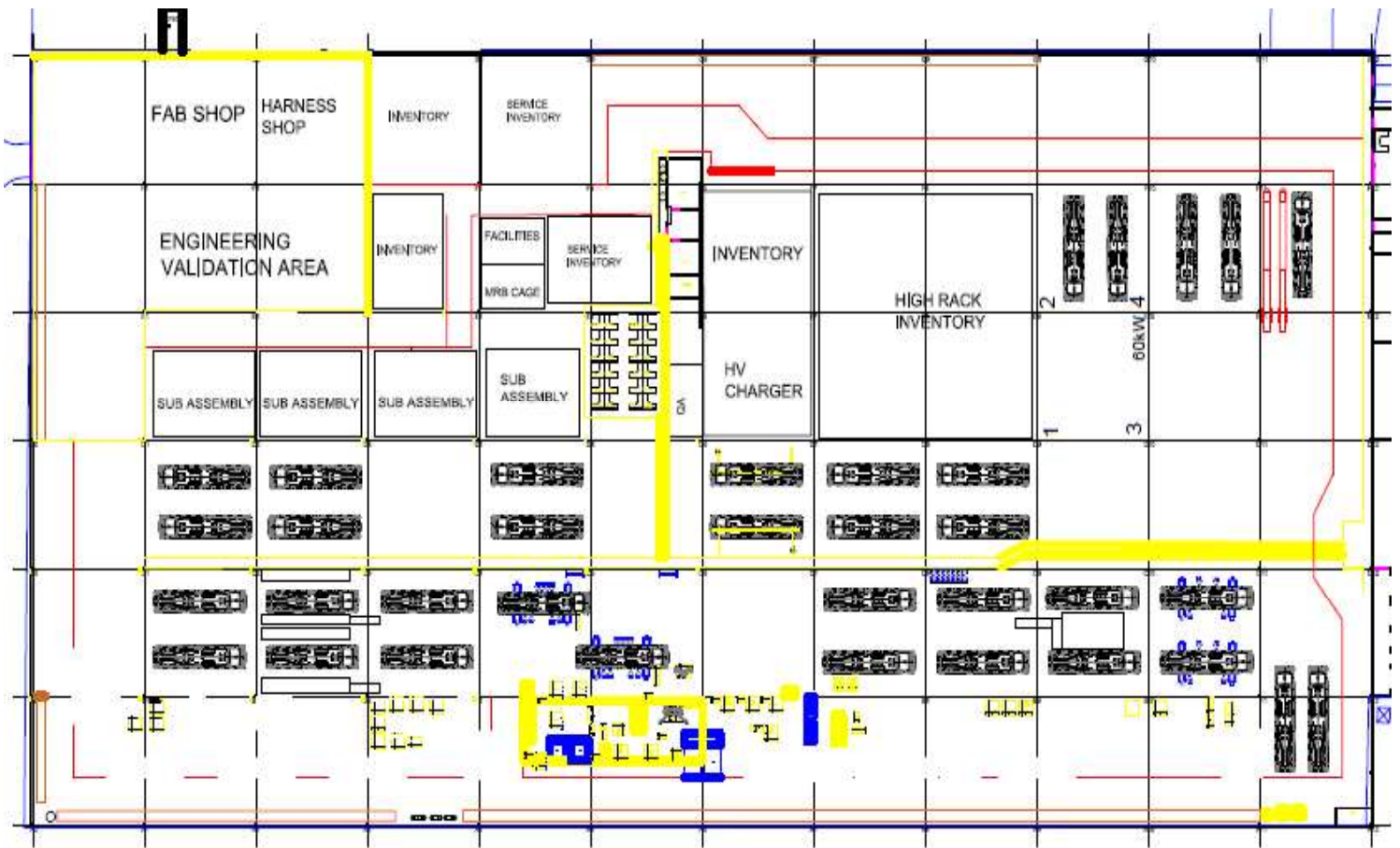
East Coast Manufacturing / Primary Engineering Facility

1 Whitlee Court
Greenville, SC 29607

Number of Employees: 338

Activities Performed: Supply Chain, Legal, Sales,
Accounting, Audit, Engineering, Battery Electric Bus
Manufacturing, Testing, Inspection, and Validation.

The image to the right is the outside of our facility and the
below image contains an image representing the two (2)
separate lines of production manufacturing lines in
Greenville:



Proterra Confidential Information

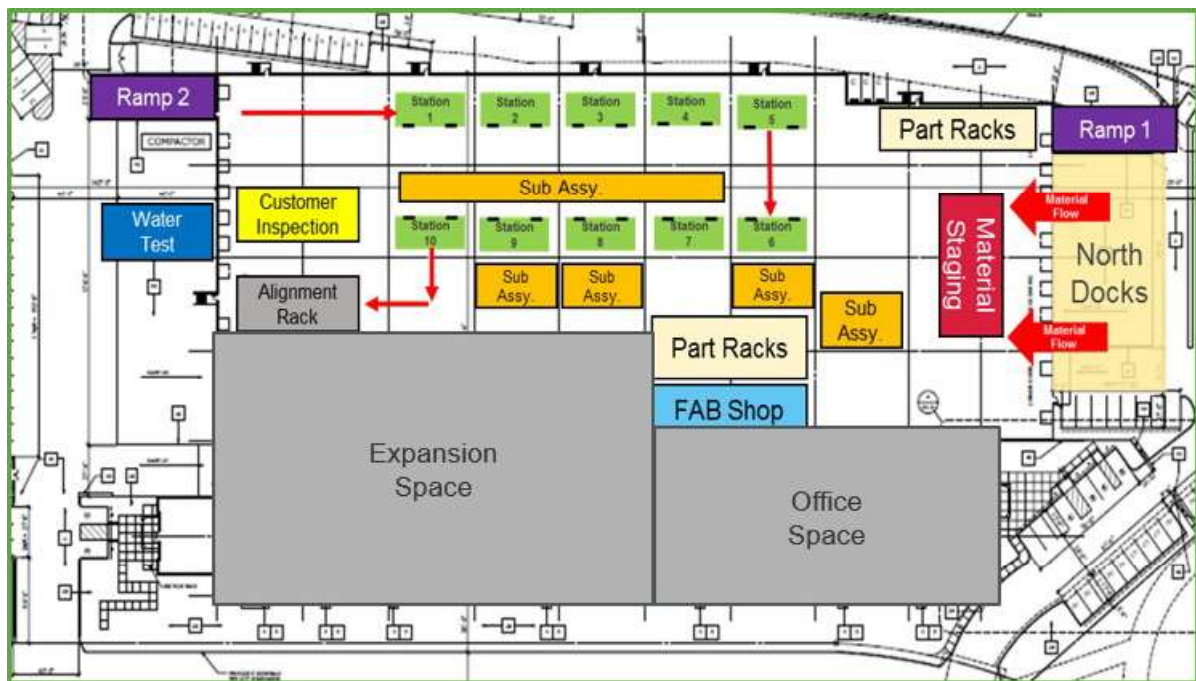


West Coast Manufacturing Facility & Service Hub

383 Cheryl Lane
Walnut, CA 91789 (Los Angeles County)

Number of Employees: 118

Activities Performed: Legal, Sales,
Accounting, Audit, Engineering, Vehicle Testing,
Battery Electric Bus Manufacturing and Validation.
The image to the right is outside of our facility and the
below is an image of the Los Angeles facility layout:



Proterra Confidential Information



Proterra Headquarters / Advanced Battery R&D and Manufacturing

1815 Rollins Road
Burlingame, CA 94010

Number of Employees: 130

Activities Performed: Executive Leadership, Legal, Sales, Accounting, Audit, Engineering, Advanced Battery R&D, Charger Manufacturing and Validation.

The heavy-vehicle industry's most advanced lithium-ion batteries are being designed, tested, validated, and manufacture in Burlingame, CA. Proterra's battery engineering team has extensively tested and validated the E2 battery packs and as a result Proterra offers a 12-year warranty on all high voltage battery packs.

The image to the right is the outside of our facility. The high voltage battery pack manufacturing layout is confidential, although we would encourage a team from Lextran to travel to Burlingame to visit the facility during the evaluation process. It is unrivaled in the North American transit market as no one else designs, validates, and manufactures their own high voltage battery packs in the United States.



Proterra Confidential Information

Headquarters
1815 Rollins Road, Burlingame, CA 94010

East Coast Manufacturing
1 Whitlee Court, Greenville, SC 29607

West Coast Manufacturing
383 Cheryl Lane, City of Industry, CA 91789

www.proterra.com



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10. Production and Delivery Schedule and Other Contract Commitments



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Proterra Delivery Schedule (Typical)

Task Name	Milestone (Start Dates)	Duration of Task	Responsibility
Notice of Award / Purchase Order	Date of Issuance	1 day	FL Agency / Customer
Phase 1.A – Pre-Production	# from Notice of Award		
Kick-Off Meeting			
<ul style="list-style-type: none"> Infrastructure Site Walk (If required) / Planning Configuration Process Preliminary Build Schedule Service Overview 	+ 1 month	2 days	Proterra/Customer
Configuration Discussions	+ 1 month	60 days	Proterra/Customer
Pre-Production Meeting	+ 1 month	2 days	Proterra/Customer
Configuration/Design Freeze	+ 3 months	1 day	Proterra
Phase 1.B – Charger Equipment / Infrastructure (if applicable)	# from Notice of Award		
Design and Permitting	+0 months	3 months	Proterra or Customer / 3 rd Party
Construction	+4 months	3 months	Proterra or Customer / 3 rd Party
Delivery of Charging Equipment	+ 6 months	1 day	Proterra
Installation and Commission	+7 months	1 months	Proterra or Customer / 3 rd Party
Phase 2 – Bus Build	# from Configuration/Design Freeze		
Engineering Design	+ 0 months	~3 months	Proterra
Design Overview Meeting	+ 1 months	1 hour	Proterra/Customer
Bus Production (For up to 5 buses)	+ 6 months	2 months	Proterra
Inspection, Delivery and Final Acceptance	+ 7 months	1 month	Proterra/Customer



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Task Name	Milestone (Start Dates)	Duration of Task	Responsibility
Phase 3 - Deployment	# Of Days from Final Acceptance		Proterra or Customer / 3 rd Party
Operator/Maintenance Training	+0 months	5 days	Proterra/Customer
Shadow Service	+1 month	14 days	Customer
Launch Revenue Service	+2 months	1 day	Customer

Note: This timeline is illustrative of the typical lifecycle of a BEB Project, from Notice of Award / Purchase Order to Initiation of Revenue Service. Actual milestones may vary based on project specifics and agency approach.

Note: Actual build slots will be finalized when the Purchase Order is issued to Proterra.

Understanding Proterra's Delivery Commitment

PURCHASE ORDER ISSUANCE	EXPECTED DELIVERY DATES
12/31/2021	Q4 2022
3/31/2022	Q1 2023
6/30/2022	Q2 2023
9/30/2022	Q3 2023



Other Contract Commitments

Account Name	Bus Qty	Plant Location	Projected Completion Date (First Bus)
City of San Luis Obispo	1	LAX	10/6/2021
Detroit	4	GVL	10/11/2021
Hillsboro Transit	10	GVL	10/13/2021
Mountain Metro	4	LAX	10/15/2021
Rock Island County Metropolitan Mass Transit	14	LAX	10/18/2021
SUBURBAN MOBILITY AUTHORITY FOR REGIONAL TRANSPORTATION	4	GVL	10/23/2021
City of Rock Hill	4	GVL	11/3/2021
Iowa City Transit	4	LAX	11/10/2021
Duke University	2	GVL	11/14/2021
Biddeford Saco Old Orchard Beach (BSOOB) Transit	2	GVL	11/15/2021
San Jose Airport	6	LAX	12/1/2021
Valley Regional Transit	8	LAX	12/1/2021
Belle Urban System – Racine (The Bus)	9	GVL	12/6/2021
Charleston Area Regional Transportation Authority (CARTA)	20	GVL	12/12/2021
Miami-Dade Transit(MDT)	32	GVL	1/3/2022
Miami Dade County	62	GVL	1/5/2022
John Wayne Airport	3	LAX	1/6/2022
City of Albuquerque	5	LAX	1/29/2022



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Guam Regional Transit Authority	8	GVL	1/31/2022
City and Borough of Juneau	8	LAX	2/8/2022
City of Moline	9	GVL	2/11/2022
Greater Portland Transit District	2	GVL	2/11/2022
Edmonton Transit System	20	GVL	2/27/2022
AppalCart	1	GVL	3/9/2022
Avon	2	LAX	3/9/2022
Santa Maria Area Transit	2	LAX	3/16/2022
Prince George County Transit System	8	GVL	3/21/2022
Ontario International (Lot 2)	8	LAX	3/23/2022
Bridgeport	3	GVL	3/31/2022
City of Fresno	7	LAX	4/24/2022
Napa County Transportation Planning Agency (NVTa)	2	LAX	5/13/2022
Santa Rosa City Bus	4	LAX	5/21/2022
Sacramento International Airport	7	LAX	6/6/2022
Sam Trans	4	LAX	8/27/2022
Roseville Transit	10	LAX	11/12/2022
DC Circulator	13	GVL	5/19/2023
D-DOT	13	GVL	5/19/2023



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Pinellas Suncoast Transit Authority

11. Management Plan

PROTERRA LEADERSHIP



JACK ALLEN

Chairman and CEO



GARETH JOYCE

President of Proterra



JOSH ENSIGN

President of Proterra Transit



JOANN COVINGTON

Chief Legal Officer & Head of
Government Relations



DUSTIN GRACE

Chief Technology Officer



JOHN WALSH

Chief Commercial Officer



KELLY SCHEIB

Vice President of Human
Resources



RICK HUIBREGTSE

Senior Vice President of
Engineering

Jack Allen - CHAIRMAN AND CEO

Jack Allen is the Chairman and Chief Executive Officer of Proterra. He is a results-focused leader who has spent his career defining the commercial truck industry. He has more than three decades of experience in the driving core businesses at Navistar International Corporation where he successfully strengthened its core businesses, improved quality and customer satisfaction, drove profitability and delivered value to shareholders. He most recently served as Navistar's executive vice president and chief operating officer, and previously was president of that company's North America truck and parts division. Allen also served as president of Navistar's engine group, where he led major business initiatives including the acquisition of Brazilian engine producer MWM and a partnership with MAN of Germany. He also has served as vice president and general manager of the company's parts organization. He holds a bachelor of science degree from the Milwaukee School of Engineering and an MBA from the Illinois Institute of Technology. He serves on the boards of the Milwaukee School of Engineering's Board of Regents and Lurie Children's Hospital of Chicago.



Gareth Joyce - President of Proterra. Gareth Joyce is President of Proterra. He previously served as Chief Sustainability Officer for Delta Air Lines, overseeing Delta's \$1 billion commitment toward becoming carbon neutral and leading the airline's Global Sustainability team. His responsibilities included building on Delta's industry-leading voluntary sustainability efforts to expand the airline's carbon reduction and removal work, while engaging with partners and other stakeholders to advance global sustainability. Prior to joining Delta, Joyce held a variety of senior leadership positions with Mercedes-Benz throughout South Africa, Europe, and North America – his last role being CEO of Mercedes-Benz Canada. Prior to his time at Mercedes-Benz, Joyce held positions with IQ Business Group, Standard Bank South Africa, Blick PLC, Austen Security, and Deloitte & Touche.

A resident of Atlanta, Joyce has also served on the board of the American Cancer Society since 2016. The society's investment into cancer research and treatment is second only to the United States government and has contributed to a 29% decrease in the overall US cancer death rate since 1991. Joyce holds a Bachelor of Science in Engineering from the University of Witwatersrand and a Master of Commerce in Business Management from the University of Johannesburg.

Josh Ensign – President of Proterra Transit. Josh serves as President of Proterra Transit. A U.S. Army veteran and former executive of Honeywell International and Tesla Motors, Ensign's track record includes leading global operations for 42 factories in 15 countries and managing the supporting supply chains. As vice president of manufacturing at Tesla Motors, Ensign was responsible for all manufacturing activities at the Fremont, California production site. This included the installation of the current Model S high volume production line, the launch of both the dual-motor platform and the Model X, and the establishment of Tesla's new seat manufacturing facility. Before Tesla, Ensign led global operations in Honeywell International's automotive and aerospace businesses. Ensign has extensive functional experience in supply chain, logistics, purchasing, and manufacturing and has lived and operated abroad in Germany, Mexico, China and Switzerland. Josh has a bachelor's in engineering from Gonzaga University and an MBA from the University of Southern California.

JoAnn Covington - Chief Legal Officer & Head of Government Relations

JoAnn Covington, Proterra's chief legal officer, leads the company's legal and government relations, and serves as corporate secretary. JoAnn joined Proterra from advertising technology firm, Rocket Fuel Inc., where she served as senior vice president and general counsel and led the legal, policy, business affairs and business development functions. While there she was instrumental in leading Rocket Fuel through its 2013 IPO when that company was the fastest growing technology company on Deloitte's Fast 500. Prior to Rocket Fuel, JoAnn held senior legal roles for Electronic Arts Inc., an entertainment software company. She began her career with Fenwick & West LLP representing technology companies in intellectual property litigation. JoAnn received her law degree from Harvard Law School, magna cum laude.

Proterra Confidential Information



Other Key Personnel of Proterra

Proterra has assembled a world-class leadership team that is focused on replacing every heavy-duty emission-producing transit coach with clean, quiet battery electric coaches. The leadership team's experience varies between heavy-duty transit, automotive, aerospace, and high voltage battery technology. Listed below are key members of the team that will support CARTA's electric transit bus project if awarded:

Dustin Grace, Chief Technology Officer

- Dustin Grace is the Chief Technology Officer at Proterra, responsible for Energy Storage and Power Systems development programs. He joined Proterra five years ago to establish and build the engineering team located at Proterra's Silicon Valley headquarters. Since completion of Proterra's first generation high voltage battery program in 2017, he is now leading future developments projects which adapt Proterra battery technology into heavy duty OEM vehicle applications, second life stationary storage, and fleet scale high power charging systems. He brings nine years of powertrain development expertise from Tesla Motors prior to joining the Proterra team.

John Walsh - Chief Commercial Officer

- John Walsh serves as the Chief Commercial Officer at Proterra. Prior to joining Proterra, Walsh was President and Chief Operating Officer of Davey Coach Sales, Inc., one of the leading dealers of new and used mid-sized buses and shuttles in North America. Prior to that, he served as President of the REV Group, one of the largest bus manufacturing groups in the United States. Walsh was also Vice President of Sales and Marketing at ARBOC Specialty Vehicles and CEO of VPG Autos, maker of the MV-1, the first purpose-built wheelchair-accessible car. Before that, Walsh spent more than two decades at National Bus Sales & Leasing, Inc. and served as President, where he grew National from a small school bus dealership to the largest bus dealership at the time.

Rick Huibregtse, Senior Vice President Engineering

- Rick leads Proterra's engineering organization, including battery & charger engineering, vehicle engineering, and electrical / controls engineering. Under Rick's leadership, Proterra has implemented a more controlled, phase-gate approach to new product development and strengthened our relationship with the FTA Office of Technology, or commitment to meeting SAE standard for electric vehicles and chargers, and our position as the leading innovator in heavy-duty bus transportation.

Kelly Scheib - Vice President of Human Resources

- Kelly Scheib leads the Human Resources department at Proterra. Scheib has over 15 years of progressive Human Resources experience, most recently serving as the Vice President of Human Resources for Tindall Corporation. Prior, she worked for Hubbell Lighting in positions including HR Management, Organizational Development and Organizational Effectiveness. She holds certifications including the Senior Professional in Human Resources certification (SPHR) awarded by the HR Certification Institute and the Senior Certified Professional certification awarded by the Society for Human Resource Management (SHRM-SCP) and was recently named as the South Carolina Human Resources Professional of the Year by the South Carolina Chamber of Commerce. Kelly graduated from Penn State University with a Master of Science, Industrial Relations and Human Resources, as well as a Bachelor of Science, Labor and Industrial Relations

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Customer Definition, Engineering Design, Procurement, Build, & Test

Proterra is deeply committed to the success of our partner agencies and takes a very hands-on partnership approach with all of our customers. With every successful procurement, Proterra assigns a dedicated Customer Program Manager (CPM) to the project once we receive notice of award. During the configuration definition process, the CPM will take the lead. The CPM will coordinate the kick-off meeting and design overview meetings with PSTA. Once the design portion of the activity is complete, the CPM will continue to be the primary point of contact to ensure the build process is smooth and meets the requirements of the contract and configuration.

As the internal customer champions, the CPM Team will conduct weekly internal meetings to ensure issues are resolved, questions answered, and open items closed in a timely manner.

Once the contract is awarded the project can be defined by a series of tasks that break down as follows:

Primary Tasks of the Customer Program Manager

- Schedule and hold Kick-Off Meeting at PSTA
- Provide pre-award Buy America documentation
- Finalizing the bus configuration definition (configuration templates & option tracker)
- Schedule and hold design overview meetings
- Finalize the design with PSTA
- Coordinate development of Training Program
- Coordinating office requirements & familiarization training with PSTA's resident inspector
- Producing/delivering the Prototype Bus, if required
- Coordinating the Testing Program for the Prototype Bus, if required
- Beginning Production Bus production
- Delivering Production Buses
- On-site acceptance testing at PSTA
- Assisting Proterra's customer service team with coordination / scheduling of training

Configuration Templates

In 2017, Proterra's customer-facing Business Engagement team and Customer Engineering team began utilizing standardized templates as tools to confirm exact vehicle configurations well in advance of any design reviews. The Customer Success Team will fill out the templates based on the information contained in the RFP technical specification and send them to their counterparts at PSTA for review and input. In total, there are seven (7) distinct configuration templates.

Proterra Confidential Information

Headquarters
1815 Rollins Road, Burlingame, CA 94010

East Coast Manufacturing
1 Whitlee Court, Greenville, SC 29607

West Coast Manufacturing
383 Cheryl Lane, City of Industry, CA 91789

www.proterra.com

PROTERRA BOARD OF DIRECTORS

Board of Directors



JACK ALLEN

Chairman and CEO



RYAN POPPLE

Co-Founder and Executive
Director



JAKE ERHARD

Board Member



JOCHEN GOETZ

Board Member



BROOK PORTER

Board Member



JOAN ROBINSON-BERRY

Board Member



JEANNINE SARGENT

Board Member



CONSTANCE SKIDMORE

Board Member



MIKE SMITH

Board Member



PROTERRA

Pinellas Suncoast Transit Authority

12. Quality Assurance Plan



Certificate of Registration

This certifies that the Quality Management System of

Proterra Inc.

1815 Rollins Road
Burlingame, California, 94010, United States

has been assessed by NSF-ISR and found to be in conformance to the following standard(s):

ISO 9001:2015

Scope of Registration:

Design, and assembly of batteries and supporting power and charging systems.

Certificate Number: C0525087-ISR1
Certificate Issue Date: 01-SEP-2020
Registration Date: 01-SEP-2020
Expiration Date *: 31-AUG-2023

Tom Chestnut,
Sr Vice President - ISR,
NSF-ISR, Ltd.

Page 1 of 2



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ANNEX PAGE FOR CERTIFICATE REGISTRATION NUMBER

C0525087-IS1

CERTIFICATE ISSUE DATE: 01-SEP-2020

CERTIFICATE EXPIRATION DATE: 31-AUG-2023

Proterra Inc.

1815 Rollins Road

Burlingame, California, 94010, United States

Remote Location: Proterra Inc.- C0525088 383 Cheryl Lane City of Industry, California, 91789, United States	Scope: Design and Assembly of electrical buses.
Remote Location: Proterra Inc.- C0525089 1 Whitlee Court Greenville, South Carolina, 29607, United States	Scope: Design and Assembly of electrical buses.

NSF International Strategic Registrations

789 North Dixboro Road, Ann Arbor, Michigan 48105 | (888) NSF-9000 | www.nsf-isr.org

This Annex is only Valid in connection with the above-mentioned certificate issued by NSF-ISR



Certificate of Registration

This certifies that the Quality Management System of

Proterra Inc.

383 Cheryl Lane
City of Industry, California, 91789, United States

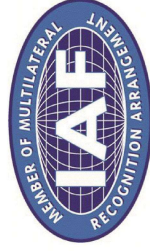
has been assessed by NSF-ISR and found to be in conformance to the following standard(s):

ISO 9001:2015

Scope of Registration:

Design and Assembly of electrical buses.

The validity of this certificate depends on the validity of the main certificate C0525087 Proterra Inc.



Certificate Number:	C0525087-ISR-C0525088
Certificate Issue Date:	01-SEP-2020
Registration Date:	01-SEP-2020
Expiration Date *:	31-AUG-2023

Tom Chestnut,
Sr Vice President - ISR, NSF-
ISR, Ltd.

NSF International Strategic Registrations

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Certificate of Registration

This certifies that the Quality Management System of

Proterra Inc.

1 Whitlee Court
Greenville, South Carolina, 29607, United States

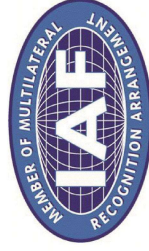
has been assessed by NSF-ISR and found to be in conformance to the following standard(s):

ISO 9001:2015


Scope of Registration:

Design and Assembly of electrical buses.

The validity of this certificate depends on the validity of the main certificate C0525087 Proterra Inc.



Certificate Number:	C0525087-ISR-C0525089
Certificate Issue Date:	01-SEP-2020
Registration Date:	01-SEP-2020
Expiration Date *:	31-AUG-2023


Tom Chestnut,
Sr Vice President - ISR, NSF-
ISR, Ltd.

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Authorized Registration and/or Accreditation Marks. This certificate is property of NSF-ISR and must be returned upon request.
*Company is audited for conformance at regular intervals. To verify registrations call (888) NSF-9000 or visit our web site at www.nsf-isr.org



Certificate of Registration

This certifies that the Environmental Management System of

Proterra Inc.

1815 Rollins Road
Burlingame, California, 94010, United States

has been assessed by NSF-ISR and found to be in conformance to the following standard(s):

ISO 14001:2015

Scope of Registration:

The Design, Development, Assembly, test and delivery of Electric Buses and supporting power and charging systems.



Certificate Number:	C0525087-EM1
Certificate Issue Date:	31-AUG-2020
Registration Date:	31-AUG-2020
Expiration Date *:	30-AUG-2023

Tom Chestnut,
Sr Vice President - ISR,
NSF-ISR, Ltd.

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ANNEX PAGE FOR CERTIFICATE REGISTRATION NUMBER

C0525087-EMI

CERTIFICATE ISSUE DATE: 31-AUG-2020

CERTIFICATE EXPIRATION DATE: 30-AUG-2023

Proterra Inc.
1815 Rollins Road
Burlingame, California, 94010, United States

Remote Location: Proterra Inc.- C0525088 383 Cheryl Lane City of Industry, California, 91789, United States	Scope: The Design, Development, Assembly, test and delivery of Electric Buses and supporting power and charging systems.
Remote Location: Proterra Inc.- C0525089 1 Whitlee Court Greenville, South Carolina, 29607, United States	Scope: The Design, Development, Assembly, test and delivery of Electric Buses and supporting power and charging systems.

NSF International Strategic Registrations

789 North Dixboro Road, Ann Arbor, Michigan 48105 | (888) NSF-9000 | www.nsf-isr.org

This Annex is only Valid in connection with the above-mentioned certificate issued by NSF-ISR



Certificate of Registration

This certifies that the Environmental Management System of

Proterra Inc.

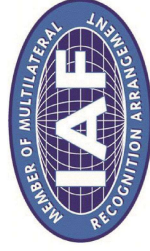
383 Cheryl Lane
City of Industry, California, 91789, United States

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ISO 14001:2015

Scope of Registration:

The Design, Development, Assembly, test and delivery of Electric Buses and supporting power and charging systems.
The validity of this certificate depends on the validity of the main certificate C0525087 Proterra Inc.



Certificate Number: C0525087-EM1-C0525088
Certificate Issue Date: 31-AUG-2020
Registration Date: 31-AUG-2020
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Tom Chestnut,
Sr Vice President - ISR, NSF-ISR, Ltd.

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Proterra Inc.

1 Whitlee Court
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Certificate Issue Date:	31-AUG-2020
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Tom Chestnut,
Sr Vice President - ISR, NSF-
ISR, Ltd.

NSF International Strategic Registrations

789 North Dixboro Road, Ann Arbor, Michigan 48105 | (888) NSF-9000 | www.nsf-isr.org



Quality Assurance Overview

Proterra has an established quality assurance program that is fully supported by the Executive Leadership Team. At Proterra, we strive to continually improve our product quality by:

- communicating the importance of meeting customer and regulatory requirements
- having a dedicated quality department
- ensuring quality objectives are established, monitored and achieved
- ensuring adequate resources are available for continuous improvement of quality
- striving for building quality products right the first time

Proterra's quality assurance program controls all phases of the product life cycle including proposals, contracts, design, sourcing, manufacturing, delivery and service. By gathering reliable information on customer expectations through the proposal and contracts processes, Proterra can design, manufacture, deliver and service a product that meets those expectations.





Proterra's product quality starts with control of engineering design and development. The inputs to this process are customer requirements, functional and performance requirements, regulatory requirements, and lessons learned from previous experience. By following our Engineering Change Order (ECO) process, we have systematic review and approval of the design and validation results by a cross functional team. This process ensures that the engineering design meets all of the input requirements and has sufficient definition to be manufactured and assembled into the vehicle.

To maintain the integrity of our drawings, specifications and procedures, Proterra uses a Change Control Board (CCB) to review and approve all changes impacting the definition of the vehicle. The CCB requires review and approval from Engineering, Manufacturing, Quality and Service before changes can be implemented. The ECO and CCB processes ensure that the engineering definition of the bus is maintained in a controlled manner and that sufficient definition is available to source, manufacture, assemble and deliver a completed vehicle.

Proterra ensures that the correct parts are purchased by including detailed information of all drawings, specifications and standards on the purchase order. Information is transferred to suppliers using secure file sharing software which allows Proterra and its suppliers to maintain current revisions of all controlled documents. Where warranted, suppliers must submit supporting data to prove manufactured parts meet the purchase order requirements. Certain critical components also have required reception inspection, and every part is inspected at point of use before assembly onto the vehicle.

Once conforming parts are received, they are assembled onto the vehicle using well defined and controlled processes. The primary controls for assembly are the engineering Bill of Materials (BOM), drawings, specifications and work instructions. These materials ensure that assembly professionals, meeting the minimum training requirements, have all of the information and tools necessary to assemble the vehicle properly. Tools used for product acceptance to meet an engineering standard must be compliant with Proterra's gage calibration program. Proterra uses a reputable 3rd party vendor to ensure that all gages, tools, and instruments are certified to national standards.

Proterra monitors adherence and compliance to the engineering specifications using a rigorous inspection program. Proterra quality inspectors are involved in approving products from incoming inspections, sub-assemblies, individual work stations, and the final completed vehicle. Quality inspector approval is required for material to move between sections of the assembly process. Proterra's quality inspectors are senior, experienced quality professionals who have received 3rd party training in quality assurance principles. In addition to our quality inspectors, all Proterra employees are well informed of customer expectations and can stop the line if they have a quality concern.

If a non-conformance is detected, it is logged in our Non-Conformance Record (NCR) database. This database is available for all Proterra employees to raise a quality concern. It also serves as a template to walk employees through the process of containing, identifying, segregating, correcting and preventing non-conformances. The keys to this process are having engineering provide a disposition and the quality department verify that the disposition is appropriately applied. There are multiple check points in the vehicle assembly process to ensure that all non-conformances are resolved in a timely manner and that every non-conformance is addressed before delivery of a vehicle to the customer. The NCR database also allows the quality



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department to use statistical techniques to track quality performance and isolate areas for continuous improvement.

Detailed records of all quality processes are retained by Proterra to serve as evidence that the processes are being followed and that a completed vehicle meeting the engineering requirements is delivered to the customer. This data also allows Proterra to review long term trends and continually improve the effectiveness of our quality management system. The goal at Proterra is to do everything right the first time through careful planning, detailed execution and continuous improvement.

**PROTERRA**

Business System Manual

ISO 9001: 2015; Quality Management Systems - Requirements

ISO 14001: 2015; Environmental Management Systems – Requirements with
guidance for use

Copy Number: _____

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Section 0.1 – Policy Statements

Proterra Quality and Environmental Policy

Safety, Quality and the Environment are integral elements of Proterra's Business Principles. They are the core of our beliefs and values. They are at the heart of how we add value to the world. At Proterra, our commitment is to never compromise on the safety, compliance and quality of our products and services and to protect the environment in our daily activities. It requires everyone to be engaged, to understand our responsibilities and to be empowered to act to live up to these principles.

Proterra's Quality and Environmental Policy is:

- **Foster a Customer oriented quality mindset with the intent to develop, manufacturing and deliver products and services with Zero Defects**
- **Encourage participation of all our associates, suppliers, business partners and customers in the improvement of quality and the environment**
- **Drive an Environmental Management System that is consistent with our Zero Emissions objectives and prevent pollution, minimize waste, recycle materials and utilize materials efficiently wherever practical throughout the company, to protect the environment**
- **Commit to continually improve the Quality and Environmental Management Systems by focusing on our fundamental principles of Safety, Quality and the Environment, and our commitment to improve our carbon footprint and reduce carbon emissions.**
- **Comply with all relevant laws, regulations and compliance obligations**

To achieve this policy, Proterra is committed to establish and maintain an effective Quality Management System (QMS) as well as an Environmental Management System (EMS) conforming to the requirements of ISO 9001 and ISO 14001, respectively. Both management systems are described within this common manual.

To ensure that Proterra fully meets these policies and objectives, the effectiveness of the Quality and Environmental Management Systems are subject to regular review by Proterra executive management.

The Proterra policies are accessible to interested parties on Proterra's website.

Revision Date:
8/4/2020

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Section 0.2 – Revision History

The Business System Manual was issued originally on September 30, 2019. The following revisions for the last three years have been approved and issued:

Revision Date	Revision Details
10/31/19	Cover Page – added logo. Sec. 0.3 – added that Public Drive is list of documents applicable to system. Sec. 0.4 – added availability of EMS scope. Sec. 1.2 – updated the form numbers listed in the bus short ship process flow. Sec. 1.6 – changed title of Aftermarket Warranty Parts Manager to Parts Manager. Sec. 2.4 – added list of engineering groups in Purpose section. Also changed Manager of Publications responsibilities from Customer Service process. Added new form number for Change Management. Sec. 2.9 – added Warranty Manager responsibilities. Sec. 2.11 – removed reference to Red Carts. Sec. 3.3 – added reference to resume as part of competency records and changed Grandfather clause to 11/1/19. Sec. 3.5 – added Master Compliance Obligation Matrix. Appendix – updated list of records
12/31/19	All – updated titles to match titles in Proterra's Org. Chart in intranet. Sec. 1.1 – removed reference to C of A's since these are not required from suppliers. Sec. 1.5 – added responsibility of notifying contractors of the environmental requirements for construction of infrastructure. Sec. 2.3 – added CPM-WI-009 to process flow and revised process flow to include last step of resolving post-delivery concerns and issues. Sec. 2.4 – added if required for product validations in Responsibilities and Authorities section and in process flow, added requirement to address the environmental requirements for each life cycle stage of company products. Sec. 2.5 – updated titles and added environmental criteria for approving and evaluating new direct suppliers. Also added "if required" to SQE auditing all new suppliers. Sec. 2.7 – added subcontracted services to meeting compliance obligations and removed reference to Demand Planning Manager. Sec. 2.9 – added process flow for customer concerns and issues and process flow for customer surveys. Sec. 2.10 – added responsibility for control of non-precise measuring tools. Sec. 2.11 – added responsibilities for removing obsolete parts or product from inventory. Sec. 2.12 – added responsibilities for VP of IT, changed title of ISO Coordinator to QS Coordinator and changed responsibilities from NQD to site Quality Leader. Sec. 3.1 – improved verbiage to demonstrate plan to achieve objectives and replaced "statutory and regulatory" with compliance obligations. Sec. 3.2 – revised requirements for management review to cover all management review requirements instead of all requirements. Sec. 3.4 – removed "weekly" before CQE meeting reference, revised corrective action process flow to include review of Risks and Opportunities Matrix, and changed to appropriate Facility Manager coordinating compliance audits. Sec. 3.5 – add responsibility for maintenance of facility and production equipment plus any changes that effect the environment and modified significant aspects process flow to add if additional controls are required. Records Table – removed to a standalone document.
1/31/20	Sec. 0.0 – Renumbered all processes to align with Sec. 0.6 Interaction Flowchart. Sec. 0.3 – replaced National Quality Director (NQD) with Director, Battery Operations and Manufacturing Strategy (DBO). Sec. 0.4 – added breakdown of QMS Scope of Registration by plant and eliminated development, test and delivery from scope. Sec. 0.5 – replaced NQD with DBO. Sec. 0.6 – added new process flowchart showing interactions of all processes. Sec. 1.1 – removed reference to Business Engagement and updated responsibilities for Business Development. Sec. 1.2 – combined Business Engagement (old Sec. 2.1) and Customer Program Management (old Sec. 2.3) into a new process called Customer Success and moved the SIOP process (old Sec. 2.2) into new Sec. 2.3. Sec. 1.3 – changed inputs from Program Management requests to Customer Success requests. Sec. 1.4 – moved requirement to notify supplier of lost or damaged supplier owned material to Sourcing process (Sec. 2.4) and moved requirement to notify customer of lost or damaged customer owned material to new Customer Success process (Sec. 1.2). Sec. 1.6 and 1.7 – removed reference to factory OEE. Sec. 2.1 – added VP, HR responsibilities and substituted DBO for NQD. Sec. 2.3 – substituted DBO for NQD. Sec.

Revision Date:
8/4/2020

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	2.4 – added a fourth supplier ranking called problem supplier. Also added responsibilities as described in Sec. 1.4 above. Sec. 2.7 – renamed to add Process Engineering and added responsibilities of Burlingame Process Engineer. Sec. 2.10 – added responsibilities for controlling 3D models and changes to BOMs. Sec. 3.1 – substituted DBO for NQD. Sec. 3.2 – substituted DBO for NQD. Sec. 3.3 – moved Customer Program Management to Sec. 1.2 and Technical Publications to Sec. 1.3. Revised flowcharts to new responsibilities and titles. Sec. 3.4 – added requirement for layered process audits and substituted DBO for NQD.
2/29/20	Sec. 0.5 – changed Quality Management Systems Coordinator to ISO Document Control Specialist in all sections. Sec. 1.2 – updated responsibilities and flowchart to current process. Sec. 1.3 – changed titles to reflect current customer success process. Sec. 1.4 – revised the process flowchart. Sec. 1.8 – added to purpose that the infrastructure designs do not follow the requirements of Sec. 1.3 for products. Sec. 1.9 – Revised process flowchart. Sec. 2.1 – added reference to Skills Matrix for verifying competency and added HR Leadership to 2 nd box of process flowchart. Sec. 2.3 – removed requirement for Contingency Plan and modified flowchart to add QMS Coordinator to update Risks and Opportunities Matrix and training records. Sec. 2.8 – added that tools calibrated internally have a work instruction. Sec. 2.9 – updated responsibilities and flowchart to current process. Sec. 2.10 – updated titles in responsibilities and flowchart. Sec. 3.1 – updated responsibility for Risks and Opportunities Matrix. Sec. 3.4 – updated flowcharts to current requirements.
5/20/2020	Section 3.2 Separated performance trends on Quality and Environmental Objectives to two meetings Quality and Safety and Environmental Sec. 1.8 Replace SR, Director with VP, Energy
7/14/2020	Section 0.3 Master Copy 2 changed DBO to Quality Management Systems Coordinator. Sec 2.0 replaced DBO with Quality Management Systems Coordinator. 2.3 replaced DBO with Quality Management Systems Coordinator. Section 3.1 Replaced DBO with Quality Management Systems Coordinator. Replaced ISO Document Control specialist with Quality Management Systems Coordinator. Section 3.1 Replaced ISO Document Control Specialist with Quality Management Systems Coordinator and replaced DBO with VP of Quality. Removed percentages from Proterra's Metrics. Remove CQE. Sec 3.2 Rewrote paragraph 1 to reflect new Quality and Environmental Meetings being held separately. Replace DBO with Quality Management Systems Coordinator. 3.4 Replaced DBO with Quality Management Systems Coordinator. Removed internal audits will be performed by a third parts to QMS Coordinator will conduct them. Changed paragraph six to read Quality Management Systems Coordinator responsible for quality and DBO responsible for Environmental. Changed the seventh paragraph from DBO to VP of Quality. Updated Environmental and Quality Policy to include Proterra's commitment to protect the environment, .06 gave Proterra Powered its own box in process flow
8/4/20	Updated Sec. 3.4 Updated Corrective action process flow

Only revisions issued in accordance with the Control of Documents and Records Process in Section 2.10 of this manual and authorized by the CEO or COO below are inserted in the manual.

Approved By: Josh Ensign COO
(CEO or COO)

Section 0.3 – Circulation List

The Quality Management Systems Coordinator or designee controls an electronic copy and a hardcopy, Master Copy, of the Business System Manual. The following are controlled hardcopy holders:

Copy Number	Manual Holder
Electronic Master Copy 1	PDF on Public Drive Quality Management Systems Coordinator,

Additional copies of this manual are available upon request and authorization by the Quality Management Systems Coordinator. If controlled, the list is amended and the Quality Management Systems Coordinator, or designee, as necessary, provides the additional copy. Unauthorized photocopying of any part of the manual is not permitted, under any circumstances.

Printed copies of any of the controlled documents, other than the Master Copy, are uncontrolled copies. They are not updated. The Public Drive is the list of the internal and external documents, standards and reference manuals applicable to Proterra.

Section 0.4 – Company Background and Scope of Registration

Proterra was established in 2004 in Golden, Colorado to produce electric buses with Zero Emissions for a cleaner environment. In 2011, Proterra opened the Greenville, South Carolina facility for bus assembly and engineering. The Burlingame, California corporate headquarters and battery manufacturing center was opened in 2015, making Proterra a high-tech company located in the heart of Silicon Valley. In 2017, Proterra opened the West Coast bus assembly plant in City of Industry, California. In 2019 the Proterra Powered business group was organized to provide parts and products to OEM companies worldwide.

All Proterra facilities have modern offices, conference rooms, and communication and development equipment.

Its customers and its peers in the industry recognize Proterra for its innovative parts and products. The Company has also been recognized for its excellent quality and service plus its commitment to providing “Zero Emission” products to protect the environment. The Company is focused on the future, recognizes that their associates are their most valuable resource, and strives continually to exceed their customer’s expectations.

Scope of Registration: The design and assembly of electric buses and supporting power and charging systems.

Burlingame – The design and assembly of batteries and charging systems.

Greenville – The design and assembly of electric buses.

City of Industry – The design and assembly of electric buses.

The scope of the Environmental Management System includes all current facilities. This scope is available to interested parties when requested.

Section 0.5 – Organization Chart

The complete Organization Chart with names is in Proterra's Intranet. The Organization Chart along with the Responsibilities and Authorities defined in each section of the manual effectively communicates the responsibility and authority of the Quality and Environmental Management Systems to the organization.

https://proterra.mangoapps.com/sites/peoples?org_chart=true

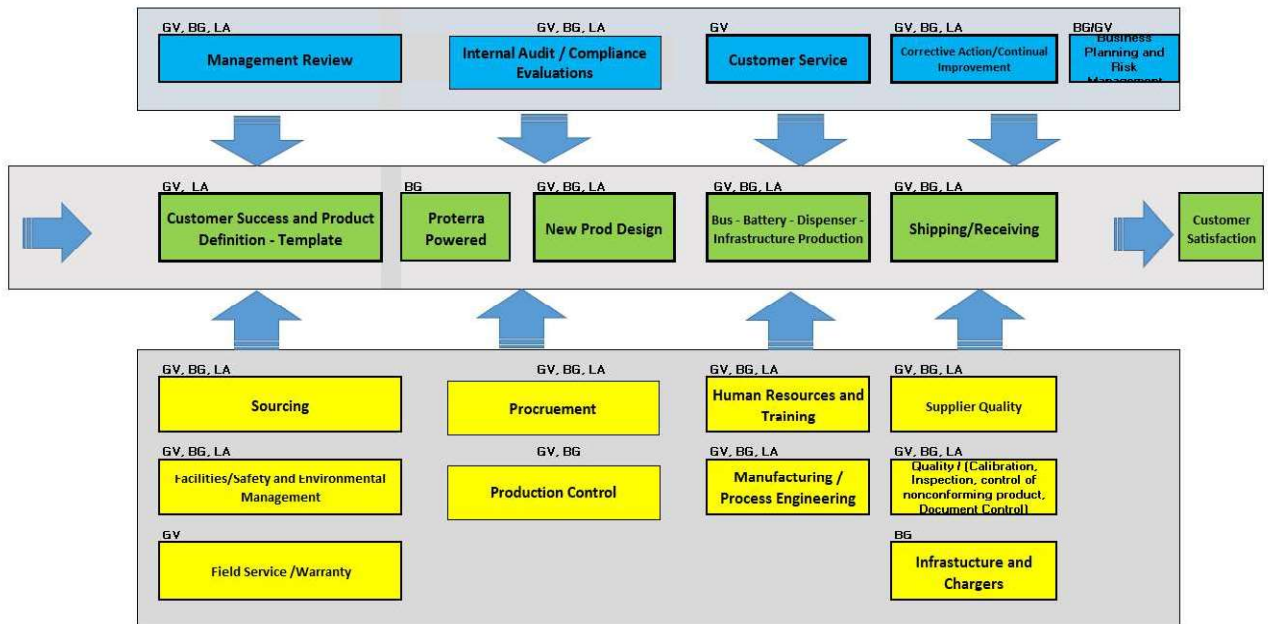
The CEO and COO have appointed the VP of Quality, The Quality Management Systems Coordinator) to manage the Quality System and the DBO the Environmental Management Systems and report on their performance, effectiveness and opportunities for improvement. The Director of Bus Quality has been appointed to be the backup for the Quality Management Systems Coordinator, if the Quality Management Systems Coordinator is unavailable. The Quality Management Systems Coordinator or designee also promotes customer focus throughout the organization and coordinates changes to the Quality and Environmental Management Systems so that the changes are planned and implemented.

Section 0.6 – Process Interaction Flowchart

The sequence and interaction of the processes of the overall organization are described by the flowchart below. Each section of the manual also has a more detailed flowchart for that section, if applicable.



Process Description



Section 1.0 – Core Processes

Section 1.1 – Sales and Business Development (Proterra Powered)

Purpose

This process describes the individual responsibilities and authorities, procedures, documents and records used to define the sales and business development process.

Responsibilities and Authorities

The VP, Proterra Powered, Director, Business Development, Director, Product Management or designee are responsible for contacting customers, obtaining customer-specific requirements, including special characteristics, and getting feedback from customers.

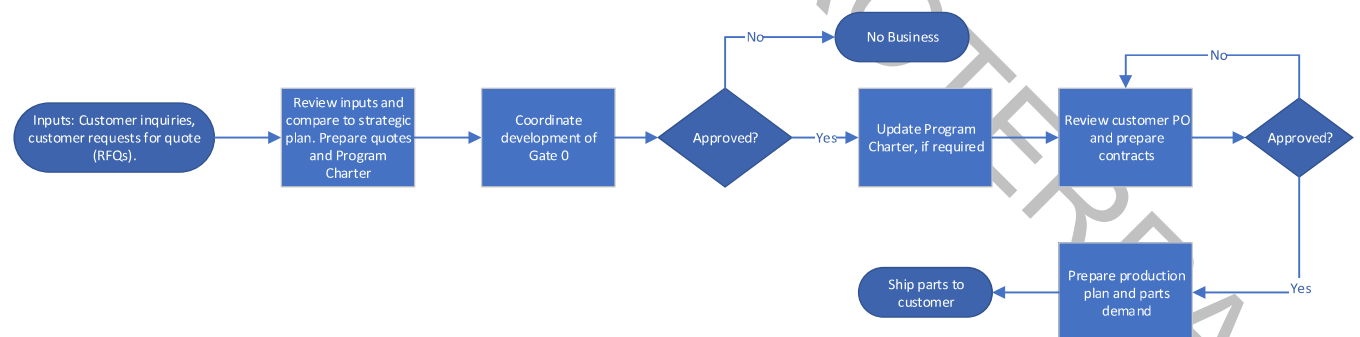
The Director, Business Development or designee is responsible for preparing quotations, establishing a Program Charter, executing contracts, and updating the Program Charter, if required.

The Program Manager, Proterra Powered, or designee is responsible for review of customer Purchase Order, the demand planning process, and creating the demand for parts.

The Director, Product Management, or designee is responsible Gate 0 sign-off.

The Director, Field Service or designee is responsible for working with the customer on any customer issues or concerns (See BSM Section 3.3).

Process



Section 1.2 – Sales and Customer Success (Bus Business)

Purpose

This process describes the individual responsibilities and authorities, procedures, documents and records used to define the sales and customer success process.

Responsibilities and Authorities

The CEO or COO, the Sr. VP, Sales, VP, Customer Success or designee are responsible for contacting customers, obtaining customer-specific requirements, including special characteristics, and getting feedback from customers.

The bid and proposal team are responsible for responding to formal customer solicitations including obtaining appropriate approvals from the Executive Team.

The VP, Customer Success, the Customer Program Manager (CPM) or designee is responsible from the point of award to establish a program charter, obtain customer configuration requirements, facilitate and execute the contract, and enter the Customer Purchase Order.

The CPM introduces the customer program into the Sales, Inventory, Operations, Planning (SIOP) Process (See BSM process 2.2), obtains approval for configurable options via the customer design review meetings and creates the demand for parts based on the completed bus templates. The CPM also manages late changes and assesses and mitigates risks associated with the production of the bus and facilitates response to Customer Change Request.

The CPM enables the receipt of any customer supplied equipment, provides regular customer communication throughout the build, coordinates for external graphics, customer visits, customer inspections and 3rd party installations like wrapping the bus or Infrastructure (see BSM Section 1.8) and commission as appropriate.

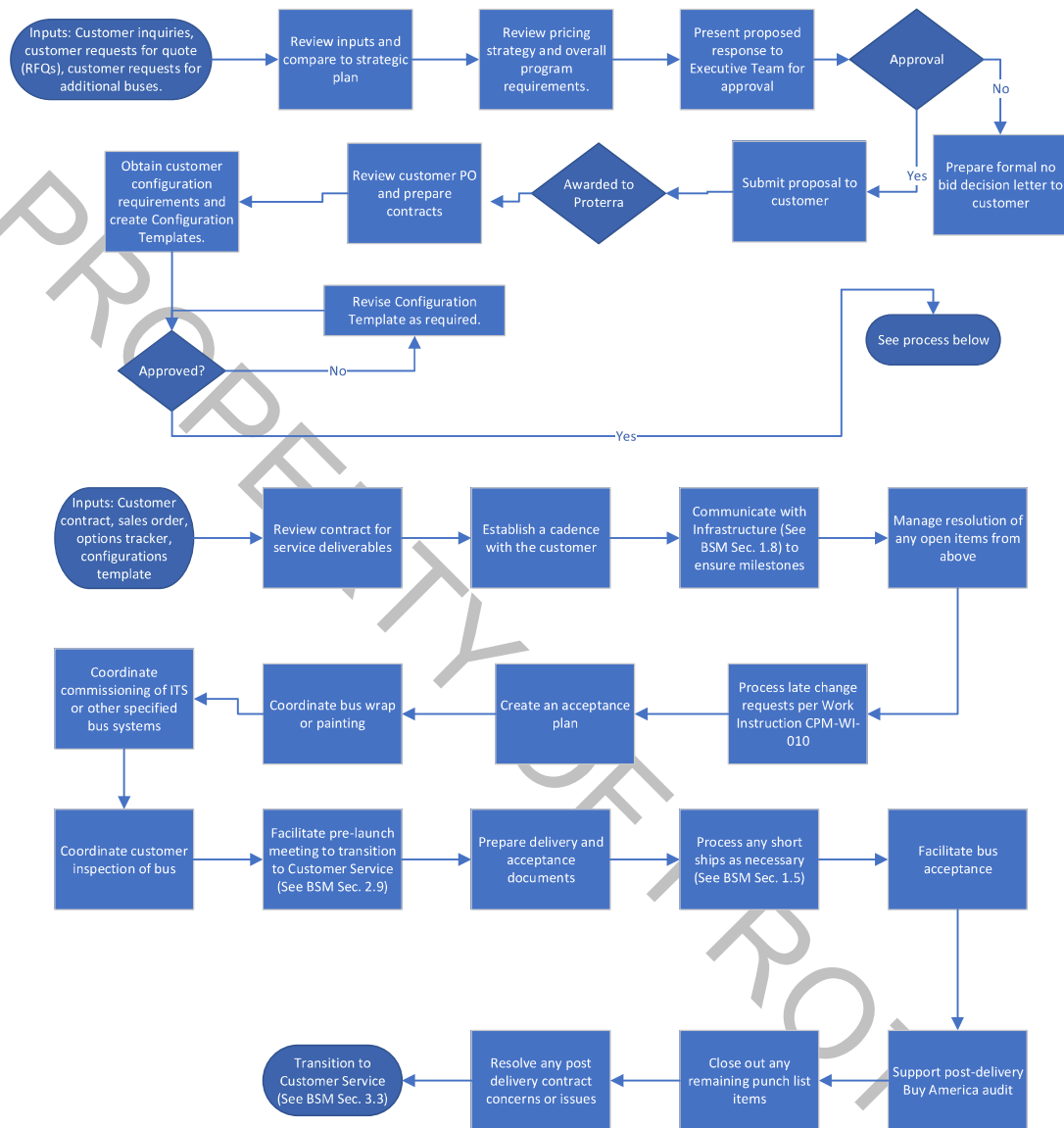
The CPM also coordinates with logistics for shipment and notifies the Field Service Representative (FSR) to plan for Post Delivery Inspection (PDI), confirms resolution of inspection findings, ensures completion of project deliverables, coordinates for project closure and acceptance documents and transfers customer to the Field Service Team.

The CPM is also responsible for notifying the customer if any customer property on site is lost, damaged or becomes unsuitable for use by completing an External Property Notification form.

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Process



Note: The above activities may be performed in any order based on customer requirements or priority

Section 1.3 – New Product Design and Development

Purpose

This Process describes the policies, individual responsibilities, procedures, documents and records used to define the new product design and development process.

Responsibilities and Authorities

The Director, Product Management is responsible for setting the product roadmap and strategy for the company and determining the requirements and communicating them to the Company.

The Director, Product Management and Sr. Manager, Program Management are responsible for developing new internal modified product and service requirements. The Director, Product Management and Sr. Manager, Program Management is also responsible for establishing controls, as appropriate, to ensure that the environmental requirements are addressed for Proterra's products at each life cycle stage.

The Director, Product Management and Sr. Manager, Program Management are responsible for maintaining the new product development documentation and communicating the results to the enterprise. See New Product Development document ENG-WI-006.

Engineering Operations is responsible for controlling, documenting and facilitating changes, including those from the supplier that affect production or the customer. Changes are validated, if required, before being implemented and approved by the customer, if required. Additional verification or validation is performed, if required by the customer. The change records are maintained in the Product Lifecycle Management (PLM) system in Arena. See Change Management document PRC-CM-001 in PLM system.

The Manager, Publications or designee is responsible for creating the technical operation and repair manuals for each product, as required.

All persons responsible for the design and development process ensure confidentiality of customer-contracted products and projects under development and related product information.

Process

New Product Development



Engineer to Order



Section 1.4 - Receiving

Purpose

This process describes the individual responsibilities and authorities, procedures, documents and records used to define the receiving process.

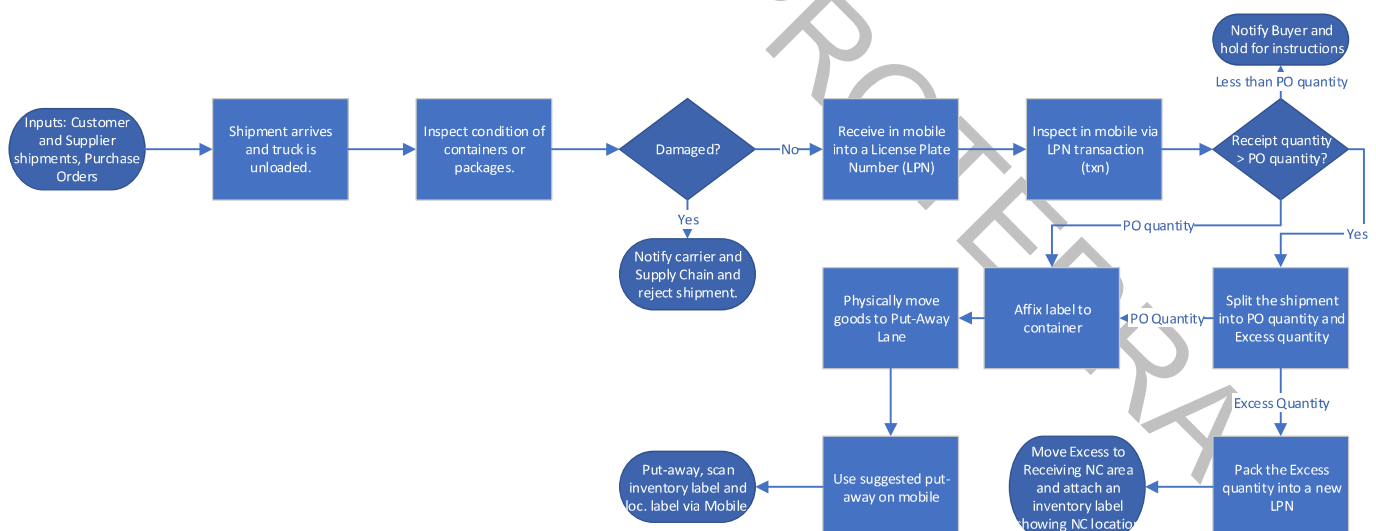
Responsibilities and Authorities

The Director, Materials and appropriate site Sr. Manager, Materials and Supervisor, Materials are responsible for establishing and maintaining the requirements for the receiving process. The appropriate site Sr. Manager, Materials or Supervisor, Materials is also responsible for the care, identification, verification and protection of customer and supplier property while it's in the facility.

The appropriate site Quality Leader (QL) or designee is responsible for approving the use of items in damaged packages, if any.

The site Shipping and Receiving (S/R) personnel are responsible for inspecting incoming material for correct identification and paperwork, quantity of material and condition of containers or packages. Additionally, the site Shipping and Receiving (S/R) personnel are responsible for logging in receipts, scanning barcode labels, applying part identification labels, and placing materials in appropriate stocking locations after it is approved.

Process



Section 1.5 – Bus Assembly

Purpose

This process describes the individual responsibilities and authorities, procedures, documents and records used to define the bus assembly process from approval of bus bodies to the commissioning and customer inspection and approval of the finished bus.

Responsibilities and Authorities

The appropriate Site Director is responsible for implementing and maintaining the operations activities necessary to meet the internal and customer requirements for quality and the environment.

The Advanced Manufacturing Engineering Manager, Manager, Manufacturing Engineering or designee is responsible for creating appropriate Work Instructions in Visual Factory for controlling quality and environmental operational controls. See BSM Section 2.7.

The appropriate site Sr. Manager, Materials, or designee is responsible for providing the required items for sub-assembly and bus assembly.

The Quality Technician is responsible for doing the required inspections at each station of the assembly process verifying the operation's quality. Required inspection Work Instructions are found in Visual Factory.

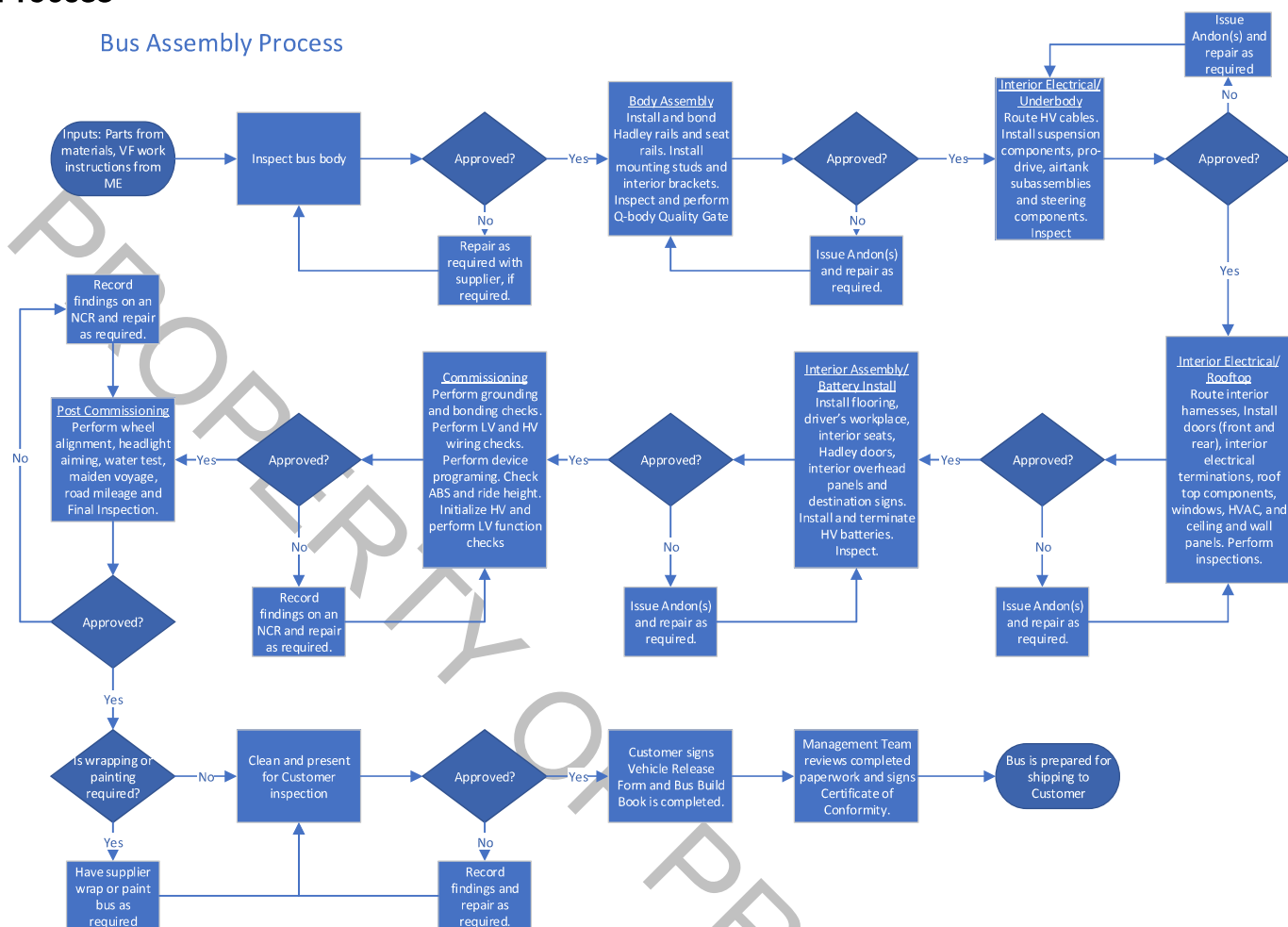
The Operations Associates are responsible for following the work instructions in Visual Factory and maintaining the fixtures and gages used in assembly. Some parts and the completed product are identified according to company and customer requirements throughout the assembly process. The completion of the work instructions in Visual Factory indicates the bus's monitoring and measurement status. Records of any serialized parts are listed in Box and some are in the Bus Build Books for traceability purposes, as required.

The site Quality Leader or designee is responsible for documenting and communicating any short ship items to Proterra leadership and the customer. The signed Certificate of Conformity with a minimum of the Site Director and site Quality Leader or their designees indicates the bus is approved for shipping to the customer. See Short ship process flow below.

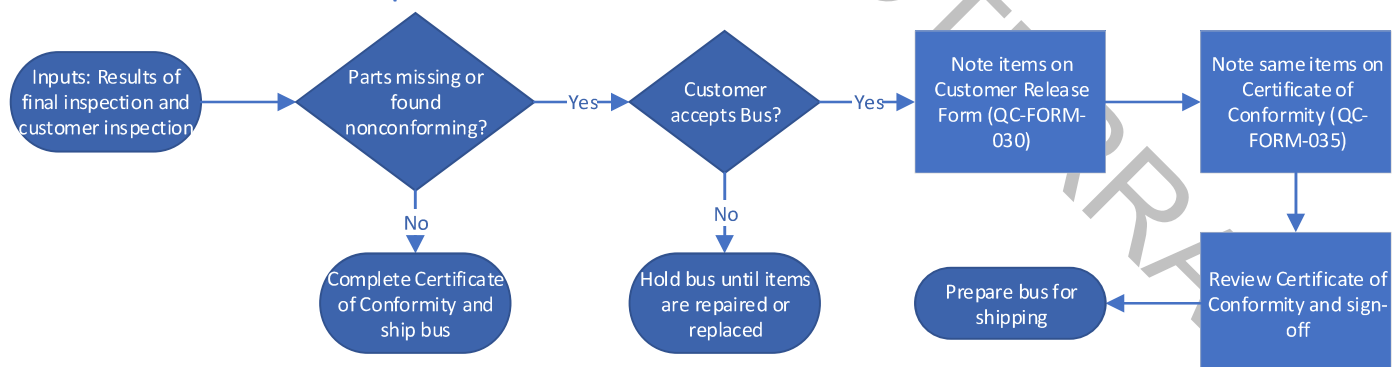
All Associates are responsible for quality, following their applicable Work Instructions, the cleanliness of their work area, working safely and protecting the environment. All Associates are also responsible for stopping production, completing an Andon and/or notifying their Supervisor when a quality or environmental problem is found.

Process

Bus Assembly Process



Bus Shortship Process



Section 1.6 – Battery Pack Assembly

Purpose

This process describes the individual responsibilities and authorities, procedures, documents and records used to define the battery pack assembly process from selection of raw material to the inventory of finished product.

Responsibilities and Authorities

The Director, Battery Operations and Manufacturing Strategy (DBO) is responsible for implementing and maintaining the operation's activities necessary to meet the internal and customer requirements for quality and the environment.

The site Process Engineer, or designee is responsible for creating appropriate Work Instructions in Visual Factory for controlling quality and environmental operational controls.

The site Sr. Manufacturing Engineer or designee is responsible for equipment sustainment.

The site Supervisor, Materials or designee is responsible for providing the required items for sub-assembly and final battery pack assembly.

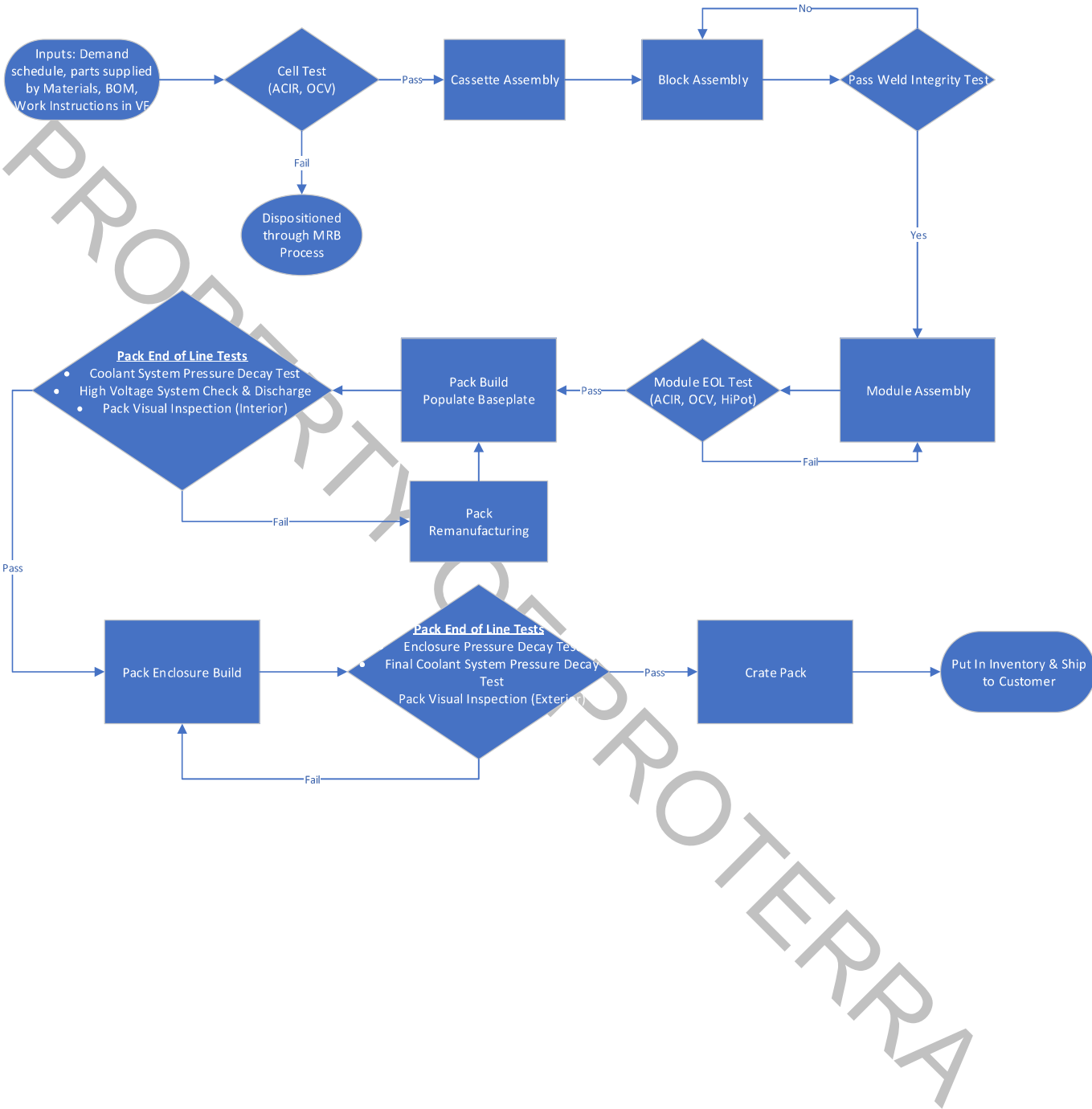
The site Quality Leader or designee is responsible for doing the required inspections at each step of the assembly process verifying operation's quality.

The Operations Associates are responsible for following the Work Instructions in Visual Factory and maintaining the fixtures and gages used in assembly. Some parts and the completed product are identified according to company and customer requirements throughout the assembly process. The completion of the Work Instructions in Visual Factory indicates the battery pack's monitoring and measurement status. Records of the serialized parts, if any, are listed in Box.

All Associates are responsible for quality, following their applicable Work Instructions, the cleanliness of their work area, working safely and protecting the environment. All Associates are also responsible for stopping assembly, completing an Andon and/or notifying their Supervisor when a quality or environmental problem is found.

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Process



Section 1.7 – Dispenser Assembly

Purpose

This process describes the individual responsibilities and authorities, procedures, documents and records used to define the dispenser assembly process.

Responsibilities and Authorities

The Director, Battery Operations and Manufacturing Strategy (DBO) is responsible for implementing and maintaining the operation's activities necessary to meet the internal and customer requirements for quality and the environment.

The site Process Engineer, or designee is responsible for creating appropriate Work Instructions in Visual Factory for controlling quality and environmental operational controls.

The site Manufacturing Engineer or designee is responsible equipment sustainment.

The site Supervisor, Materials or designee is responsible for providing the required items for dispenser assembly.

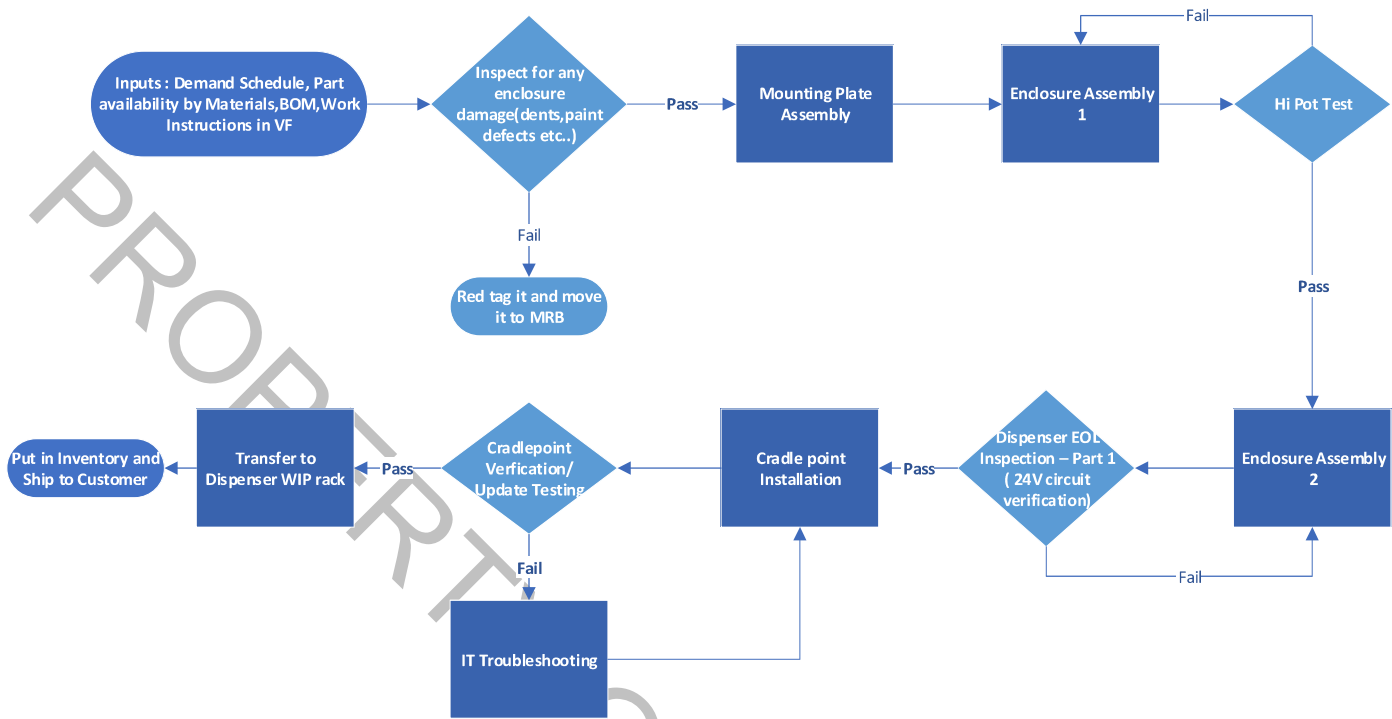
The site Quality Leader or designee is responsible for doing the required inspections at each step of the assembly process verifying operation's quality.

The Operations Associates are responsible for following the Work Instructions in Visual Factory and maintaining the fixtures and gages used in assembly. Some parts and the completed product are identified according to company and customer requirements throughout the assembly process. The completion of the Work Instructions in Visual Factory indicates the dispenser's monitoring and measurement status. Records of the serialized parts, if any, are listed in Box.

All Associates are responsible for quality, following their applicable Work Instructions, the cleanliness of their work area, working safely and protecting the environment. All Associates are also responsible for stopping assembly, completing an Andon and/or notifying their Supervisor when a quality or environmental problem is found.

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Process



Section 1.8 – Charger System and Infrastructure

Purpose

This process describes the individual responsibilities and authorities, procedures, documents and records used to define the charger system and Infrastructure process. Infrastructure designs are strictly to customer design requirements and do not follow the part and product design requirements of BSM Sec. 1.3.

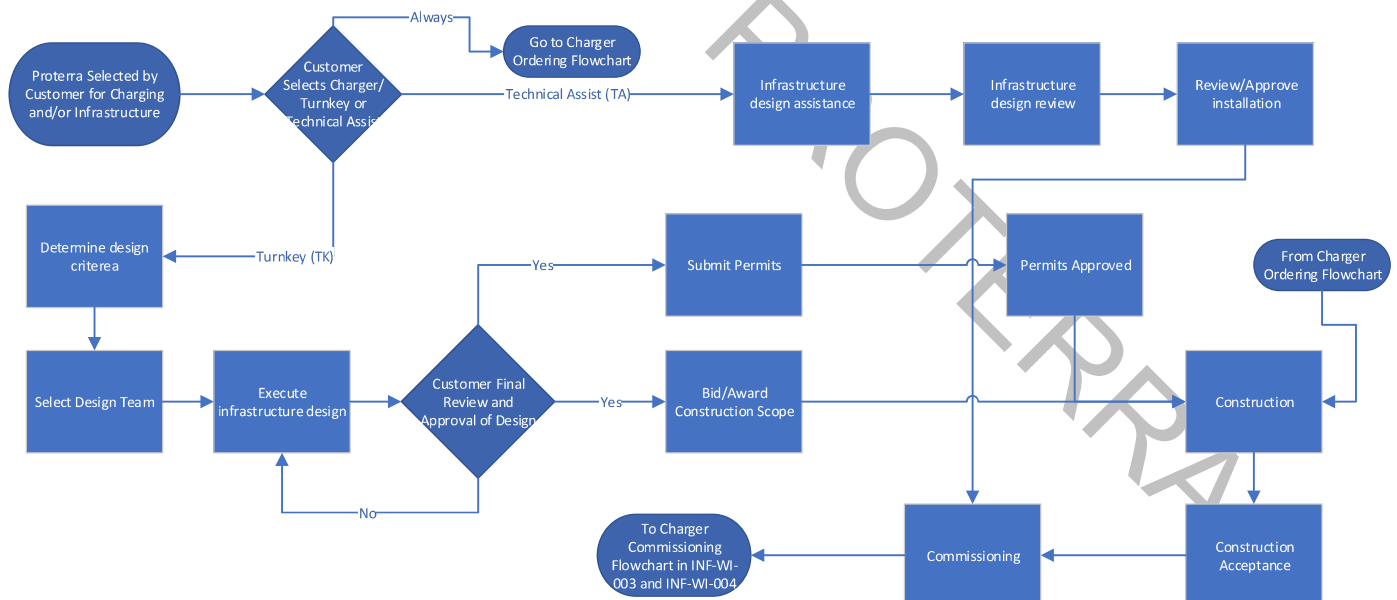
Responsibilities and Authorities

The VP, Energy or designee is responsible for working with the customer to determine if Proterra is to assist with infrastructure design and installation.

The VP, Energy or designee is also responsible completing the customer design requirements, obtaining any required permits, communicating any environmental requirements and coordinating the construction and final customer approval, as required.

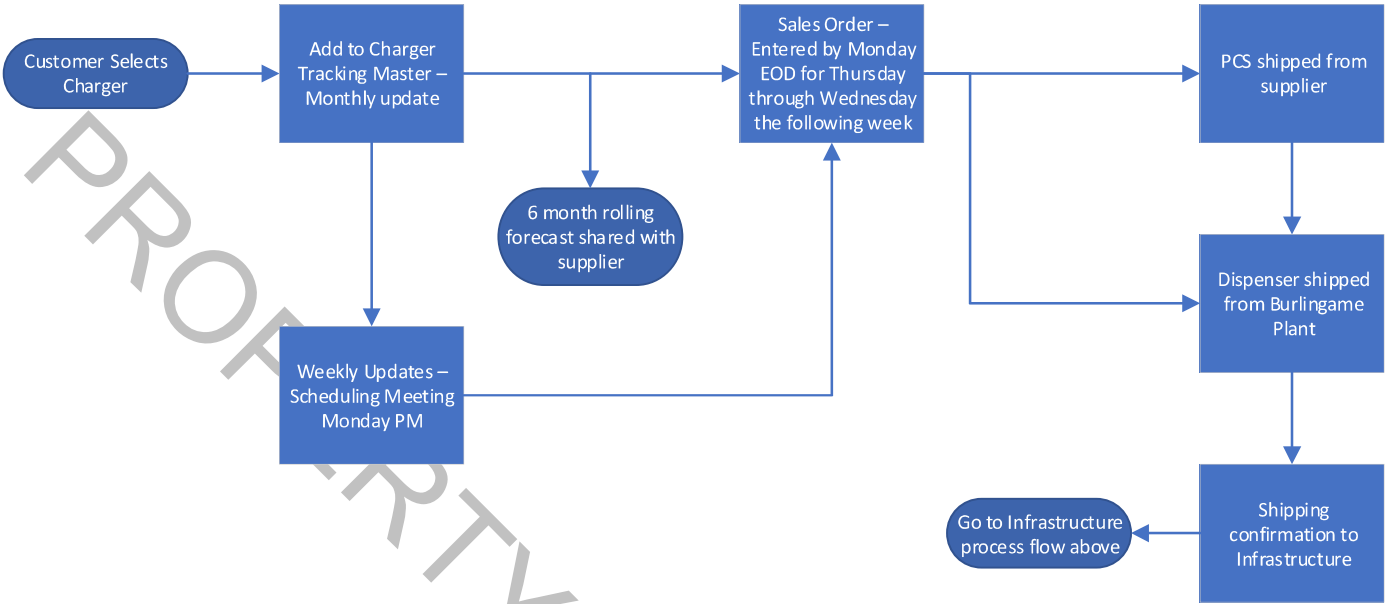
The VP, Energy or designee is also responsible for coordinating the ordering and delivery of the chargers and dispensers when the infrastructure is completed. See Charger Ordering Process below.

Process



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Charger Ordering Process



Section 1.9 –Shipping

Purpose

This Process describes the policies, individual responsibilities, procedures, documents and records used to define the shipping process.

Responsibilities and Authorities

The Manager, Logistics (ML) or designee is responsible for the overall transportation and coordination of raw material, prototypes, finished product and aftermarket warranty parts. The ML or designee is also responsible for transportation, coordination and documentation of all international logistics and shipping including compliance to international tariff and treaty requirements. Transportation suppliers are reviewed and approved by the ML and a list of approved suppliers is on the network

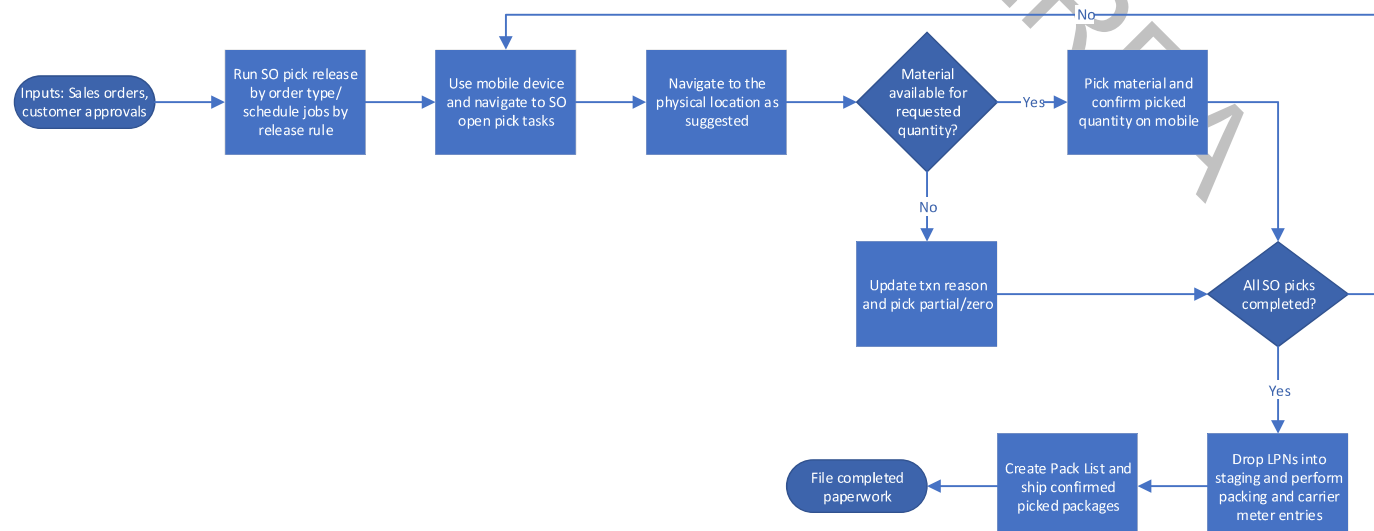
The appropriate site Manager, Materials, Supervisor, Materials or designee is responsible for establishing and maintaining the requirements for the handling, storage and warranty part shipping process. Obsolete parts or product is handled per the Control of Nonconforming Parts and Product Process, See BSM Section 2.9.

The Warranty Manager or designee is responsible for the final release of warranty parts and product to be shipped to the field. See BSM Section 3.3.

The ML, site Manager, Materials or designee is also responsible for preparing the Bill of Lading, Packing Slip, and Invoice, if required.

The site Shipping and Receiving (S/R) personnel are responsible for obtaining the appropriate paperwork, staging and loading the outbound parts or product according to the First-in First-out (FIFO) inventory management system, scanning the barcodes, if applicable, and completing the appropriate shipping paperwork with the driver.

Process



Section 2.0 – Support Processes

Section 2.1 – Human Resources and Training

Purpose

This process describes the individual responsibilities and authorities, procedures, documents and records used to define the process for human resources and training.

Responsibilities and Authorities

The CEO or COO (Top Management) are responsible for providing the required resources, quality, environmental, health and safety training for the organization and motivation to achieve objectives and targets, make continual improvements and create an environment to promote innovation.

The VP, Human Resources (HR) or designee is responsible for hiring and facilitating the creation of Job Descriptions for all positions covering required education, training, skills and experience. The appropriate HR person reviews the new associate's resume and provides the on-boarding training but the quality, environmental, health, safety and technical training is provided within the appropriate department as required. The resume and appropriate training records are the records of competency. Note: Those persons who were hired prior to November 1, 2019 are fully competent with or without a formal record.

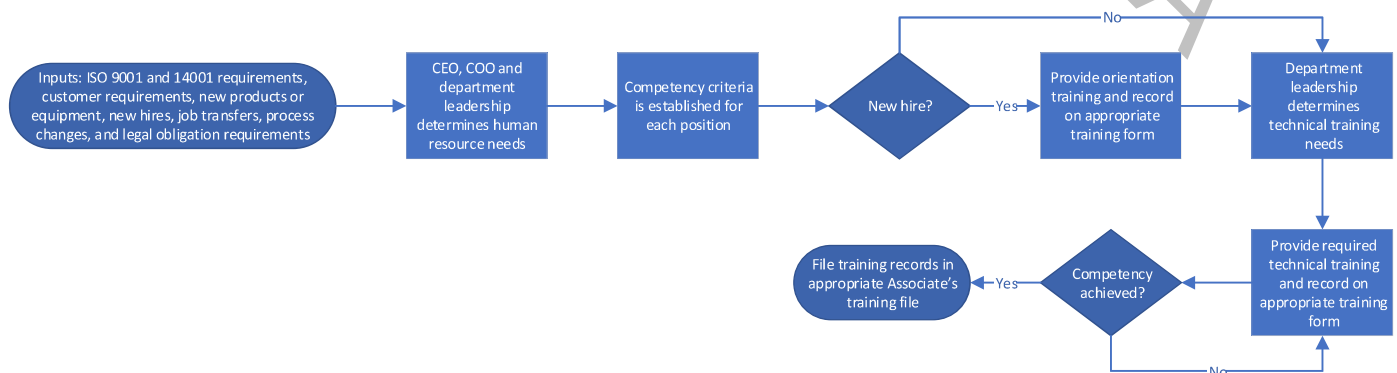
The Quality Management Systems Coordinator or designee is responsible for coordinating the required quality and environmental training and maintaining the quality and environmental training files. The internal audits evaluate the effectiveness of the training provided and measure the extent to which people are aware how they contribute to meeting Proterra Objectives. See BSM Section 3.4.

The Leadership Team, consisting of Top Management and their direct reports, is responsible for determining the training needs of their people and then coordinating the required internal, external or on-the-job training so that customer requirements are consistently and effectively met. A training Skills Matrix is created to verify competency requirements.

The Quality Management Systems Coordinator or designee is responsible for internal quality and environmental communication through bulletin board postings, email bulletins and staff meetings.

All Associates are responsible for attending the provided training classes and applying the lessons learned to meet customer requirements and continually improve Proterra's processes and its objectives. Each person is aware of the relevance and importance of their activities and how they contribute to meeting the Proterra Objectives.

Process



Section 2.2 – Sales, Inventory and Operations Planning (SIOP)

Purpose

This process describes the individual responsibilities and authorities, procedures, documents and records used to define the sales, inventory and operations planning (SIOP) process.

Responsibilities and Authorities

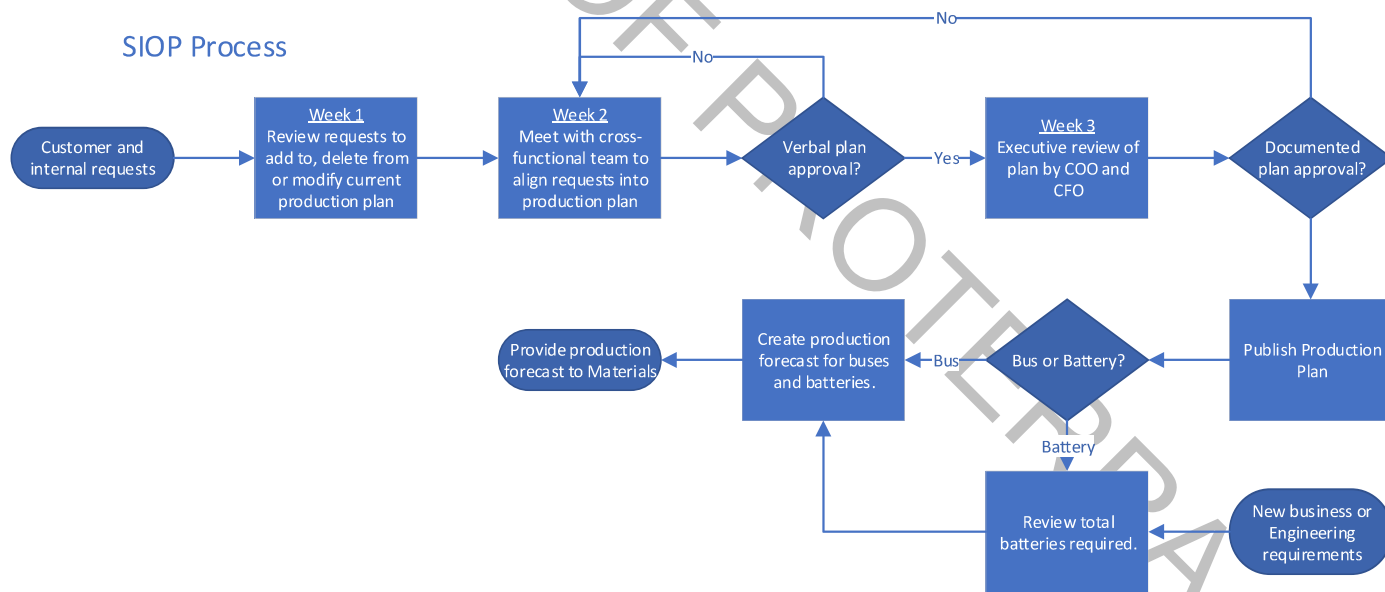
The Manager, SIOP and Operations Planning or designee is responsible for reviewing customer and internal requests and developing the proposed Production Plan.

The cross-functional planning team meets each month to review and approve the proposed Production Plan.

The COO and the CFO reviews and approves the Production Plan.

The Manager, SIOP and Operations Planning provides the approved Production Plan to Materials for procurement to support Operations.

Process



Section 2.3 – Facilities and Environmental Management System

Purpose

This process describes the individual responsibilities and authorities, procedures, documents and records used to define the facilities process and the requirements of ISO 14001 not covered by any other process.

Responsibilities and Authorities

The CEO or COO (Top Management) is responsible for providing the required infrastructure including the facility, production tooling, qualified and maintained processes and product monitoring and measuring equipment.

Quality Management Systems Coordinator is responsible for the Quality Management System (QMS) and the DBO for the Environmental Management System (EMS).

The appropriate site Facilities Manager or designee is responsible for maintaining the facility and appropriate production equipment, if any, and if controlled planned changes occur, the changes are reviewed, and actions are taken to mitigate any adverse environmental effects.

The appropriate site Facilities Manager or designee is also responsible for establishing and maintaining the Emergency Action Plan (EAP) including the review of this process and the EAP after drills or real emergency situations. Drills are performed at least annually.

The appropriate site Facilities Manager, DBO and site Leadership Team are responsible for identifying the environmental aspects and impacts of the Company's activities, products and services and determining their significance. The significant aspects are listed in the Master Environmental Aspect List maintained by the appropriate site Facilities Manager.

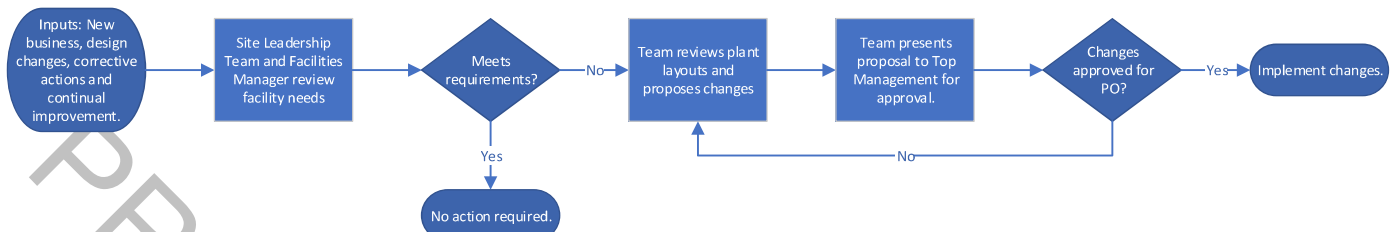
The appropriate site Facilities Manager, DBO or designee is responsible for identifying and having access to the compliance obligations. These are listed on the Master Compliance Obligation Matrix maintained by the appropriate site Facilities Manager.

The appropriate site Facilities Manager or designee is also responsible for receiving, logging and responding to relevant internal and external environmental communications. These are recorded on the Environmental Correspondence Log.

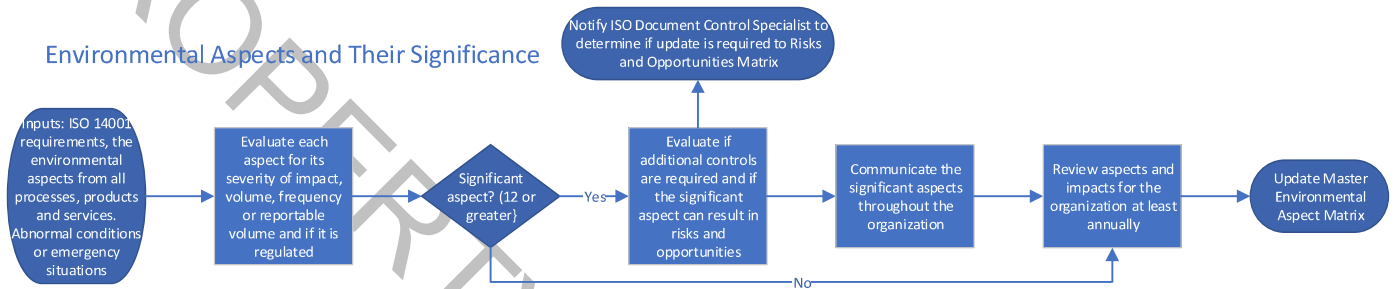
All Associates are responsible for protecting the environment throughout their job activities and for reporting to their Supervisor when they have an environmental concern.

Process

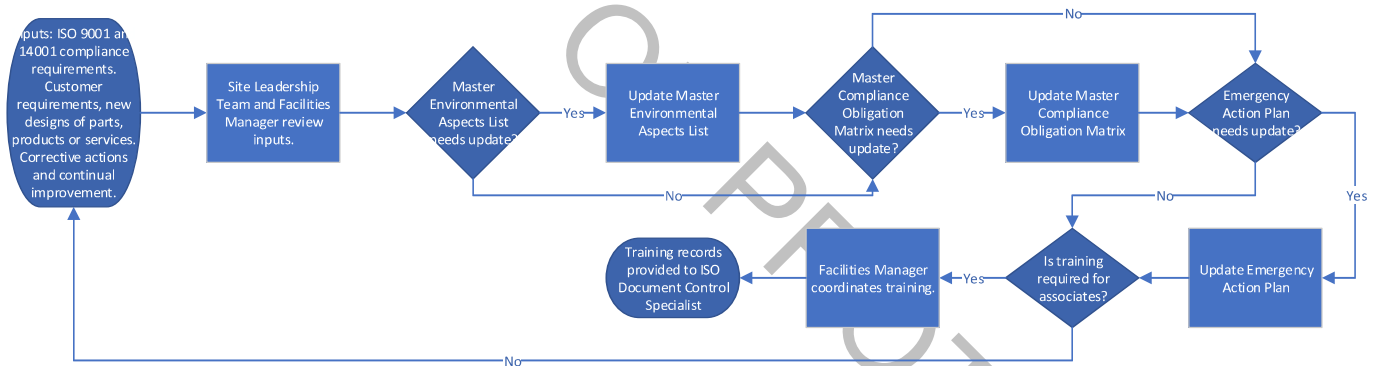
Facilities Management



Environmental Aspects and Their Significance



Maintaining Environmental Compliance Obligations



Section 2.4 – Sourcing

Purpose

This process describes the individual responsibilities and authorities, procedures, documents and records used to define the sourcing process.

Responsibilities and Authorities

The VP, Supply Chain Management (VP SCM) is responsible for assuring the top 75 suppliers by spend are evaluated and reviewed for performance and improvement cross-functionally at a minimum of a quarterly basis. The VP SCM or designee conducts monthly meetings for the review of scores and supplier improvement plans provided by the individuals listed below. The final supplier rankings (premier, preferred, probation or problem supplier) are used to support commodity sourcing strategies.

The Director, Sourcing (DS) is responsible for developing and guiding the overall strategy and supply base for each commodity. The DS is also responsible for assuring the sourcing team conducts monthly reviews of supplier performance in the areas of cost, cash, technical feedback and ease of business for the top 75 suppliers by spend. Note – the top 75 suppliers by spend account for approximately 80% of the money spent by Proterra monthly.

The Commodity Buyers (CB) and Commodity Managers (CM) are responsible for the preparation of the monthly scorecard followed by the monthly evaluation of the top 75 suppliers based on supplier performance areas of cost, cash, technical feedback and ease of business. The CBs and CMs maintain supplier action items and work with suppliers to improve performance.

The appropriate Sourcing Manager (SM) is responsible for developing and defining individual commodity strategy, supplier negotiations and management, and approving the sourcing decisions of the CBs. If any supplier property is lost, damaged or becomes unsuitable for use, the SM or designee notifies the supplier and documents the problem on an External Property Notification form.

The appropriate Sourcing Buyer (SB) is responsible for issuing the Request for Quotes (RFQs), supplier negotiation, supplier selection based off analysis from the SM developed bid list, system setup, the initial Purchase Request (PR) and Purchase Order (PO), if there is compression in the delivery requirement, and system integrity.

The New Product Sourcing Program Manager is responsible for communicating new program requirements and maintaining & improving the sourcing process.

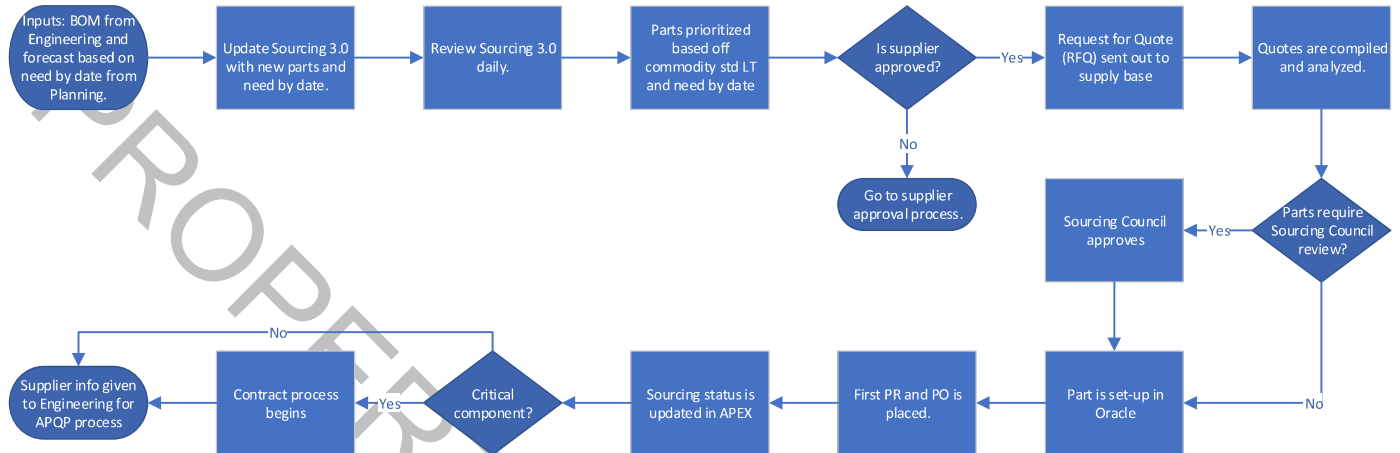
The Manager, Supplier Quality (SQM) or designee is responsible for assessing the quality of new direct suppliers (for quality and for environmental implementation status), qualifying parts produced by suppliers per the Proterra Qualification Process, managing supplier deviations and/or nonconformances and reporting supplier performance of the

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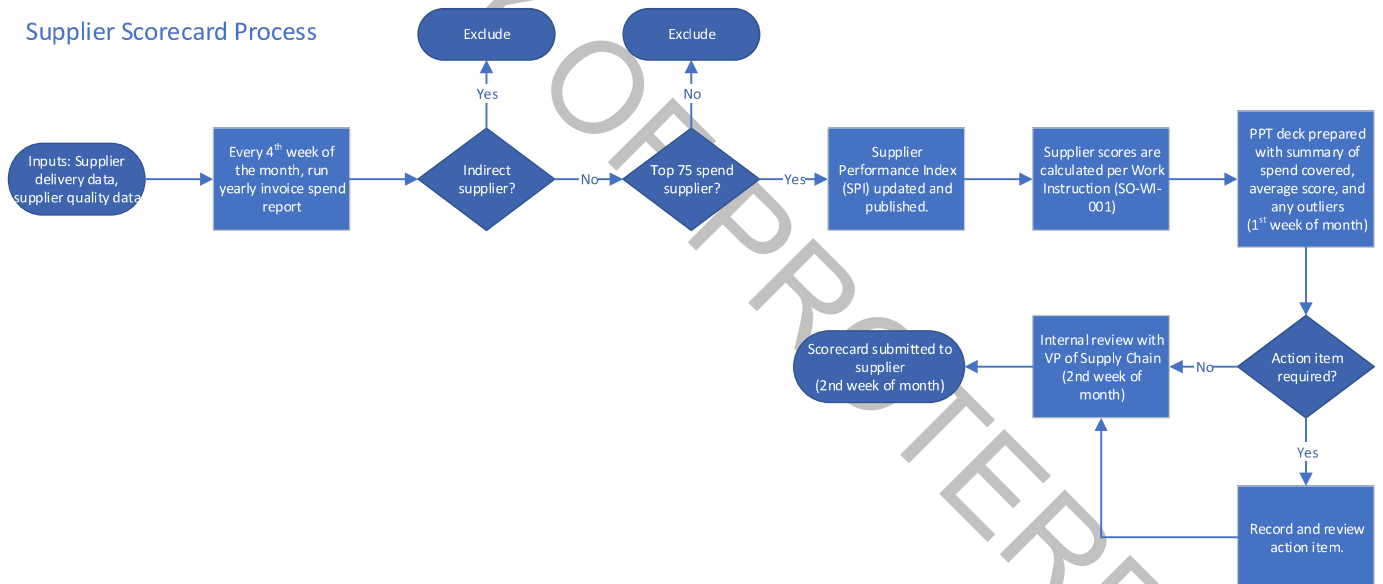
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top 75 suppliers by spend on the Supplier Scorecard and at Management Review. See BSM Section 3.2.

Process



Supplier Scorecard Process



Section 2.5 – Production Control

Purpose

This process describes the individual responsibilities and authorities, procedures, documents and records used to define the production control process.

Responsibilities and Authorities

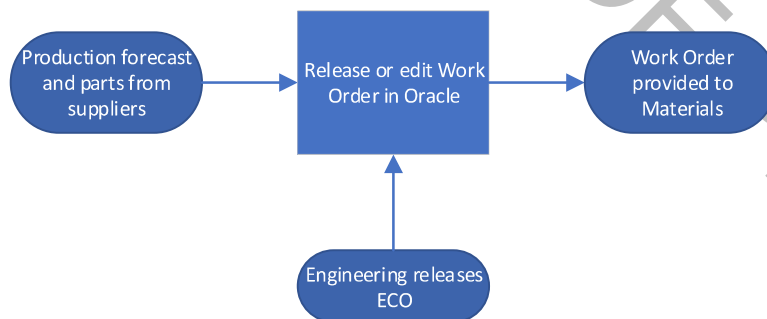
The Manager, SIOP and Operations Planning or designee is responsible for reviewing customer and internal requests for bus, battery, charger, dispenser and OEM production to create a monthly Production Plan and forecast.

The CEO, COO and CFO review and approve the Production Plan at least monthly. See BSM Section 2.2.

The Manager, SIOP and Operations Planning or designee is also responsible for releasing and editing the Work Orders in Oracle.

Process

Production Control Process



Section 2.6 – Procurement

Purpose

This process describes the individual responsibilities and authorities, procedures, documents and records used to define the procurement process.

Responsibilities and Authorities

The Director, Materials or designee is responsible for obtaining the required components for the assembly operations from suppliers approved by Sourcing. See BSM Section 2.4.

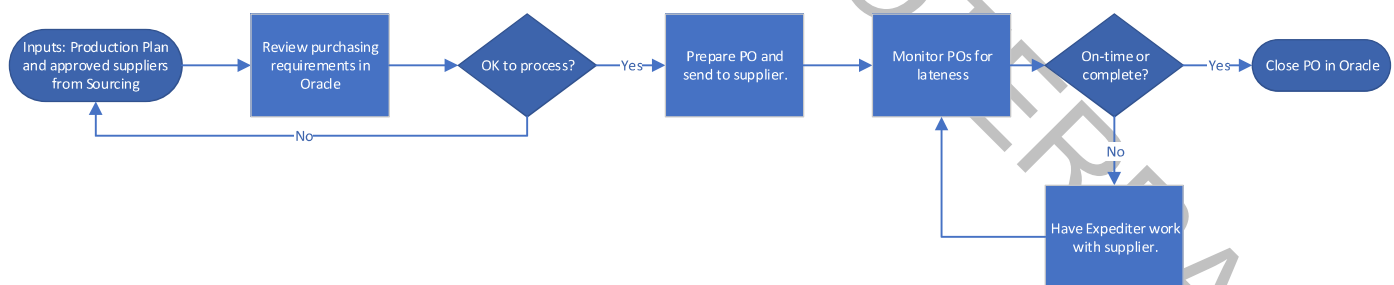
The Buyer/Planners, site Facilities Manager or designee is responsible for communicating any environmental procedures and requirements to suppliers who perform work on Proterra's premises. All parts or products purchased or used in production and subcontracted services conform to appropriate compliance obligations.

The Materials Expeditors are responsible for timely follow-up with the supplier on PO receipt and material delivery dates.

The Shipping and Receiving personnel are responsible for verification of incoming parts or product to ensure it meets Proterra and applicable customer requirements. See Receiving Process BSM Section 1.4.

All Associates are responsible for completing an IPROC Requisition Form for requesting materials or services to be purchased, having the requested purchase approved, if required, and forwarding it to the Buyer/Planner for processing.

Process



Section 2.7 – Manufacturing/Process Engineering

Purpose

This process describes the individual responsibilities and authorities, procedures, documents and records used to define manufacturing/process engineering process.

Responsibilities and Authorities

The appropriate site Manager, Manufacturing Engineering (MME) or designee is responsible for production tool and gage design. Customer-owned tooling, if applicable, is permanently marked or tagged with the customer's name.

The MME, Process Engineer or designee is responsible for verifying the BOM, item quantity, template and attribute are correct and matches with customer configuration. If changes are required, an ECR (Engineering Change Request) is submitted to Engineering.

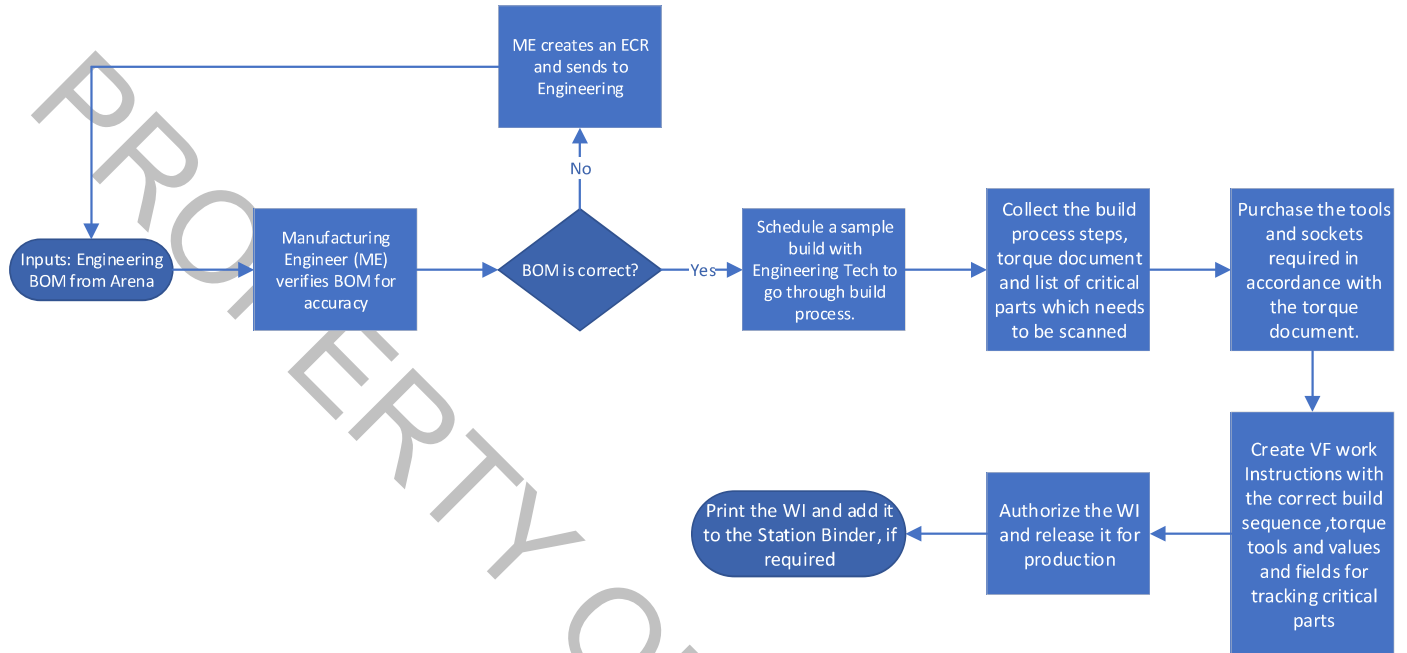
The MME, Process Engineer or designee is responsible for purchasing tools, sockets and setting the tools up in accordance with the torque document. The MME, Process Engineer or designee is also responsible for creating Work Instructions (WI) in Visual Factory with all the required data (build sequence, tool used, part tracking and required inspections).

The MME, Process Engineer or designee is responsible for reviewing the Andon's issued by Operations or Quality and make changes if necessary and authorize the WI. The MME, Process Engineer or designee also needs to make sure the station binder has the recent authorized revision of the WI in the station binder, if required.

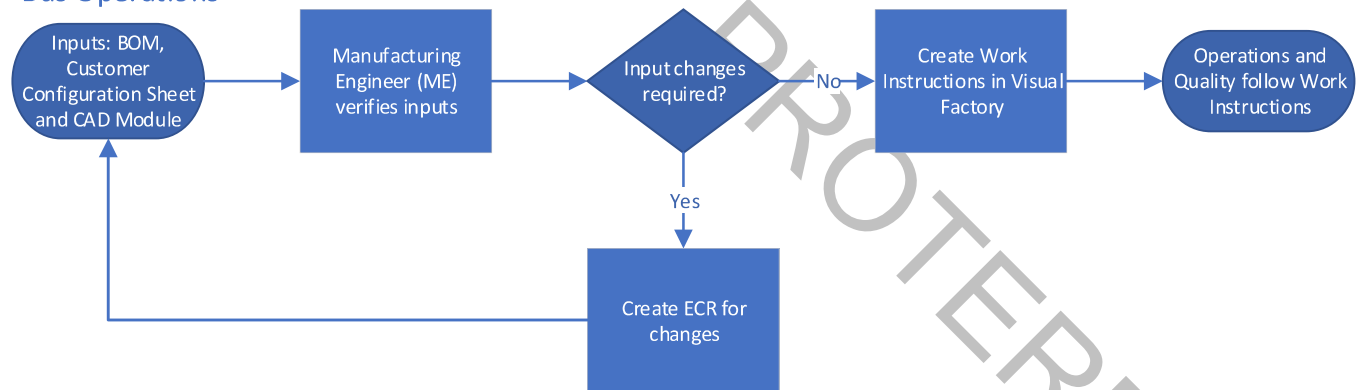
All Associates are responsible for working safely, maintaining the cleanliness of their work areas and tooling, protect production tooling while handling and reporting any equipment maintenance problems to their Supervisor.

Process

Battery Pack and Dispenser Operations



Bus Operations



Section 2.8 – Calibration and Verification

Purpose

This process describes the individual responsibilities and authorities, procedures, documents and records used to define the process for calibration and verification of monitoring and measurement devices (MMD).

Responsibilities and Authorities

The appropriate site Quality Leader or designee is responsible for determining the MMD needed to provide evidence of product conformity to Proterra and customer requirements.

The appropriate Quality Engineer (QE) or Quality Technician (QT) is responsible for the calibration and verification of MMD. This includes MMD for monitoring quality and environmental characteristics, if any. Non-precise measuring tools like scales, tape measures, templates and fixtures are checked at least annually and marked or stickered "Fit for Use". The QE or QT is also responsible for maintaining calibration, verification and fit for use records.

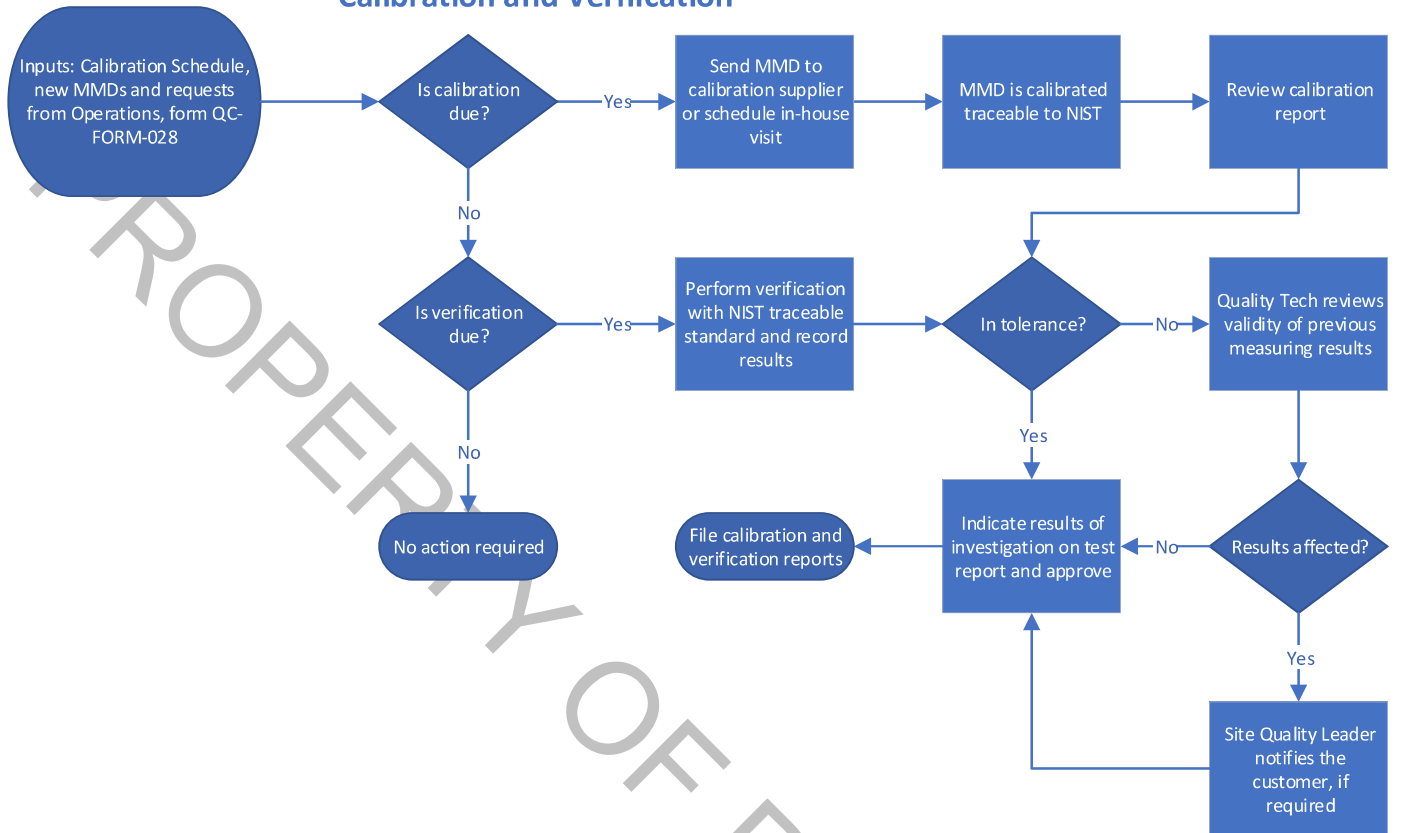
Qualified, accredited and approved external suppliers perform all the MMD calibrations with traceability to national or international standards. Calibration reports are provided to the QE or QT who reviews and files them. Those tools calibrated internally have an appropriate Work Instruction.

Qualified, accredited and approved external laboratories perform part and product testing, as required. The test reports are reviewed and filed by the site Quality Leader or designee.

All personnel that use MMDs are responsible for only using currently calibrated MMD and handling the MMD in a manner so that the calibration, verification or the measurement is not affected.

Process

Calibration and Verification



Section 2.9 – Control of Nonconforming Parts and Product

Purpose

This process describes the individual responsibilities and authorities, procedures, documents and records used to define the control of unidentified, suspect or nonconforming parts and product.

Responsibilities and Authorities

The Site Director or designee is responsible for identifying and controlling nonconforming parts and product so that they are not inadvertently shipped to a customer. Nonconforming includes unidentified and suspect parts and product.

The site Operations Manager or designee is responsible to identify suspect parts and initiate the Red Tag form with basic information describing the part as well as the problem description and affixing the form to the suspect part. The part with the Red Tag is placed onto the appropriate nonconforming cart or moved to the appropriate quarantine area.

The site Quality Leader or designee is responsible to conduct the daily nonconforming material meeting and is authorized to make decisions to disposition the parts as usable, repairable, return to supplier or scrap. A Nonconformance Report (NCR) is initiated for each return to supplier nonconforming part.

The site Manager, Operations or designee is also responsible for reworking the part or product, if required, and physically separating the nonconforming from the conforming parts.

The site Supplier Quality Engineer or MRB Coordinator is responsible to handle the return to supplier, scrapping of parts and to control the suspect parts until they are removed from the site.

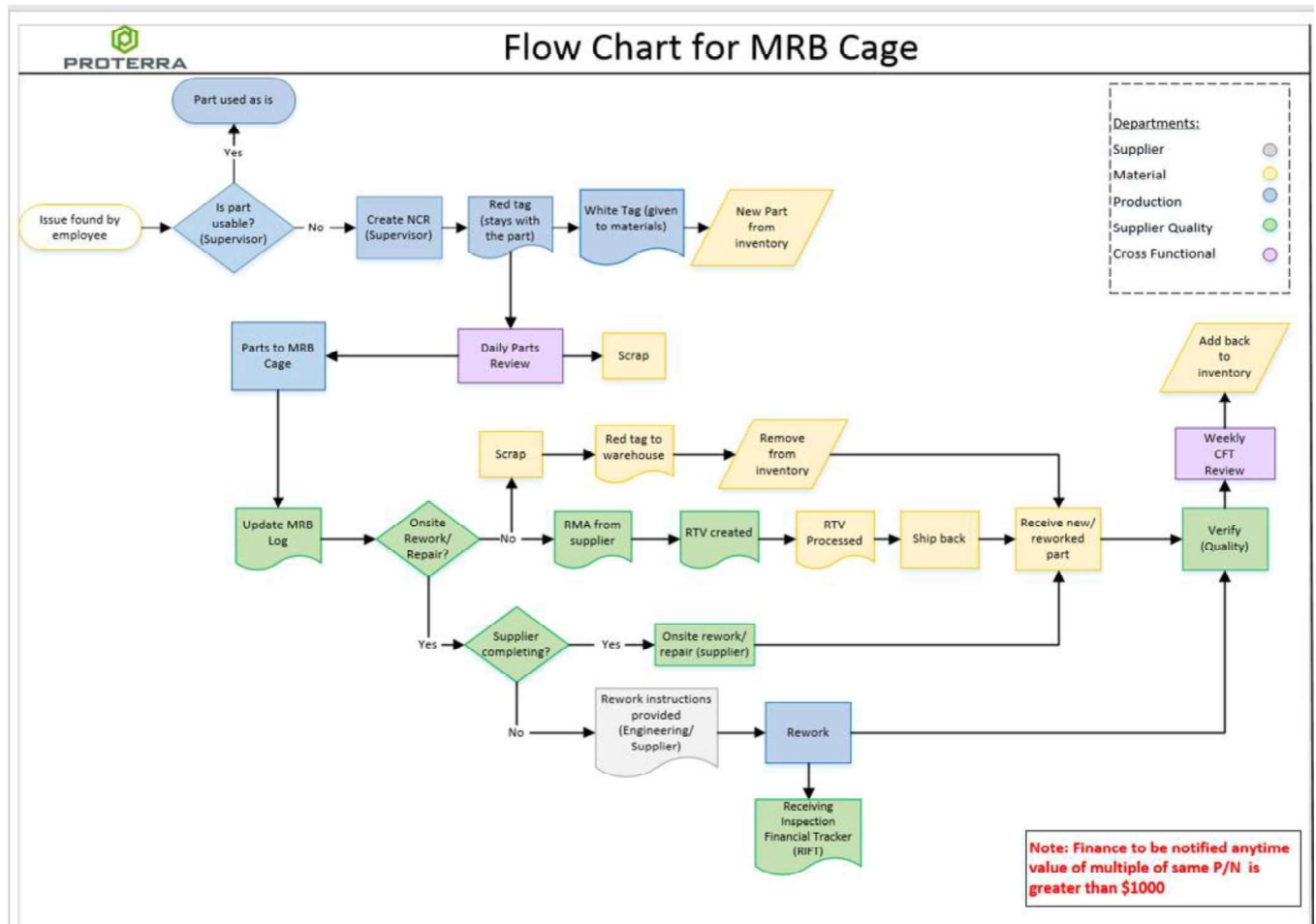
The site Quality Leader or designee is also responsible for obtaining any customer waiver of any known short ship items or nonconformances and obtaining customer signoff prior to shipment. See BSM Section 1.5.

The Director, Field Service or designee is responsible for notifying the customer of any nonconforming product that has shipped to the customer. The Director, Field Service or designee also coordinates the appropriate repair. See BSM Section 3.3.

The appropriate site Manager, Materials, Supervisor, Materials or designee is responsible for removing obsolete parts or product from inventory and either returning to supplier or discarding in appropriate containers.

All Associates are responsible for notifying the site Manager, Operations or designee when parts or products are nonconforming.

Process



Section 2.10 – Control of Documents and Records

Purpose

This process describes the individual responsibilities and authorities, procedures, documents and records used to define the control of system documentation and records.

Responsibilities and Authorities

The CEO or COO is responsible for approving the Business System Manual and appropriate department heads or Subject Matter Experts (SME) approve the other controlled documents.

The appropriate site Quality Leader, Quality Management Systems Coordinator or designee is responsible for the control of quality and environmental documents and records. The controlled documents, internal and external, are saved as PDF files in the Proterra Public Drive and obsolete documents are archived. The controlled records are listed in the Records Table for the control of identification, storage, protection, retrieval, retention time and disposition. The recorded retention times satisfy customer, Proterra and compliance obligations.

The Sr. VP, Engineering or designee is responsible for controlling customer specifications, Bill of Materials (BOMs), 3D Models and drawings, if applicable. The customer specifications and drawings are reviewed within two working weeks of receipt and are implemented to meet customer requirements. BOMs and changes are managed within the Product Lifecycle Management (PLM) system. Specifications, 3D models and drawings are managed in PLM and Electronic Product Definition Management (EPDM) system.

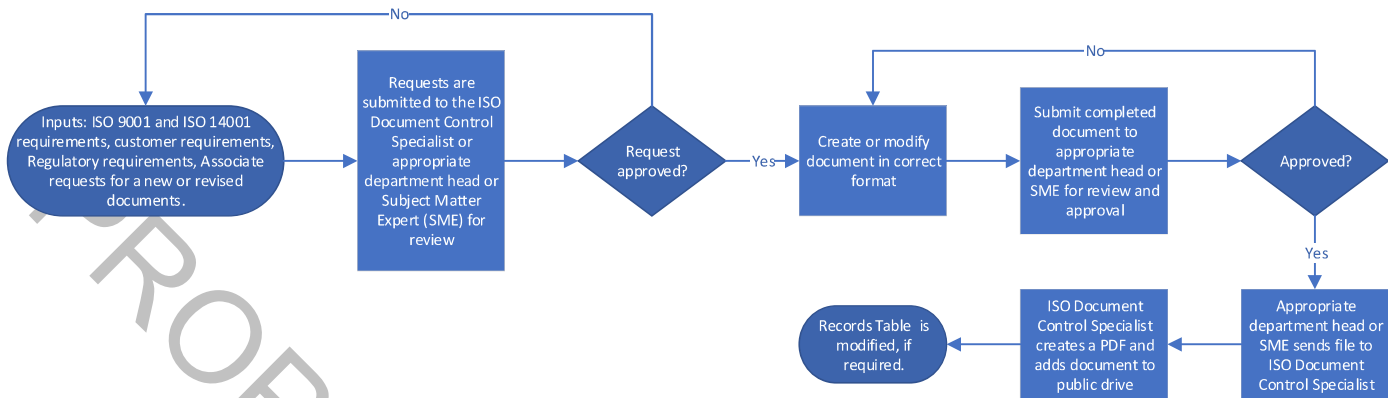
The appropriate department head or SME in each process is authorized to approve or reject requests for changes to controlled documents submitted to them. If approved, the appropriate department head or SME facilitates the document modification(s), updates the document and submits the approved document to the Quality Management Systems Coordinator, who enters it into the system.

The VP, Information Technology (IT) or designee is responsible for new software development and reviewing and approving purchased software before implementation. The VP, IT is also responsible for the back-up system to protect electronic documents and records within Proterra's quality and environmental management systems.

All Associates are responsible for identifying the need for initiating or revising documented Procedures and Work Instructions required for their job and communicating this request by submitting a marked-up copy or a highlighted file for proposed changes to the (QMS) Coordinator or the appropriate department head or SME. All Associates are also responsible for following their applicable controlled documents and storing the assigned records.

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Process



Section 3.0 – Management Processes

Section 3.1 – Business Planning and Risk Management

Purpose

This process describes the individual responsibilities and authorities, procedures, documents and records used to define the business planning and risk management process.

Responsibilities and Authorities

The CEO or COO (Top Management) or designee is responsible for setting Quality and Environmental Objectives, developing the company Business Plan and maintaining the Risk and Opportunities Matrix. The plan and matrix are reviewed at least annually by the Leadership Team and contain as a minimum the objectives and targets addressing the effectiveness and efficiency of the organization, enhancing customer satisfaction and protecting the environment.

Top Management along with the Quality Management Coordinator is responsible for communicating to the organization the importance of meeting customer and compliance obligations at least annually. Top Management has designated all personnel to be responsible for ensuring products and services meet customer requirements.

The Sr. VP, Engineering is responsible for product design and development. See BSM Section 1.3.

The Quality Management Systems Coordinator is responsible for maintaining the Risks and Opportunities Matrix and for communicating these risks and opportunities to Top Management during Management Review (See BSM Sec. 3.2).

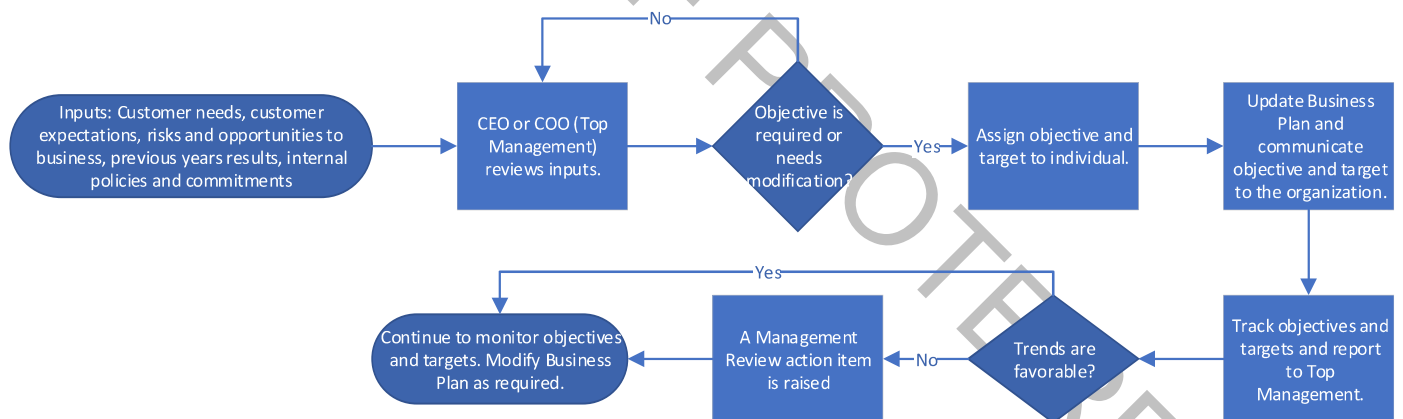
The VP of Quality or designee is responsible for corrective actions (See BSM Section 3.4) and relevant technical training (See BSM Section 2.1 Human Resources and Training).

The quality and environmental objectives of the Company and the person assigned to track them is as follows;

- **Quality and Customer Experience:**
 - Average Daily Availability for Buses and Chargers at (VP, Customer Service)
- **People:**
 - Total Case Incident Rate (TCIR), (COO)
- **Operations:**
 - Delivery of quality products on time to our promise dates – (VP, Customer Service)
- **Engineering:**
 - Product designs, BOMs, and validation tests released in time for supply chain lead time (Sr. VP, Engineering)
- **Supply Chain:**
 - Parts sourced to qualified suppliers on time to support Clear to Build (VP, Supply Chain)
- **Environmental:**
 - No Environmental Violations (Sr. Facilities Manager – Greenville)
 - Achieve companywide diversion and pursue Zero Waste Certification (Sr. Facilities Manager – Greenville)

The assigned individual or designee is responsible for determining the resources required, collecting data, analyzing the data trends and reporting the results at the Corporate Quality and Environmental Meetings and at Management Review Meetings, as appropriate.

Process



Section 3.2 – Management Review

Purpose

This process describes the individual responsibilities and authorities, procedures, documents and records used to define Management Review of both the Quality Management System and the Environmental Management System.

Responsibilities and Authorities

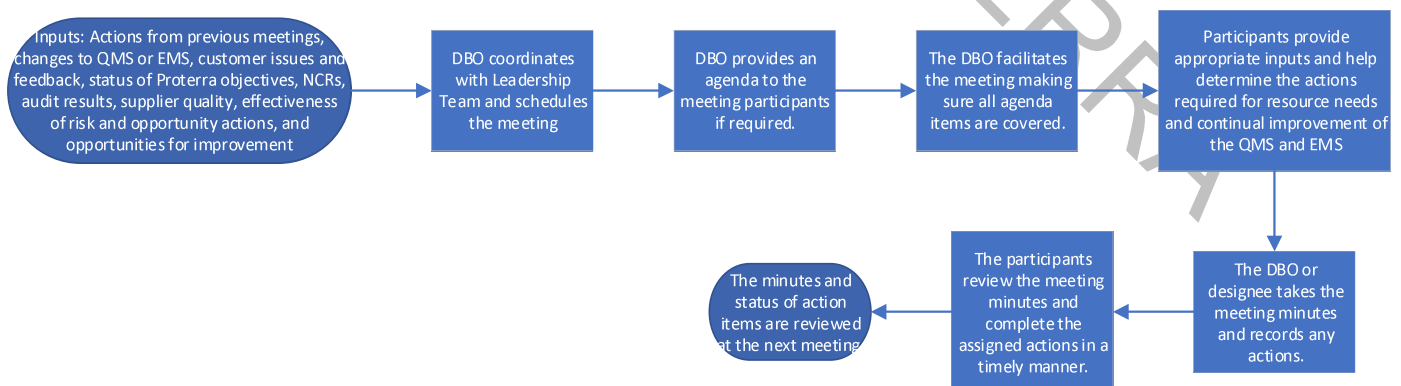
The CEO or COO (Top Management) is responsible for holding a Management Review Meeting at least annually. Meetings can be held more frequently so long as all requirements of the Management Review sections of the ISO 9001 Quality Management System (QMS) and ISO 14001 Environmental Management System (EMS) are reviewed at least annually. Performance trends on Quality are reviewed at least monthly in the Corporate Quality Meetings and at Management Review. Performance trends for Environmental Objectives are reviewed at least monthly during the Safety and Environmental meetings.

The VP of Quality or designee is responsible for reporting to Top Management on the effectiveness of the implementation of the appropriate management system and maintaining the meeting minutes. The Quality Management Systems Coordinator also represents Proterra with the external registration company.

The Quality Management Systems Coordinator or designee is also responsible for taking the meeting minutes and tracking the action items from each meeting. The action items are tracked per the Continual Improvement Process. See BSM Section 3.4.

Participants in the meetings are responsible for providing input to the meeting, helping identify actions required to improve parts, products, services and the appropriate management system and implementing the identified actions on a timely basis.

Process



Section 3.3 – Customer Service

Purpose

This process describes the individual responsibilities and authorities, procedures, documents and records used to define the customer service process.

Responsibilities and Authorities

The VP, Customer Service or designee is responsible for field service, customer service engineering and warranty and post-delivery part replacement.

The Director, Field Service (DFS) or designee is responsible for receiving and satisfying customer issues and concerns. The concerns and issues are entered into ServiceMax and Nonconformance Reports (NCRs) are generated, if required, per the Continual Improvement Process, see BSM Section 3.4.

The Manager, Customer Service Engineering (CSE) or designee is responsible for supporting field service in solving customer issues and concerns. CSE also works with Development Engineering to resolve customer issues and concerns, if required.

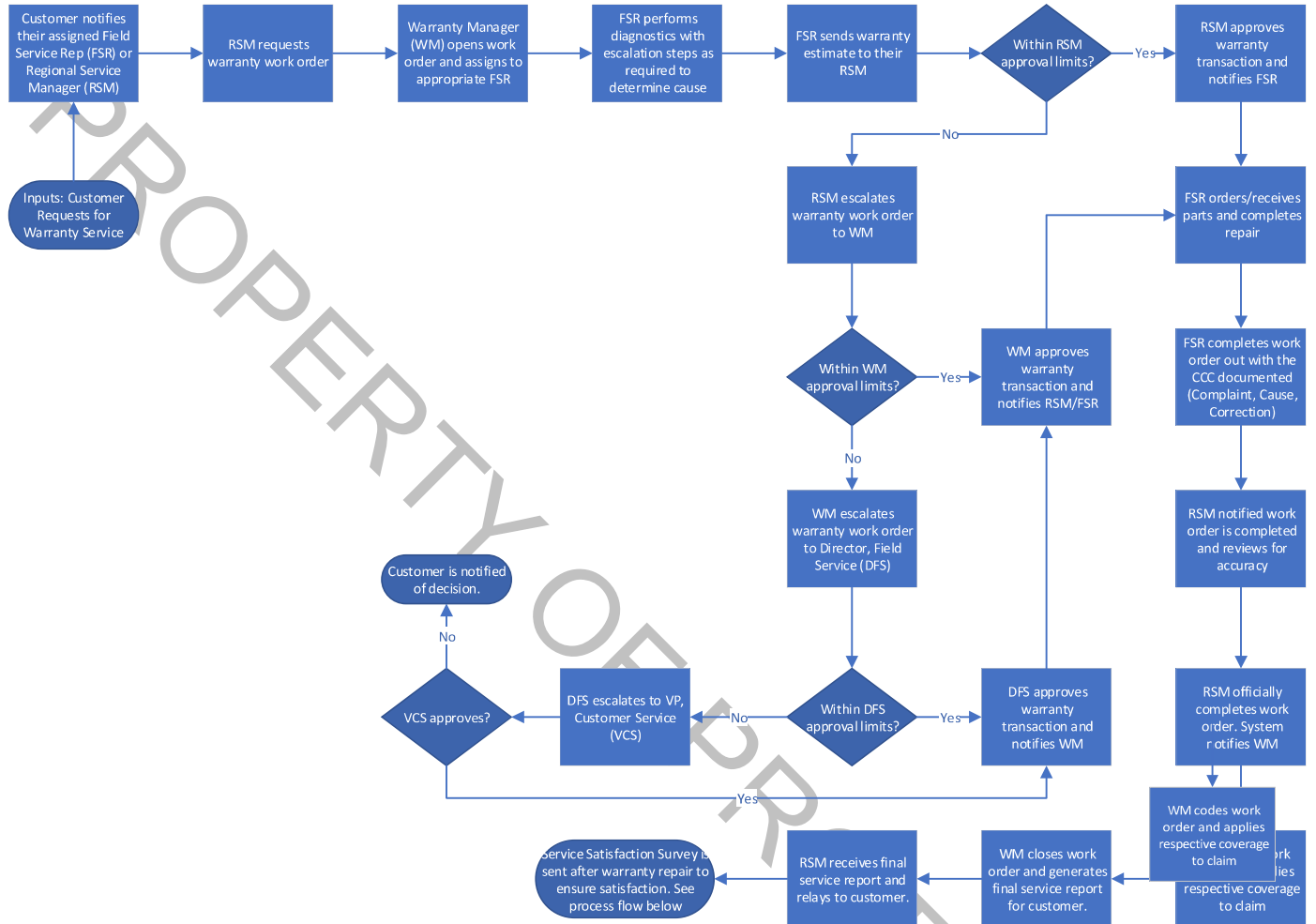
The Regional Service Managers and Field Service Representatives are responsible for working with the customers on solving their issues and concerns.

The Manager, Parts or designee is responsible for coordinating the purchase and delivery of parts needed by field service or the customer to repair and maintain vehicles in the field.

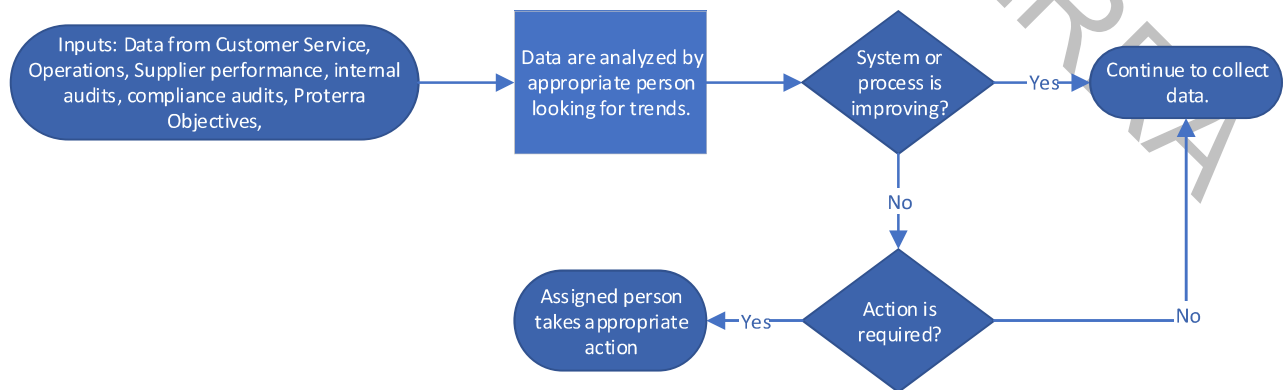
The Warranty Manager or designee is responsible for handling and processing all warranty claims and payment. Warranty claims are tracked on the Warranty Claim Log.

Process

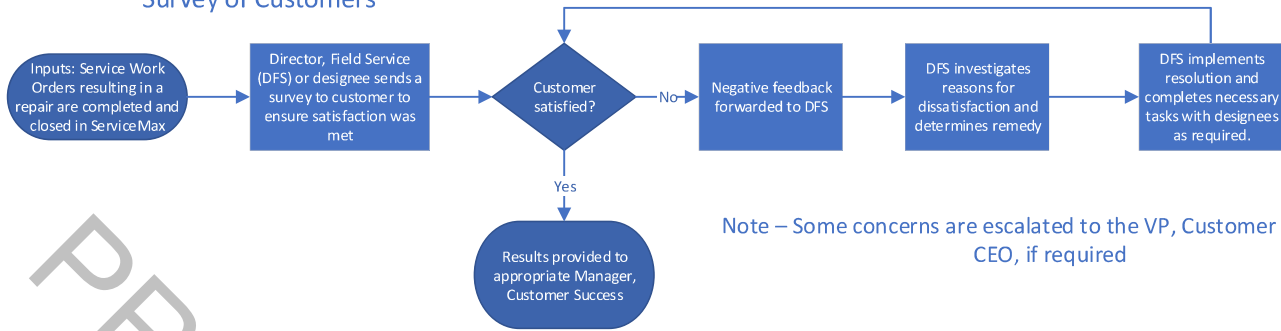
Warranty Approval Process



Continual Improvement



Survey of Customers



Note – Some concerns are escalated to the VP, Customer Service or CEO, if required

PROPERTY OF PROTERRA

Section 3.4 – Continual Improvement

Purpose

This process describes the individual responsibilities and authorities, procedures, documents and records used to define the continual improvement process including internal audits of quality and environmental management systems, environmental compliance evaluations, layered process audits, customer satisfaction and corrective actions.

Responsibilities and Authorities

The CEO or COO (Top Management) is responsible for continual improvement of the Quality and Environmental Management Systems using the appropriate Proterra Policy statements, Proterra Quality and Environmental Objectives, audit results, analysis of data including risks and opportunities to the organization, corrective actions and management reviews.

The Quality Management Systems Coordinator or designee is responsible for scheduling, at least annually, and coordinating quality and environmental internal audits, monitoring customer satisfaction, managing the corrective action system and reporting the results at Management Review. The internal audits are performed by The Quality Management Systems Coordinator, and shall cover all processes, activities and shifts, if appropriate. The frequency is increased based on status or importance of process or area, nonconformances from previous audits, customer complaints or internal process failures.

The Quality Management Systems Coordinator or designee and appropriate site Facilities Manager are responsible for coordinating the required environmental compliance evaluations with an approved, qualified third party at least every three years and managing any environmental compliance corrective actions.

The Quality Management Systems Coordinator is also responsible for coordinating the Corporate Quality Meetings and the Facilities Manager the Environmental Meetings to review the Proterra Objectives and the other Management Review requirements of both ISO 9001 and ISO 14001 management systems. See BSM Section 3.2.

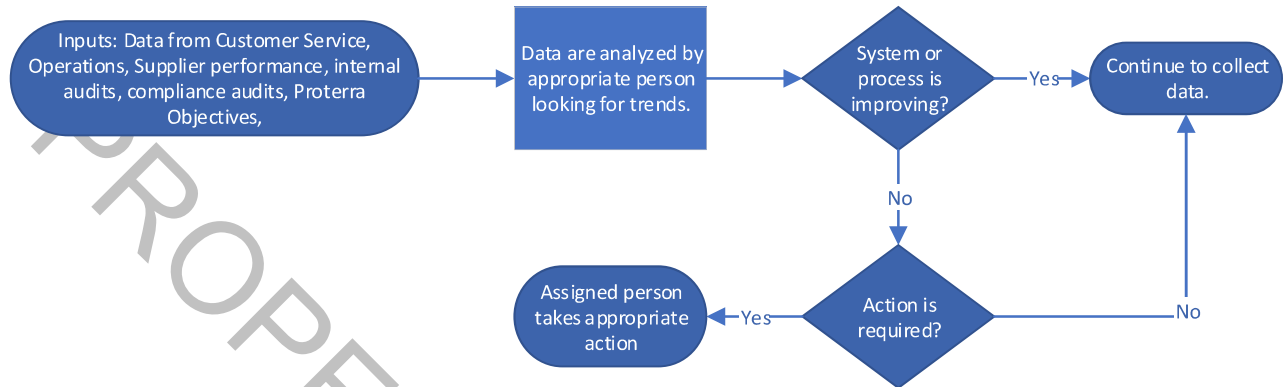
The VP of Quality or designee also coordinates disciplined problem solving to identify root causes so problems can be eliminated and uses error-proofing methods in the corrective action process, as practicable. The customer-prescribed format for corrective actions is used when required.

The DBO, site Quality Leader or designee is responsible for analyzing, in a timely manner, parts or product rejected by the customer and for maintaining records of the analysis.

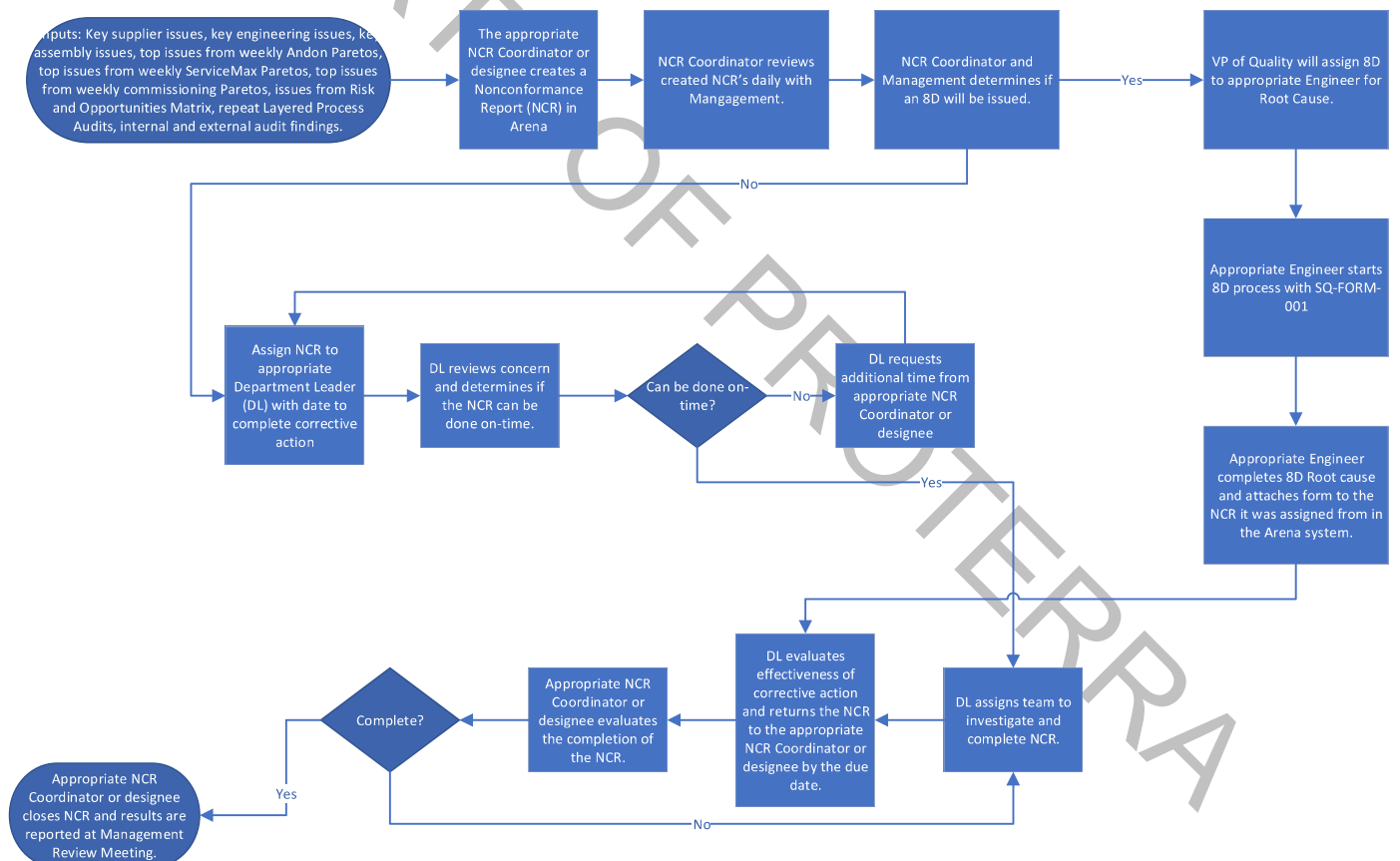
The VP, Supply Chain or designee is responsible for monitoring supplier performance and for reporting the results at CQE Meetings and Management Review. See BSM Section 2.4.

Process

Continual Improvement



Corrective Action Process





Pinellas Suncoast
Transit Authority



Price Proposal

RFP 21-980369

September 21, 2021

2021



PROTERRA

Pinellas Suncoast Transit Authority

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1. Letter of Transmittal
2. Pricing Schedule



PROTERRA

Pinellas Suncoast Transit Authority

1. Letter of Transmittal



September 20, 2021

Alvin R. Burns Jr.
Director of Procurement
Pinellas Suncoast Transit Authority (PSTA)
3201 Scherer Drive
St. Petersburg, FL 33716

Subject: Letter of Transmittal, RFP 21-980369 Florida Electric Transit Buses with Charging and Associated Equipment

Dear Mr. Burns:

Proterra Operating Company, Inc. (Proterra) is pleased to submit this proposal to Pinellas Suncoast Transit Authority (PSTA) and excited about the opportunity to establish Proterra Battery Electric Buses (BEBs) and charging equipment on the Florida contract for Electric Transit Buses with Charging and Associated Equipment. We're excited to continue to work with transit agencies across Florida as they deploy BEBs in their fleets.

As North America's leading manufacturer of BEBs, Proterra is the only Heavy-Duty Bus Manufacturer who focuses solely on the design and manufacturing of BEB technology. Because we aren't tied to legacy heavy-duty bus platforms, we started with a clean sheet to design the world's best performing and safest purpose-built BEBs rather than re-purposing a conventional diesel, CNG or hybrid platform.

The 35' and 40' ZX5 BEBs proposed herein are Proterra's fifth generation BEBs and feature a more streamlined body design and a lower vehicle height that enables greater route access, as well as new shocks and enhanced ergonomics to provide riders and drivers with a smoother riding experience. The ZX5 is also optimized to allow optional overhead pantograph charging, offering greater flexibility and optionality for our transit customers. Additionally, the Proterra ZX5 features Proterra's advanced high-voltage battery systems, which have been proven on the road through more than 22 million miles in service for mass transit. Our battery systems are unrivaled in the North American transit industry and are further detailed in Tab 2 of the Technical Proposal.

Key Points of the Proposal

Since delivering our first BEB to Foothill Transit more than 10 years ago, Proterra has a demonstrable and proven track record in manufacturing BEBs for transit agencies across the United States. We are supporting deployments with major US transit agencies like New York City Transit and Chicago Transit Authority as well as deployments with much smaller agencies like Port Arthur Transit in Texas or Greater Portland Metro in Maine. We've also delivered BEBs to StarMetro in Tallahassee, LYNX in Orlando, Miami-Dade County, and Broward County.



For this proposal, Proterra is offering our 35' and 40' Proterra ZX5+ with 450kWh along with optional pricing for our ZX5 Max for the 40' buses (not available on the 35' buses); which has an industry leading range due to the size of the Energy Storage System (ESS) with 675 kWh of on-board energy storage.

For delivery, we are proposing delivery within twelve (12) months from the issuance of executed contract documents (NTP) with subsequent buses to follow based on the guidance contained in the RFP document.

The proposal pricing is valid for one hundred and eighty (180) days from the date of submittal.

Point of Contact for this Proposal

If you have any questions or concerns regarding this proposal, please feel free to contact individual below who is responsible for managing proposal related activities for Proterra's PSTA proposal:

Devin Ikenberry
Sr. Business Engagement Manager
Proterra Inc
1815 Rollins Rd
Burlingame, CA 94010
Phone: 256.499.5696
Email: dikenberry@proterra.com

Summary

Our goal at Proterra is to design, build, and deliver the world's best performing heavy-duty transit vehicles (that also happen to be zero-emission BEBs). We welcome the opportunity to provide detailed technical information about those vehicles to PSTA in this proposal.

Sincerely,

Ethan Carbaugh
Director of Business Engagement
Proterra Inc
1 Whitlee Ct
Greenville, SC 29607



PROTERRA

Pinellas Suncoast Transit Authority

2. Pricing Schedule

PINELAS 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) 29FT/30FT, low floor, all electric bus, per the specifications	BASE BUS	1	No Quote	No Quote	No Quote	No Quote	No Quote
2	Cost of (1) 35FT, low floor, all electric bus, per the specifications	BASE BUS	1	\$ 816,914.00	per PPI (WPU 1415)	per PPI (WPU 1415)	per PPI (WPU 1415)	per PPI (WPU 1415)
3	Cost of (1) 40FT, low floor, all electric bus, per the specifications	BASE BUS	1	\$ 821,944.00	per PPI (WPU 1415)	per PPI (WPU 1415)	per PPI (WPU 1415)	per PPI (WPU 1415)
4	Cost of (1) 45FT, all electric bus, per the specifications	BASE BUS	1	No Quote	No Quote	No Quote	No Quote	No Quote
5	Cost of (1) 60FT (articulated), low floor, all electric bus, per the specifications	BASE BUS	1	No Quote	No Quote	No Quote	No Quote	No Quote
6	Cost of (1) Depot Charger	120kW industrial cabinet with 2 single-cable dispensers (2x simultaneous 60kW charging)	1	\$ 76,900.00	per PPI (PCU221122221122)	per PPI (PCU221122221122)	per PPI (PCU221122221122)	per PPI (PCU221122221122)
7	Cost of (1) Depot Charger	180kW industrial cabinet with 3 single-cable dispensers (3x simultaneous 60kW charging)	1	\$ 94,250.00	per PPI (PCU221122221122)	per PPI (PCU221122221122)	per PPI (PCU221122221122)	per PPI (PCU221122221122)
8	Cost of (1) Depot Charger	1.5MW station with minimum 10 single-cable dispensers (10x simultaneous 150kW charging)	1	\$ 553,200.00	per PPI (PCU221122221122)	per PPI (PCU221122221122)	per PPI (PCU221122221122)	per PPI (PCU221122221122)
9	Cost of (1) Depot Charger	Additional Dispensers (each) for 1.5mW	1	Quote	Quote	Quote	Quote	Quote
10	Cost of (1) On Route Charger	240kW with Single Pantograph	1	\$ 179,750.00	per PPI (PCU221122221122)	per PPI (PCU221122221122)	per PPI (PCU221122221122)	per PPI (PCU221122221122)
11	Cost of (1) On Route Charger	480kW with Single Pantograph	1	\$ 274,250.00	per PPI (PCU221122221122)	per PPI (PCU221122221122)	per PPI (PCU221122221122)	per PPI (PCU221122221122)
12	Cost of (1) On Route Charger		1					
13	Cost of (1) On Route Charger		1					
14	Cost of (1) On Route Charger		1					
15	ADVERTISING FRAMES	None	1					
16	ADVERTISING FRAMES	Advertising Frame - Interior 22" X 21"-RH Load, Open Back, Clear Aluminum Finish	1	\$ 425.00	\$ 425.00	\$ 425.00	\$ 425.00	\$ 425.00
17	ADVERTISING FRAMES	(1) Information Board (#15-55401-000)	1	No Quote	No Quote	No Quote	No Quote	No Quote
18	ADVERTISING FRAMES		1					
19	ADVERTISING FRAMES		1					
20	ADVERTISING FRAMES		1					
21	AIR SYSTEM	Bendix AD9 Air Dryer	1	No Quote	No Quote	No Quote	No Quote	No Quote
22	AIR SYSTEM	Shop Air Connection (Milton S790)	1	\$ -	\$ -	\$ -	\$ -	\$ -
23	AIR SYSTEM	Kingston Auto Drain Valve at Ping Tanks	1	No Quote	No Quote	No Quote	No Quote	No Quote
24	AIR SYSTEM	Bendix AD1P, Heated, Air Dryer	1	No Quote	No Quote	No Quote	No Quote	No Quote
25	AIR SYSTEM	Bendix Puraguard Air / Oil Separator	1	\$ -	\$ -	\$ -	\$ -	\$ -
26	AIR SYSTEM	Chicago Rawhide Dual Turbo 2000 Air Dryer	1	No Quote	No Quote	No Quote	No Quote	No Quote
27	AIR SYSTEM	Graham White Sludge Braker QBA15 Air Dryer	1	\$ 600.00	\$ 600.00	\$ 600.00	\$ 600.00	\$ 600.00
28	AIR SYSTEM	Graham White Sludge Braker QBA60 Air Dryer	1	No Quote	No Quote	No Quote	No Quote	No Quote
29	AIR SYSTEM	Haldux Consep Moisture Ejector, Heated, at Air Dryer	1	\$ 637.00	\$ 637.00	\$ 637.00	\$ 637.00	\$ 637.00
30	AIR SYSTEM	SKF HCT 2000 Duraguard, 24V Heated, Filtration Plus Air Dryer	1	No Quote	No Quote	No Quote	No Quote	No Quote
31	AIR SYSTEM	SKF HCT 2000 Duraguard Air Dryer	1	No Quote	No Quote	No Quote	No Quote	No Quote
32	AIR SYSTEM	Wabco SS 1800, Heated, Air Dryer	1	No Quote	No Quote	No Quote	No Quote	No Quote

280	FLOORING	Altro Transflor	1	\$	-	\$	-	\$	-	\$	-	\$	-
281	FLOORING	RCA Rubber Flooring	1		No Quote	No Quote		No Quote		No Quote		No Quote	
282	FLOORING	Composite Sub Floor	1	\$	-	\$	-	\$	-	\$	-	\$	-
283	FLOORING	Gerflor Tarabus Helios Flooring	1	\$	-	\$	-	\$	-	\$	-	\$	-
284	FLOORING	Stainless Steel Trim on Risers and Wheelhousings	1	\$	-	\$	-	\$	-	\$	-	\$	-
285	FLOORING		1										
286	FLOORING		1										
287	FLOORING		1										
288	FRAME	None	1	\$	-	\$	-	\$	-	\$	-	\$	-
289	FRAME	Engine Skid Protection with Extended Tow Eyes	1		No Quote	No Quote		No Quote		No Quote		No Quote	
290	FRAME	Engine Skid Protection W/ Extended Tow Eyes & 2" Thick x 2" Wide Wear Plate	1		No Quote	No Quote		No Quote		No Quote		No Quote	
291	FRAME	Reinforced A-Post Skid Plates (Per Side)	1		No Quote	No Quote		No Quote		No Quote		No Quote	
292	FRAME	Frame Undercoating	1		No Quote	No Quote		No Quote		No Quote		No Quote	
293	FRAME		1										
294	FRAME		1										
295	FRAME		1										
296	GAUGES--DRIVERS DASH	Speedometer, Air Pressure Gauge, 12/24 volt Gauges, Coolant Temp Gauge, State of Charge	1	\$	-	\$	-	\$	-	\$	-	\$	-
297	GAUGES--DRIVERS DASH	Add Low State of Charge Alarm	1	\$	-	\$	-	\$	-	\$	-	\$	-
298	GAUGES--DRIVERS DASH	Add Low State of Charge Warning Indicator	1	\$	-	\$	-	\$	-	\$	-	\$	-
299	GAUGES--DRIVERS DASH	Add Engine Hour Meter	1		No Quote	No Quote		No Quote		No Quote		No Quote	
300	GAUGES--DRIVERS DASH	Add Auxiliary Stop Request Light	1	\$	-	\$	-	\$	-	\$	-	\$	-
301	GAUGES--DRIVERS DASH	Add Multifunction Display (MFD)	1		Quote	Quote		Quote		Quote		Quote	
302	GAUGES--DRIVERS DASH		1										
303	GAUGES--DRIVERS DASH		1										
304	GAUGES--DRIVERS DASH		1										
305	HEATING/AIR CONDITIONING	Thermo King TE-14 All-Electric	1		No Quote	No Quote		No Quote		No Quote		No Quote	
306	HEATING/AIR CONDITIONING	Sutrak All-Electric HVAC SYSTEM--(Roof Mounted/Rear Mounted HVAC system)	1		Quote	Quote		Quote		Quote		Quote	
307	HEATING/AIR CONDITIONING	SantUVAire- Safe Breathe Air Purification System	1		Quote	Quote		Quote		Quote		Quote	
308	HEATING/AIR CONDITIONING	Thermo King Pressure and Return Display Mounted to Unit	1		No Quote	No Quote		No Quote		No Quote		No Quote	
309	HEATING/AIR CONDITIONING		1										
310	HEATING/AIR CONDITIONING		1										
311	HUBOMETER	Veeder Root Mechanical without Tenth, without Guard	1	\$	325.00	\$	325.00	\$	325.00	\$	325.00	\$	325.00
312	HUBOMETER	E J Ward Data System (Includes CANceiver, Display Unit, and Antenna)	1		Quote	Quote		Quote		Quote		Quote	
313	HUBOMETER	Engler (Stemco) Mechanical without Tenth, without Guard	1		Quote	Quote		Quote		Quote		Quote	
314	HUBOMETER	S/A Fleetwatch Data Logger JX 55	1		No Quote	No Quote		No Quote		No Quote		No Quote	
315	HUBOMETER	Add Hubodometer Guard	1		Quote	Quote		Quote		Quote		Quote	
316	HUBOMETER	S/A Fleetwatch Data Logger JX 555 (note: JX 55 is obsolete)	1	\$	926.00	\$	926.00	\$	926.00	\$	926.00	\$	926.00
317	HUBOMETER		1										
318	HUBOMETER		1										
319	INTERIOR LIGHTS	LED Interior Lights	1	\$	-	\$	-	\$	-	\$	-	\$	-
320	INTERIOR LIGHTS		1										
321	INTERIOR LIGHTS		1										
322	INTERIOR MIRRORS	8.25" x 16" Interior Rear View Mirror, Flat Faced	1	\$	-	\$	-	\$	-	\$	-	\$	-
323	INTERIOR MIRRORS	12" Convex at Rear Door Stanchion	1	\$	-	\$	-	\$	-	\$	-	\$	-
324	INTERIOR MIRRORS	6" Flat Faced Spot Mirror at Bottom of Front Destination Sign Compartment	1	\$	43.00	\$	43.00	\$	43.00	\$	43.00	\$	43.00
325	INTERIOR MIRRORS		1	\$	62.00	\$	62.00	\$	62.00	\$	62.00	\$	62.00
326	INTERIOR MIRRORS	4.75" x 15" Interior Mirror, Flat Faced	1										
327	INTERIOR MIRRORS		1										
328	ITS SYSTEM	None	1	\$	-	\$	-	\$	-	\$	-	\$	-
329	ITS SYSTEM	Avail IVU with MDC, GPS, APC, and WLAN	1		Quote	Quote		Quote		Quote		Quote	
330	ITS SYSTEM	Avail System Pre-Wire (IVU, MDT, APC, Fare Box)	1		Quote	Quote		Quote		Quote		Quote	

331	ITS SYSTEM	Clever Devices IVN 5 (AVL/GPS/CAD/Automatic Stop Annunciation)	1	\$	21,684.00	per PPI (WPU 1415)	per PPI (WPU 1415)	per PPI (WPU 1415)	per PPI (WPU 1415)
332	ITS SYSTEM	Clever Devices Automatic Vehicle Monitoring System	1	\$	5,828.00	\$	5,828.00	\$	5,828.00
333	ITS SYSTEM	Clever Devices BusTime System	1	\$	3,347.00	\$	3,347.00	\$	3,347.00
334	ITS SYSTEM	Clever Devices CleverCAD System	1	\$	5,292.00	\$	5,292.00	\$	5,292.00
335	ITS SYSTEM	Clever Devices CleverVision	1	\$	18,965.00	\$	18,965.00	\$	18,965.00
336	ITS SYSTEM	Clever Devices Secure Bus Access System	1	\$	2,940.00	\$	2,940.00	\$	2,940.00
337	ITS SYSTEM	Clever Devices Turn Warning System	1	\$	3,401.00	\$	3,401.00	\$	3,401.00
338	ITS SYSTEM	Opticom Traffic Signal Priority	1	\$	6,041.00	per PPI (WPU 1415)	per PPI (WPU 1415)	per PPI (WPU 1415)	per PPI (WPU 1415)
339	ITS SYSTEM	MobileEye Collision Avoidance System	1	\$	9,300.00	per PPI (WPU 1415)	per PPI (WPU 1415)	per PPI (WPU 1415)	per PPI (WPU 1415)
340	ITS SYSTEM	Transloc Transit Visualization System AVL	1		Quote	Quote	Quote	Quote	Quote
341	ITS SYSTEM	Intelligent Vehicle System Prewire Only (Pending System Specification)	1		Quote	Quote	Quote	Quote	Quote
342	ITS SYSTEM	Luminator InfoTransit--2 Monitors (18.5") Proxys Module	1	\$	13,950.00	per PPI (WPU 1415)	per PPI (WPU 1415)	per PPI (WPU 1415)	per PPI (WPU 1415)
343	ITS SYSTEM	Luminator InfoTransit--Upgrade to 29" Monitors	1	\$	12,600.00	per PPI (WPU 1415)	per PPI (WPU 1415)	per PPI (WPU 1415)	per PPI (WPU 1415)
344	ITS SYSTEM	Luminator InfoTransit--Upgrade to 37" Monitors	1	\$	14,580.00	per PPI (WPU 1415)	per PPI (WPU 1415)	per PPI (WPU 1415)	per PPI (WPU 1415)
345	ITS SYSTEM	Luminator InfoLite--2 Monitors (18.5") Proxys Module	1	\$	6,975.00	per PPI (WPU 1415)	per PPI (WPU 1415)	per PPI (WPU 1415)	per PPI (WPU 1415)
346	ITS SYSTEM	Luminator InfoLite--Upgrade to 29" Monitors	1	\$	12,600.00	per PPI (WPU 1415)	per PPI (WPU 1415)	per PPI (WPU 1415)	per PPI (WPU 1415)
347	ITS SYSTEM	Luminator InfoLite--Upgrade to 37" Monitors	1	\$	14,580.00	per PPI (WPU 1415)	per PPI (WPU 1415)	per PPI (WPU 1415)	per PPI (WPU 1415)
348	ITS SYSTEM		1						
349	ITS SYSTEM		1						
350	ITS SYSTEM		1						
351	ITS SYSTEM		1						
352	ITS SYSTEM		1						
353	ITS SYSTEM		1						
354	ITS SYSTEM		1						
355	ITS SYSTEM		1						
356	ITS SYSTEM		1						
357	ITS SYSTEM		1						
358	MISCELLANEOUS	Scissor Style Sunshades--Drivers Windows	1	\$	87.00	\$	87.00	\$	87.00
359	MISCELLANEOUS	Drivers Coat Hook	1	\$	-	\$	-	\$	-
360	MISCELLANEOUS	Roller Style Sunshades--Drivers Windows	1	\$	94.00	\$	94.00	\$	94.00
361	MISCELLANEOUS	Euramatic Cup Holder	1		Quote	Quote	Quote	Quote	Quote
362	MISCELLANEOUS	Registration Card holder	1	\$	25.00	\$	25.00	\$	25.00
363	MISCELLANEOUS	Stainless Steel Waste Basket and Bracket	1	\$	112.00	\$	112.00	\$	112.00
364	MISCELLANEOUS		1						
365	MISCELLANEOUS		1						
366	MISCELLANEOUS		1						
367	MODESTY PANELS	Standard Melamine Panels on Lower Section	1		Quote	Quote	Quote	Quote	Quote
368	MODESTY PANELS	Quick Changing Glazing Upper Clear Plexiglas Modesty Panels Both Sides of Rear Exit Door	1		Quote	Quote	Quote	Quote	Quote
369	MODESTY PANELS	Front Door Modesty Panel	1		No Quote	No Quote	No Quote	No Quote	No Quote
370	MODESTY PANELS	Lower Modesty Panel Forward of Rear Door	1		Quote	Quote	Quote	Quote	Quote
371	MODESTY PANELS	Melamine Panel Lower Section (Aft Rear Door)	1	\$	-	\$	-	\$	-
372	MODESTY PANELS	Upper Clear Plexiglas Modesty Panel Forward Rear Door	1		Quote	Quote	Quote	Quote	Quote
373	MODESTY PANELS	Standard Kydex Panels on Lower Section (Proterra standard)	1	\$	-	\$	-	\$	-
374	MODESTY PANELS		1						
375	MODESTY PANELS		1						
376	PAINT	One Color w/ Black Mask at Windows	1		No Quote	No Quote	No Quote	No Quote	No Quote
377	PAINT	Add--Additional Color--Per Pass	1		Quote	Quote	Quote	Quote	Quote
378	PAINT	Add--Clear Coat	1		Quote	Quote	Quote	Quote	Quote
379	PAINT	Add Roof Numbers	1		Quote	Quote	Quote	Quote	Quote
380	PAINT	Custom Paint / Decal Design (Per Spec)	1		Quote	Quote	Quote	Quote	Quote
381	PAINT	Base White Gelcoat without black masking (Proterra's buses have hidden frame windows)	1	\$	-	\$	-	\$	-
382	PAINT		1						
383	PAINT		1						
384	PAINT		1						

435	REAR RUN GAUGES	Add Hour Meter	1	Quote	Quote	Quote	Quote	Quote
436	REAR RUN GAUGES	Add A/C Hour Meter	1	Quote	Quote	Quote	Quote	Quote
437	REAR RUN GAUGES	Add Coolant Temperature--Mechanical	1	Quote	Quote	Quote	Quote	Quote
438	REAR RUN GAUGES	Add Coolant Temperature--Electrical	1	Quote	Quote	Quote	Quote	Quote
439	REAR RUN GAUGES	Add Voltmeter (12V or 24V)	1	Quote	Quote	Quote	Quote	Quote
440	REAR RUN GAUGES		1					
441	REAR RUN GAUGES		1					
442	REAR RUN GAUGES		1					
443	REAR RUN GAUGES		1					
444	ROOF HATCHES	Manual Hatch at Front and Rear Positions	1	\$	-	\$	-	\$
445	ROOF HATCHES	Delete (1) Roof hatch	1	No Quote	No Quote	No Quote	No Quote	No Quote
446	ROOF HATCHES	Note: 40' Buses have two (2) hatches, 35' Buses have one (1) hatch	1	\$	-	\$	-	\$
447	ROOF HATCHES		1					
448	SAFETY EQUIPMENT	5LBS ABC Fire Extinguisher (Mounted Behind Driver Seat)	1	Quote	Quote	Quote	Quote	Quote
449	SAFETY EQUIPMENT	Safety Triangles (K-D 610-4645)	1	\$	-	\$	-	\$
450	SAFETY EQUIPMENT	Bio- Hazard Disposal Kit	1	Quote	Quote	Quote	Quote	Quote
451	SAFETY EQUIPMENT	Blood Born Pathogens Kit	1	Quote	Quote	Quote	Quote	Quote
452	SAFETY EQUIPMENT	Ten Unit First Aid Kit	1	Quote	Quote	Quote	Quote	Quote
453	SAFETY EQUIPMENT	Wheel Chocks (Per Set)	1	Quote	Quote	Quote	Quote	Quote
454	SAFETY EQUIPMENT	5LBS ABC Fire Extinguisher (Mounted in C/S storage compartment)	1	\$	-	\$	-	\$
455	SAFETY EQUIPMENT		1					
456	SAFETY EQUIPMENT		1					
457	SAFETY EQUIPMENT		1					
458	SCHEDULE RACK	NONE	1					
459	SCHEDULE RACK	(1) Schedule Holder OBIC 2019 4PW-49/923BO- 4	1	Quote	Quote	Quote	Quote	Quote
460	SCHEDULE RACK	Slots Gray Color	1	\$	62.00	\$	62.00	\$
461	SCHEDULE RACK	22" x 21" Black, RH Load Open Back	1	\$	45.00	\$	45.00	\$
462	SCHEDULE RACK	Innocom Schedule Racks 3.75" x 7" x 1.5"	1	\$	59.00	\$	59.00	\$
463	SCHEDULE RACK	Innocom Schedule Racks 8.62" x 1 1" x 1"	1					
463	SCHEDULE RACK	OBIC To (4) Quad Pamphlet & (1) Single Pamphlet Holders	1	Quote	Quote	Quote	Quote	Quote
464	SCHEDULE RACK	Transit Info Products OBIC110P2L TRMC	1	Quote	Quote	Quote	Quote	Quote
465	SCHEDULE RACK	Transit Information Products -19"x 21" OBIC 19/214P1L TRMC	1	Quote	Quote	Quote	Quote	Quote
466	SCHEDULE RACK	Note to above: Transit Information Products has ended production of their On Board Info Station products as of March 31, 2021. Proterra would work with agencies to find acceptable replacement sources						
467	SCHEDULE RACK		1					
468	SCHEDULE RACK		1					
469	SCHEDULE RACK		1					
470	STANCHIONS/GRAB RAILS	Stainless Steel Vertical Stanchions, Grabrails, and Modesty Panel Tubes	1	\$	-	\$	-	\$
471	STANCHIONS/GRAB RAILS	Vinyl Coated Nylon Grab Straps--Each	1	\$	20.00	\$	20.00	\$
472	STANCHIONS/GRAB RAILS	Yellow Powder Coated Vertical Stanchions, Grab Rails, and Modesty Panel Tubes	1	\$	3,500.00	\$	3,500.00	\$
473	STANCHIONS/GRAB RAILS	Yellow Powder Coated Vertical Stanchions Only	1	\$	2,250.00	\$	2,250.00	\$
474	STANCHIONS/GRAB RAILS	Vehicle Stanchion at Front Wheel Wells--Each	1	\$	-	\$	-	\$
475	STANCHIONS/GRAB RAILS	Add Farebox Grabrail	1	\$	-	\$	-	\$
476	STANCHIONS/GRAB RAILS	Horizontal Grabrail on Curbside & Streetside Wheelhousing	1	\$	-	\$	-	\$
477	STANCHIONS/GRAB RAILS	SSTL Spring Loaded Grab Handle--Each	1	\$	225.00	\$	225.00	\$
478	STANCHIONS/GRAB RAILS		1					
479	STANCHIONS/GRAB RAILS		1					
480	STANCHIONS/GRAB RAILS		1					
481	STANCHIONS/GRAB RAILS		1					
482	STANCHIONS/GRAB RAILS		1					
483	STEERING SYSTEM	Douglas Single Tilt Without Column Turn Signal, Without High-Low Beam Switch	1	No Quote	No Quote	No Quote	No Quote	No Quote

578	DECALS & SIGNAGE	Interior Rear Step Floor Decals--"WATCH YOUR STEP", White Lettering on Red Background	1	Quote	Quote	Quote	Quote	Quote
579	DECALS & SIGNAGE	Interior Symbol Decals (3)--ISO Symbols, No Smoking/Eating/Drinking/Radio, White on Black	1	Quote	Quote	Quote	Quote	Quote
580	DECALS & SIGNAGE	Vehicle Height Decal--English "Caution Clearance Height XX FT XX IN, Black on Yellow	1	Quote	Quote	Quote	Quote	Quote
581	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	Quote	Quote	Quote	Quote	Quote
582	DECALS & SIGNAGE	Wheelchair Securement Decals--"WHEELCHAIR SEATING AREA REQUIREMENTS ARE LOCATED BELOW THESE SEATS", Black on Optically Clear	1	Quote	Quote	Quote	Quote	Quote
583	DECALS & SIGNAGE	TrilingualDecals	1	Quote	Quote	Quote	Quote	Quote
584	DECALS & SIGNAGE	Yield Sign Decal	1	Quote	Quote	Quote	Quote	Quote
585	DECALS & SIGNAGE		1					
586	DECALS & SIGNAGE		1					
587	DECALS & SIGNAGE		1					
588	DECALS & SIGNAGE		1					
589	MANUALS	Drivers, Service, Parts, Electrical, Vendor (Hardcopy) & Compact Disc (CD)--1 Set Hardcopy & 1 CD (Up to 3 buses ordered)	1	\$ 825.00	\$ 825.00	\$ 825.00	\$ 825.00	\$ 825.00
590	MANUALS	Additional Drivers Handbook--Each	1	\$ 100.00	\$ 100.00	\$ 100.00	\$ 100.00	\$ 100.00
591	MANUALS	Additional Service Manual (Hardcopy)--Each	1	\$ 300.00	\$ 300.00	\$ 300.00	\$ 300.00	\$ 300.00
592	MANUALS	Additional Parts Manual (Hardcopy)--Each	1	\$ 200.00	\$ 200.00	\$ 200.00	\$ 200.00	\$ 200.00
593	MANUALS	Additional Electrical Schematics (Hardcopy)--Each	1	\$ 75.00	\$ 75.00	\$ 75.00	\$ 75.00	\$ 75.00
594	MANUALS	Additional Drivers, Service, Parts, or Electrical Schematics (CD)--Each	1	\$ 75.00	\$ 75.00	\$ 75.00	\$ 75.00	\$ 75.00
595	MANUALS	Additional Vendor Manuals (Hardcopy)--Each	1	Quote	Quote	Quote	Quote	Quote
596	MANUALS	Additional Vendor Manuals (CD)--Each	1	Quote	Quote	Quote	Quote	Quote
597	MANUALS		1					
598	MANUALS		1					
599	MANUALS		1					
600	MANUALS		1					
601	TRAINING	Operator Orientation Training--By Bus Manufacturer at Agency Property (Per Driver/Per Class)	1	\$ 175.00	\$ 175.00	\$ 175.00	\$ 175.00	\$ 175.00
602	TRAINING	Maintenance Orientation Training--By Bus Manufacturer at Agency Property (Per Technician/Per Class)	1	\$ 600.00	\$ 600.00	\$ 600.00	\$ 600.00	\$ 600.00
603	TRAINING	Steering System--By OEM Supplier at Agency Property (Per Technician/Per Class)	1	\$ 150.00	\$ 150.00	\$ 150.00	\$ 150.00	\$ 150.00
604	TRAINING	Chassis & Body--By OEM Supplier at Agency Property (Per Technician/Per Class)	1	\$ 150.00	\$ 150.00	\$ 150.00	\$ 150.00	\$ 150.00
605	TRAINING	Door Systems--By OEM Supplier at Agency Property (Per Technician/Per Class)	1	Quote	Quote	Quote	Quote	Quote
606	TRAINING	Suspension--By OEM Supplier at Agency Property (Per Technician/Per Class)	1	\$ 150.00	\$ 150.00	\$ 150.00	\$ 150.00	\$ 150.00
607	TRAINING	Electrical & Electronics---By Bus Manufacturer and/or OEM Supplier at Agency Property (Per Technician/Per Class)	1	\$ 600.00	\$ 600.00	\$ 600.00	\$ 600.00	\$ 600.00
608	TRAINING	Air & Brake Systems--By OEM Supplier at Agency Property (Per Technician/Per Class)	1	\$ 150.00	\$ 150.00	\$ 150.00	\$ 150.00	\$ 150.00
609	TRAINING	HVAC & Climate Controls--By OEM Supplier at Agency Property (Per Technician/Per Class)	1	Quote	Quote	Quote	Quote	Quote
610	TRAINING	Wheelchair Ramp--By OEM Supplier at Agency Property (Per Technician/Per Class)	1	Quote	Quote	Quote	Quote	Quote
611	TRAINING	Destination Sign--By OEM Supplier at Agency Property (Per Technician/Per Class)	1	\$ 3,300.00	\$ 3,300.00	\$ 3,300.00	\$ 3,300.00	\$ 3,300.00



PROTERRA

RECOMMENDED TOOLS AND SAFETY EQUIPMENT Base Powertrain

PART NO.	DESCRIPTION	QTY	SELL PRICE \$	EXTENDED PRICE \$
037337	PROTERRA DIAGNOSTIC TOOL	1	5,000.00	5,000.00
014063	DIAGNOSTIC LAPTOP COMPUTER	1	2,500.00	2,500.00
026024	NEXIQ USB-Link (WiFi)	1	1,214.00	1,214.00
026025	NEXIQ J1962 Adaptor	1	100.00	100.00
037475	GLOVES, ELECTRICAL, SIZE 8	1	150.00	150.00
037476	GLOVES, ELECTRICAL, SIZE 9	1	150.00	150.00
037477	GLOVES, ELECTRICAL, SIZE 10	1	150.00	150.00
037478	GLOVES, ELECTRICAL, SIZE 11	1	150.00	150.00
037479	GLOVES, ELECTRICAL, SIZE 12	1	150.00	150.00
035873	SUIT, ARC FLASH, SIZE S	1	830.00	830.00
035874	SUIT, ARC FLASH, SIZE M	1	830.00	830.00
035875	SUIT, ARC FLASH, SIZE L	1	830.00	830.00
035876	SUIT, ARC FLASH, SIZE XL	1	830.00	830.00
035877	SUIT, ARC FLASH, SIZE 2XL	1	830.00	830.00
031438	Red Lockout Padlock	2	178.00	356.00
031440	Grip-Cinching Cable Lockout, 8FT	2	118.00	236.00
031439	Lockout Tag, Package of 10	2	39.00	78.00
035021	LIFT TABLE, E2 BATTERY	1	10,500.00	10,500.00
025199	KIT, DEUTSCH, COMPLETE	1	432.00	432.00
018759	HARNESS, OBD2 DIAGNOSTICS	1	135.00	135.00
040139	DIAGNOSTIC TOOL, VENTURA	1	617.50	617.50
015293	Deutsch Crimper	1	444.00	444.00
036779	MUX Crimper	1	290.00	290.00
015304	Deutsch Pin Removal Tool	1	22.00	22.00
036780	VOLTMETER, FLUKE 175	1	390.00	390.00
042536	Mixpac 400ml manual gun	1	410.00	410.00
042537	Mixpac 400ml pneumatic gun	1	585.00	585.00
042535	80pc master insulated tool set	1	2660.00	2660.00



Proterra, Inc.
 1815 Rollins Road
 Burlingame CA 94010

Quote	
Quote Number	Quote Date
	09-April-21
Customer PO Number	Customer Number
Quote	
Payment Terms	Freight Terms
30 NET	
Method of Shipment	FOB
Salesperson	Email
	serviceparts@proterra.com

Line	Item	Description	QTY	UOM	Unit Price	Extended Total
1.1	035246	SPRING, LOCKING GAS, 5.5" STROKE, 30 LBS	3	Each	13.25	39.75
2.1	039219	SPRING, GAS, 5.5" STROKE, 30LB.	3	Each	10.80	32.40
3.1	025811	LATCH, COMPRESSION, SQUARE KEY	1	Each	27.21	27.21
4.1	014616	FENDER FLARE	2	Each	240.00	480.00
5.1	014621	WHEEL WELL FLARE, REAR	2	Each	355.50	711.00
6.1	037376	MIRROR, EXTERIOR, CURBSIDE	2	Each	1,051.73	2,103.46
7.1	038857	CONVERTER, DC-DC	1	Each	2,008.50	2,008.50
8.1	036155	CONTACTOR, AUTOMATIC LOW-VOLTAGE DISCONNECT, 24V	2	Each	231.40	462.80
9.1	038692	BATTERY CHARGE EQUALIZER, 24V/32AMP	1	Each	596.70	596.70
10.1	000880	BATTERY, 12V, 100AH, GROUP 31	2	Each	339.70	679.40
11.1	025179	CONTACTOR, GX26, 600A, 800 VDC	2	Each	176.15	352.30
12.1	034100	FUSE,30A,MEV100C30-S	2	Each	2.66	5.32
13.1	014391	VFD, DUAL 30KW OUTPUT	1	Each	4,184.00	4,184.00
14.1	039674	SWITCH, GEAR SELECTOR	3	Each	459.36	1,378.08
15.1	046679	SUBASSY, 5-POSITION DOOR SWITCH	2	Each	0.00	0.00
16.1	050920	SWITCH, OVERHEAD CHARGER	1	Each	0.00	0.00



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Salesperson	Email
	serviceparts@proterra.com

Line	Item	Description	QTY	UOM	Unit Price	Extended Total
17.1	001137	SWITCH, FLOOR, DIMMER, HEADLAMP	2	Each	11.86	23.72
18.1	001139	SWITCH, FLOOR, TURN SIGNAL	2	Each	19.28	38.56
19.1	014147	WIPER MOTOR, 2 SPEED	1	Each	238.78	238.78
20.1	017648	WIPER ARM, WINDSHIELD, CS (50MM LONGER)	1	Each	94.40	94.40
21.1	014149	WIPER ARM, WINDSHIELD, SS	2	Each	93.63	187.26
22.1	014150	WIPER, BLADE	1	Each	24.68	24.68
23.1	017629	WIPER BLADE, WINDSHIELD, 1000MM	1	Each	29.32	29.32
24.1	004747	SPRING, AIR, FRONT, 1T19L-5 BELLOW	2	Each	127.25	254.50
25.1	015064	SHOCK ABSORBER FRONT	2	Each	359.74	719.48
26.1	000297	SPRING, AIR, REAR 1T15L-4	2	Each	81.29	162.58
27.1	019265	SHOCK ABSORBER,SUSPENSION,REAR	2	Each	47.56	95.12
28.1	004695	SENSOR, HEIGHT, SUSPENSION, 6 INCH ARM	2	Each	64.88	129.76
29.1	042083	TAIL LAMP, REAR, LED, RED	2	Each	146.28	292.56
30.1	042085	REVERSE LAMP, REAR, LED, CLEAR	2	Each	146.28	292.56
31.1	042084	TURN SIGNAL, REAR, LED, AMBER	2	Each	146.28	292.56



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Method of Shipment	FOB
Salesperson	Email
	serviceparts@proterra.com

Line	Item	Description	QTY	UOM	Unit Price	Extended Total
32.1	013844	LIGHT, SIDE, MARKER, RED	4	Each	23.97	95.88
33.1	013843	LIGHT, SIDE MARKER, YELLOW	8	Each	22.27	178.16
34.1	038182	MODULATOR VALVE, M-40QR, 24VDC	2	Each	0.00	0.00
35.1	000320	VALVE, DOUBLE CHECK, DC-4	1	Each	9.77	9.77
36.1	000321	VALVE, SINGLE CHECK, SC-3	1	Each	9.59	9.59
37.1	004697	SOLENOID, PNEUMATIC, EXHAUST, HIGH FLOW, SUSPENSION)	2	Each	347.97	695.94
38.1	000323	TRANSDUCER, PRESSURE	1	Each	48.07	48.07
39.1	037645	PUMP, WATER, CATALYST, E-MARK	3	Each	455.00	1,365.00
40.1	023912	GLASS, SINGLE PARASOL GREY	1	Each	320.78	320.78
41.1	041953	DOOREXIT,DOORLEAF L 1250 SG PARSOL GREY	1	Each	0.00	0.00
42.1	041955	DOOR EXIT,DOORLEAF R 1250 SG PARSOL GREY	1	Each	0.00	0.00
43.1	014662	GAS SPRING, LOWER SIDE HATCH, 1432EB	3	Each	13.62	40.86
44.1	013721	MIRROR, EXTERIOR, LOW SLUNG, SS	2	Each	650.64	1,301.28
45.1	020918	WINDSHIELD, 73% L.T., CATALYST	1	Each	463.36	463.36
46.1	014142	WINDOW, DRIVER'S	1	Each	1,344.67	1,344.67



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Quote Number	Quote Date
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30 NET	
Method of Shipment	FOB
Salesperson	Email
	serviceparts@proterra.com

Line	Item	Description	QTY	UOM	Unit Price	Extended Total
47.1	031111	WINDOW, DRIVER'S, DUAL SLIDER "HIDDEN FASTENERS"	1	Each	4,896.62	4,896.62
48.1	015656	GASKET,WINDSHIELD,V2	1	Each	214.52	214.52
49.1	001275	Controller, MULTIPLEX, ZR32-A, 24V	1	Each	398.58	398.58
50.1	013527	CIRCUIT BREAKER, COOPER BUSSMAN 5AMP	1	Each	3.60	3.60
51.1	013528	CIRCUIT BREAKER, COOPER BUSSMAN 10AMP	1	Each	3.54	3.54
52.1	013529	CIRCUIT BREAKER, COOPER BUSSMAN, 15AMP	1	Each	3.61	3.61
53.1	001273	CONTROLLER, NODE, MUX2-B+V	3	Each	216.50	649.50
54.1	018384	OIL, COMPRESSOR, HYDROVANE HPO	169	Fluid Ounce	1.68	283.92
55.1	019931	AIR FILTER, LARGE, AIR COMPRESSOR	1	Each	21.41	21.41
56.1	019932	AIR FILTER, SMALL, AIR COMPRESSOR	1	Each	18.17	18.17
57.1	022358	DESICCANT,PACK	10	Each	76.85	768.50
58.1	022387	DESICCATOR,ANCILLARY	5	Each	57.62	288.10
59.1	019403	FILTER, AIR, FOAM	1	Each	14.38	14.38



Pinellas Suncoast
Transit Authority



Qualifications Proposal

RFP 21-980369

September 21, 2021

2021



PROTERRA

Pinellas Suncoast Transit Authority

TABLE OF CONTENTS

1. Pre-Award Evaluation Data Form
2. Three Most Recent Audited Financial Statements
3. Letter of Insurance
4. Form for Proposal Deviation
5. Proposal Form
6. All Federal Certifications



PROTERRA

Pinellas Suncoast Transit Authority

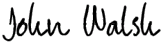
1. Pre-Award Evaluation Data Form

RFP 21-980369

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: Proterra Operating Company, Inc. 2. Address: 1815 Rollins Rd. Burlingame, CA 94010 3. <input type="checkbox"/> Individual <input type="checkbox"/> Partnership <input checked="" type="checkbox"/> Corporation <input type="checkbox"/> Joint Venture 4. Date organized: June 2, 2010 State in which incorporated: Delaware	
5. Names of officers or partners: a. Jack Allen - Chairman & CEO b. Ryan Popple - Co-Founder & Executive Director c. Jake Erhard - Board Member d. Joan Robinson-Berry - Board Member e. Brook Porter - Board Member	f. Jochen Götz- Board Member g. Jeannine Sargent - Board Member h. Constance Skidmore - Board Member i. Mike Smith - Board Member
6. How long has your firm been in business under its present name? June 14, 2021	
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? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> 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: John Walsh Company: Chief Commercial Officer DocuSigned by:  10E3CD38818412 Authorized Signature	
Date 9/10/2021	



Schedule 1

Account Name	Bus Qty	Plant Location	Projected Completion Date (First Bus)	Percentage Complete	Model
Detroit	4	GVL	10/11/2021	95%	Proterra ZX5
Mountain Metro	4	LAX	10/15/2021	95%	Proterra ZX5
SUBURBAN MOBILITY AUTHORITY FOR REGIONAL TRANSPORTATION	4	GVL	10/23/2021	92%	Proterra ZX5
City of Rock Hill	4	GVL	11/3/2021	100%	Proterra ZX5
Iowa City Transit	4	LAX	11/10/2021	94%	Proterra ZX5
Duke University	2	GVL	11/14/2021	91%	Proterra ZX5
Biddeford Saco Old Orchard Beach (BSOOB) Transit	2	GVL	11/15/2021	0%	Proterra ZX5
Valley Regional Transit	8	LAX	12/1/2021	70%	Proterra ZX5
Belle Urban System – Racine (The Bus)	9	GVL	9/28/2021	94%	Proterra ZX5
Charleston Area Regional Transportation Authority (CARTA)	20	GVL	12/12/2021	21%	Proterra ZX5
Miami-Dade Transit(MDT)	32	GVL	1/3/2022	0%	Proterra ZX5
Miami Dade County	62	GVL	1/5/2022	0%	Proterra ZX5
John Wayne Airport	3	LAX	1/6/2022	0%	Proterra ZX5
City of Albuquerque	5	LAX	1/29/2022	0%	Proterra ZX5
Guam Regional Transit Authority	8	GVL	1/31/2022	0%	Proterra ZX5
City and Borough of Juneau	8	LAX	2/8/2022	0%	Proterra ZX5



City of Moline	9	GVL	2/11/2022	0%	Proterra ZX5
Greater Portland Transit District	2	GVL	2/11/2022	0%	Proterra ZX5
Edmonton Transit System	20	GVL	2/27/2022	0%	Proterra ZX5
AppalCart	1	GVL	3/9/2022	0%	Proterra ZX5
Avon	2	LAX	3/9/2022	0%	Proterra ZX5
Santa Maria Area Transit	2	LAX	3/16/2022	0%	Proterra ZX5
Prince George County Transit System	8	GVL	3/21/2022	0%	Proterra ZX5
Ontario International (Lot 2)	8	LAX	3/23/2022	0%	Proterra ZX5
Bridgeport	3	GVL	3/31/2022	0%	Proterra ZX5
City of Fresno	7	LAX	4/24/2022	0%	Proterra ZX5
Napa County Transportation Planning Agency (NVTA)	2	LAX	5/13/2022	0%	Proterra ZX5
Santa Rosa City Bus	4	LAX	5/21/2022	0%	Proterra ZX5
Sacramento International Airport	7	LAX	6/6/2022	0%	Proterra ZX5
Sam Trans	4	LAX	8/27/2022	0%	Proterra ZX5
Roseville Transit	10	LAX	11/12/2022	0%	Proterra ZX5
DC Circulator	13	GVL	5/19/2023	0%	Proterra ZX5
D-DOT	13	GVL	5/19/2023	0%	Proterra ZX5
City of San Luis Obispo	1	LAX	8/11/2022	0%	Proterra ZX5



Schedule Two

1. Broward County Transit

1 N. University Dr. Suite 3100A
Plantation, FL 33324
James Fourcade – Director of Maintenance
garry.hurkens@edmonton.ca
(780) 496-4478



Fleet Information:

Broward County Transit Twelve (12) 40' ZX5 MAX buses that were delivered between August and September 2021.

2. City of Tallahassee – StarMetro

555 Appleyard Dr.
Tallahassee, FL 32304
Walter Kirkland – Supervisor of Equipment Services
Walter.kirklandjr@talgov.com
(850) 891-5183



Fleet Information:

StarMetro is a repeat customer whose first order of three (3) Proterra BE35 buses were accepted in late 2012. StarMetro's second order of thirteen (13) 35' Catalyst E2 buses were accepted in August 2019. Two additional orders for Proterra ZX5 buses are on order with an anticipated delivery in 2022.

3. GO Raleigh

4104 Poole Rd.
Raleigh, NC 27610
Byron Bryant – General Manager
byron.bryant@raleighnc.gov
(919) 996-3942



Fleet Information:

Go Raleigh has a diverse fleet of electric buses, that include Two (2) Proterra 40' ZX5 buses and three (3) Proterra Catalyst E2 buses.

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Stockholders and Board of Directors
Proterra Inc:

Opinion on the Financial Statements

We have audited the accompanying balance sheets of Proterra Inc (the Company) as of December 31, 2020 and 2019, the related statements of operations, stockholders' equity, and cash flows for each of the years in the three-year period ended December 31, 2020, and the related notes (collectively, the financial statements). In our opinion, the financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2020 and 2019, and the results of its operations and its cash flows for each of the years in the three-year period ended December 31, 2020, in conformity with U.S. generally accepted accounting principles.

Change in Accounting Principle

As discussed in note 2 to the financial statements, the Company changed its method of accounting for leases as of January 1, 2020 due to the adoption of Accounting Standards Codification Topic 842, *Leases*.

Basis for Opinion

These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on these financial statements based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB and in accordance with auditing standards generally accepted in the United States of America. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ KPMG LLP

We have served as the Company's auditor since 2012.

Santa Clara, California
April 7, 2021

PROTERRA INC
BALANCE SHEETS
(in thousands, except share and per share data)

	December 31,	
	2020	2019
Assets:		
Cash and cash equivalents	\$ 110,719	\$ 40,240
Accounts receivable, net	51,716	44,500
Short-term investments	68,990	39,877
Inventory	92,330	94,042
Prepaid expenses and other current assets	7,455	6,684
Deferred cost of goods sold	2,037	1,240
Restricted cash, current	8,397	5,970
Total current assets	341,644	232,553
Property, plant, and equipment, net	53,587	47,515
Operating lease right-of-use assets	10,310	—
Restricted cash, non-current	4,581	7,439
Other assets	4,789	6,366
Total assets	<u>\$ 414,911</u>	<u>\$ 293,873</u>
Liabilities and Stockholders' Equity:		
Accounts payable	\$ 25,074	\$ 37,865
Accrued liabilities	19,736	14,635
Deferred revenue, current	16,015	10,358
Operating lease liabilities, current	3,153	—
Debt, current	—	—
Total current liabilities	63,978	62,858
Debt, non-current	133,252	24,574
Derivative liability	70,870	—
Warrant liability	39,670	—
Deferred revenue, non-current	12,206	8,264
Operating lease liabilities, non-current	7,891	—
Other long-term liabilities	12,578	11,198
Total liabilities	340,445	106,894
Commitments and contingencies (Note 7)		
Stockholders' equity:		
Convertible preferred stock, \$0.0001 par value; 129,572,982 shares authorized and 129,003,889 shares issued and outstanding as of December 31, 2020 and 2019; liquidation preference \$631.3 million as of December 31, 2020 and 2019	13	13
Common stock, \$0.0001 par value; 175,100,000 shares authorized and 6,361,952 shares issued and outstanding as of December 31, 2020; 170,000,000 shares authorized and 4,400,247 shares issued and outstanding as of December 31, 2019	1	—
Additional paid-in capital	682,671	668,178
Accumulated deficit	(608,219)	(481,212)
Total stockholders' equity	74,466	186,979
Total liabilities and stockholders' equity	<u>\$ 414,911</u>	<u>\$ 293,873</u>

See accompanying notes to financial statements.

PROTERRA INC
STATEMENTS OF OPERATIONS
(in thousands, except per share data)

	Year Ended December 31,		
	2020	2019	2018
Product revenue.	\$ 190,411	\$ 172,295	\$ 119,314
Parts and other service revenue.	6,532	8,989	3,896
Total revenue.	196,943	181,284	123,210
Product cost of goods sold	181,987	173,428	130,660
Parts and other service cost of goods sold	7,417	9,467	3,767
Total cost of goods sold	189,404	182,895	134,427
Gross profit (loss)	7,539	(1,611)	(11,217)
Research and development	36,233	35,477	31,504
Selling, general and administrative.	67,139	56,132	46,343
Asset impairment charge.	121	6,440	—
Total operating expenses.	103,493	98,049	77,847
Loss from operations.	(95,954)	(99,660)	(89,064)
Interest expense, net	15,413	2,704	3,476
Loss on valuation of derivative and warrant liabilities	12,989	—	—
Other expense (income), net	2,629	(812)	(918)
Loss before income taxes	(126,985)	(101,552)	(91,622)
Provision for income taxes	22	—	—
Net loss	\$ (127,007)	\$ (101,552)	\$ (91,622)
Net loss per share of common stock, basic and diluted	\$ (25.85)	\$ (25.06)	\$ (32.36)
Shares used in computing net loss per share of common stock, basic and diluted	4,913	4,052	2,831

See accompanying notes to financial statements.

PROTERRA INC
STATEMENTS OF STOCKHOLDERS' EQUITY
(in thousands)

	Convertible Preferred Stock		Common Stock		Additional Paid-in Capital	Accumulated Deficit	Total
	Shares	Amount	Shares	Amount			
Balance, December 31, 2017 . . .	88,165	\$ 9	2,282	\$ —	\$ 386,541	\$ (288,038)	\$ 98,512
Adoption of accounting standards	—	—	—	—	587	—	587
Issuance of stock, net of costs . . .	28,262	2	1,218	—	178,625	—	178,627
Stock-based compensation	—	—	—	—	5,376	—	5,376
Net loss	—	—	—	—	—	(91,622)	(91,622)
Balance, December 31, 2018 . . .	116,427	11	3,500	—	571,129	(379,660)	191,480
Issuance of stock, net of costs . . .	12,577	2	900	—	88,388	—	88,390
Issuance of warrants	—	—	—	—	141	—	141
Stock-based compensation	—	—	—	—	8,520	—	8,520
Net loss	—	—	—	—	—	(101,552)	(101,552)
Balance, December 31, 2019 . . .	129,004	13	4,400	—	668,178	(481,212)	186,979
Issuance of stock, net of costs . . .	—	—	1,962	1	4,211	—	4,212
Stock-based compensation	—	—	—	—	10,282	—	10,282
Net loss	—	—	—	—	—	(127,007)	(127,007)
Balance, December 31, 2020 . . .	<u>129,004</u>	<u>\$ 13</u>	<u>6,362</u>	<u>\$ 1</u>	<u>\$ 682,671</u>	<u>\$ (608,219)</u>	<u>\$ 74,466</u>

See accompanying notes to financial statements.

PROTERRA INC
STATEMENTS OF CASH FLOWS
(in thousands)

	Year Ended December 31,		
	2020	2019	2018
Cash flows from operating activities:			
Net loss	\$ (127,007)	\$ (101,552)	\$ (91,622)
Adjustments to reconcile net loss to net cash used in operating activities:			
Depreciation and amortization	15,536	12,643	9,254
Loss on disposal of fixed assets	143	527	793
Asset impairment charge	121	6,440	—
Stock-based compensation	10,282	8,520	5,376
Amortization of debt discount and issuance costs	6,045	306	247
Accretion of debt end of term charge and PIK interest	3,501	604	1,196
Loss on valuation of derivative and warrant liabilities	12,989	—	—
Others	(153)	(284)	(335)
Changes in operating assets and liabilities:			
Accounts receivable	(7,216)	(9,005)	(23,196)
Inventory	2,182	(15,692)	(23,642)
Prepaid expenses and other current assets	(1,043)	563	(5,002)
Deferred cost of goods sold	(797)	4,207	(3,356)
Operating lease right-of-use assets and liabilities	87	—	—
Other assets	1,575	(4,746)	(718)
Accounts payable and accrued liabilities	(4,090)	(1,025)	12,545
Deferred revenue, current and non-current	9,599	132	11,780
Other non-current liabilities	2,176	1,068	3,001
Net cash used in operating activities	<u>(76,070)</u>	<u>(97,294)</u>	<u>(103,679)</u>
Cash flows from investing activities:			
Purchase of investments	(108,960)	(71,817)	(34,152)
Proceeds from maturities of investments	80,000	50,400	16,200
Purchase of property and equipment	(25,565)	(13,810)	(16,698)
Net cash used in investing activities	<u>(54,525)</u>	<u>(35,227)</u>	<u>(34,650)</u>
Cash flows from financing activities:			
Proceeds from debt, net of issuance costs	219,471	21,362	—
Repayment of debt	(22,787)	(26,708)	—
Repayment of finance obligation	(484)	(452)	(452)
Proceeds from government grants	275	522	1,507
Proceeds from exercise of stock options	4,168	1,726	1,916
Proceeds from issuance of stock, net of issuance costs	—	86,746	173,659
Net cash provided by financing activities	<u>200,643</u>	<u>83,196</u>	<u>176,630</u>
Net increase (decrease) in cash and cash equivalents, and restricted cash	70,048	(49,325)	38,301
Cash and cash equivalents, and restricted cash at the beginning of period	53,649	102,974	64,673
Cash and cash equivalents, and restricted cash at the end of period	<u>\$ 123,697</u>	<u>\$ 53,649</u>	<u>\$ 102,974</u>
Supplemental disclosures of cash flow information:			
Cash paid for interest	\$ 5,827	\$ 4,881	\$ 2,648
Cash paid for income taxes	9	—	—
Non-cash investing and financing activity:			
Issuance of warrants in connection with debt borrowing	\$ —	\$ 141	\$ —
Assets acquired through accounts payable and accrued liabilities	659	4,017	1,146
Non-cash transfer of vehicles from inventory to internal use	—	967	—
Non-cash transfer of leased assets to inventory	635	—	—

See accompanying notes to financial statements.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies

Organization and Description of Business

Proterra Inc (“Proterra” or the “Company”) is a leading developer and producer of electric vehicle technology for commercial application. Proterra designs, develops, manufactures, and sells electric transit buses as an original equipment manufacturer for North American public transit agencies, airports, universities, and other commercial transit fleets. It also designs, develops, manufactures, sells, and integrates proprietary battery systems and electrification solutions for global commercial vehicle manufacturers. Additionally, Proterra provides fleet-scale, high-power charging solutions for our customers. Proterra was originally formed in June 2004 as a Colorado limited liability company and converted to a Delaware corporation in February 2010. The Company operates from its headquarters and battery production facility in Burlingame, California. The Company also has manufacturing and product development facilities in Greenville, South Carolina and City of Industry, California.

The Company has incurred net losses and negative cash flows from operations since inception. As of December 31, 2020, the Company has an accumulated deficit of \$608.2 million, and \$179.7 million of cash and cash equivalents and short-term investments. The Company has funded operations primarily through a combination of equity and debt financing. Management believes that the Company’s currently available resources will be sufficient to fund its cash requirements for at least the next twelve months. However, there can be no assurance that future financings will be successfully completed or completed on terms acceptable to the Company. These financial statements do not include any adjustments that may result from the outcome of this uncertainty.

Basis of Presentation

The Company prepared the financial statements in accordance with U.S. generally accepted accounting principles (“U.S. GAAP”).

The Company has not experienced any significant impact to estimates or assumptions as a result of the COVID-19 pandemic. We will continue to monitor impacts of the pandemic on an ongoing basis. While the COVID-19 pandemic has not had a material adverse impact on our financial condition and results of operations to date, the future impact of the COVID-19 pandemic on our operational and financial performance will depend on certain developments, including the duration and spread of the pandemic, impact on our customers and effect on our suppliers, all of which are uncertain and cannot be predicted.

Segments

The Company operates in the United States and started to expand its business to the European Union in 2018 and Canada in 2019. The revenue generated outside of the United States was not material for the years ended December 31, 2018 and 2019. The revenue generated outside of the United States was about 28% of total revenue or \$55.9 million for the year ended December 31, 2020, which was primarily generated from Canada.

The Company’s chief operating decision maker is its Chief Executive Officer (CEO), who reviews financial information presented at the entity level. Accordingly, the Company has determined that it has a single reportable segment.

Use of Estimates

The preparation of financial statements in conformity with U.S. GAAP requires the use of estimates and judgments that affect the reported amounts in the financial statements and accompanying notes. U.S. GAAP requires the Company to make estimates and judgments in several areas including, but not limited to, those related to revenue recognition, collectability of accounts receivable, valuation of inventories, valuation of Convertible Notes (See Note 3), warranty liability, contingent liabilities, stock-based compensation expense, useful lives of property, plant, and equipment, recoverability of assets, residual value of leased assets, and the valuation of deferred tax assets. These estimates are based on historical facts and various other assumptions that the Company believes are reasonable. Actual results could differ materially from those estimates.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies (cont.)

Foreign Currency Transactions

The U.S. dollar is the Company's functional currency. Monetary assets and liabilities denominated in currencies other than the U.S. dollar are remeasured to the U.S. dollar at period end, and transaction gains and losses are recorded in other expense (income), net in the statements of operations. Net gains or losses resulting from foreign exchange transactions were not material for the years ended December 31, 2018 and 2019. The net losses resulting from foreign exchange transactions were \$1.1 million for the year ended December 31, 2020.

Cash and Cash Equivalents

The Company considers all highly liquid investments purchased with original maturities of three months or less to be cash equivalents.

Accounts Receivable and Allowance for Credit Losses

Accounts receivable are recorded at the invoiced amount and do not bear interest. The Company determines the allowance for credit losses based on historical write-off experience, an analysis of the aging of outstanding receivables, customer payment patterns and expectations of changes in macroeconomic conditions that may affect the collectability of outstanding receivables. The allowance for credit losses was not material as of December 31, 2020 and 2019.

Short-Term Investments

The Company's primary objectives for investment activities are to preserve principal, provide liquidity, and maximize income without significantly increasing risk. The Company classifies its short-term investments as available-for-sale at the time of purchase because it is intended that these investments are available for current operations. Investments with maturities of one year or less from the balance sheet date are classified as short-term investments.

Investments are reported at fair value and are subject to periodic impairment review. Unrealized gains and losses related to changes in the fair value of these securities are recognized in accumulated other comprehensive loss. The ultimate value realized on these securities is subject to market price volatility until they are sold. Realized gains or losses from short-term investments are recorded in other expense (income), net.

As of December 31, 2020 and 2019, short-term investments were \$69.0 million and \$39.9 million, respectively.

Restricted Cash

The Company maintains certain cash amounts restricted as to withdrawal or use. The restricted cash is primarily collateral for performance bonds issued to certain customers. The collateral is provided in the form of a cash deposit to either support the bond directly or to collateralize a letter of credit that supports the performance bonds. As of December 31, 2020 and 2019, restricted cash was \$13.0 million and \$13.4 million, respectively.

Credit Risk and Concentration

Our financial instruments that are potentially subject to concentrations of credit risk consist primarily of cash, cash equivalents, restricted cash, short-term investments, and accounts receivable. Cash and cash equivalents and short-term investments are maintained primarily at two financial institutions, and deposits exceed federally insured limits. Risks associated with cash and cash equivalents, and short-term investments are mitigated by banking with creditworthy financial institutions. The Company has not experienced any losses on its deposits of cash and cash equivalents or its short-term investments.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies (cont.)

Cash equivalents consist of short-term money market funds, corporate debt securities, and debt securities issued by the U.S. Treasury, which are deposited with reputable financial institutions. The Company's cash management and investment policy limits investment instruments to investment-grade securities with the objective to preserve capital and to maintain liquidity until the funds can be used in business operations.

Accounts receivable are typically unsecured and are generally derived from revenue earned from transit agencies, universities and airports in North America and global commercial vehicle manufacturers in both North America and the European Union. The Company periodically evaluates the collectability of its accounts receivable and provides an allowance for potential credit losses as necessary.

Given the large order value for customers and the relatively low number of customers, revenue and accounts receivable have typically been concentrated with a limited number of customers.

	Revenue			Accounts Receivable	
	Year Ended December 31,			December 31,	
	2020	2019	2018	2020	2019
Number of customers accounted for 10% or more*	1	—	3	2	4

* One customer accounted for 21% of total revenue for year ended December 31, 2020 and 33% of the accounts receivable, net as of December 31, 2020. No other individual customer accounted for more than 20% of total revenue for years ended December 31, 2020, 2019 and 2018, or accounts receivable, net as of December 31, 2020 and 2019.

Single source suppliers provide the Company with a number of components that are required for manufacturing of our current products. In other instances, although there may be multiple suppliers available, many of the components are purchased from a single source. If these single source suppliers fail to meet the Company's requirements on a timely basis at competitive prices, the Company could suffer manufacturing delays, a possible loss of revenue, or incur higher cost of sales, any of which could adversely impact the Company's operating results.

Fair Value of Financial Instruments

The carrying value of the Company's financial instruments, including cash and cash equivalents, accounts receivable, short-term investments, accounts payable, and accrued and other current liabilities, approximates fair value due to the short period of time to maturity, receipt, or payment. The carrying amount of the Company's debt, except for Convertible Notes, approximates its fair value as the stated interest rates approximate market rates currently available to the Company.

In August 2020, the Company issued Convertible Notes that contain embedded features subject to derivative accounting. These embedded features are composed of conversion options that have the economic characteristics of a contingent early redemption feature settled in a variable number of shares of the Company's stock. These conversion options are bifurcated and accounted for as a derivative liability separately from the host debt instrument. Embedded derivatives are recognized as a derivative liability on the balance sheet. The derivative liability is measured at fair value and subject to remeasurement at each balance sheet date.

The warrants issued in connection with the Convertible Notes are classified as a liability because they can become exercisable into common stock upon a Qualified Initial Public Offering ("QIPO") or into convertible preferred stock after 5 years from issuance date in the event that there is no QIPO during such period. Such warrants are measured at fair value, subject to remeasurement at each balance sheet date.

Inventories

Inventories are recorded at the lower of cost and net realizable value using the first-in, first-out method. Inventory costs consist primarily of the cost of materials, manufacturing support costs, including labor and factory overhead associated with such production, and shipping costs. The costs of vehicles, charger equipment or prototype

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies (cont.)

products delivered to customers that have not yet met revenue recognition criteria are also included in inventories. We assess the valuation of inventory and periodically record a provision to adjust inventory to its estimated net realizable value, including when we determine inventory to be obsolete or in excess of anticipated demand. Once inventory has been written-off or written-down, it creates a new cost basis for the inventory that is not subsequently written-up.

Deferred Cost of Goods Sold

Deferred cost of goods sold primarily includes incurred costs for charging system installations that have not met revenue recognition criteria.

Property, Plant, and Equipment

Property, plant, and equipment, including leasehold improvements, are stated at cost. Depreciation is computed using the straight-line method over the estimated useful lives of the respective assets, as follows:

Property, Plant, and Equipment	Estimated Useful Life
Computer hardware	3 years
Computer software	3 to 5 years
Internally used vehicles and charging systems	over the shorter of their estimated useful lives or 5 years
Machinery and equipment	5 to 12 years
Office furniture and equipment	5 years
Tooling	5 years
Leasehold improvements	over the shorter of their estimated useful lives or the terms of the related leases
Leased batteries	over the shorter of the terms of the related leases or 12 years
Leased vehicles and charging systems	over the shorter of the terms of the related leases or 5 years

In the fourth quarter of 2019, we completed a review of the estimated useful lives of vehicles and charging equipment used for demonstration purposes. Based on this review, we revised the estimated useful lives of demo vehicles from 12 years to five years effective on November 1, 2019, after considering the condition of assets and our long-term strategy for operating such assets. We believe this change in estimate is appropriate, as it is based on actual experience and the expectations for the ongoing productive use of these assets. The impact to depreciation expense caused by this change in estimate is not material to selling, general and administrative expense on the statement of operations for the year ended December 31, 2019 or future periods.

If the estimated useful life of an asset is less than the stated number of years in our capitalization policy, the depreciation expense will be recorded over the shorter period.

Upon the retirement or sale of property, plant, and equipment, the cost and associated accumulated depreciation are removed from the balance sheet, and the resulting gain or loss is reflected on the statement of operations. Maintenance and repair expenditures are expensed as incurred while major improvements that increase the functionality, output, or expected life of an asset are capitalized and depreciated ratably over the identified useful life.

Impairment of Long-Lived Assets

The Company evaluates the recoverability of property, plant, and equipment and right-of-use assets for possible impairment whenever events or circumstances indicate that the carrying amount of such assets may not be recoverable. Recoverability of these assets is measured by a comparison of the carrying amounts to the future undiscounted cash flows the assets are expected to generate. If such review indicates that the carrying amount of long-lived assets is not recoverable, the carrying amount of such assets is reduced to fair value.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies (cont.)

In addition to the recoverability assessment, the Company periodically reviews the remaining estimated useful lives of property, plant, and equipment. If the estimated useful life assumption for any asset is reduced, the remaining net book value is depreciated over the revised estimated useful life.

The Company reviews long-lived assets for impairment at the lowest level for which separate cash flows can be identified. During the fourth quarter of 2019, due to the introduction of new products and related technology advancements, we determined that an impairment analysis of certain assets leased to customers was required to be performed. The estimated undiscounted future cash flows generated by these assets were less than their carrying amounts. The carrying amounts of the assets were reduced to fair value, which resulted in an impairment charge of \$6.4 million recorded in the statement of operations for the year ended December 31, 2019.

No impairment charge was recognized in 2018. We recorded \$0.1 million impairment charge associated with a facility lease for the year ended December 31, 2020.

Deferred Revenue

Deferred revenue consists of billings or payments received in advance of revenue recognition that are recognized as revenue once the revenue recognition criteria are met. In some instances, progress billings are issued upon meeting certain milestones stated in the contracts. Accordingly, the deferred revenue balance does not represent the total contract value of non-cancelable arrangements. Invoices are typically due within 30 to 40 days.

Deferred revenue was \$28.2 million and \$18.6 million as of December 31, 2020 and 2019, respectively. For the year ended December 31, 2020, \$16.5 million revenue was recognized from the deferred revenue balance as of December 31, 2019. The reduction in deferred revenue was offset by new billings for products and extended warranty services for which revenue had not been recognized as of December 31, 2020. The current portion of deferred revenue represents the amount that is expected to be recognized as revenue within one year from the balance sheet date.

Revenue Recognition

We derive revenue primarily from the sale of vehicles and charging systems, the installation of charging systems, the sale of battery systems and powertrain components to other vehicle manufacturers, as well as the sale of spare parts and other services provided to customers. Product revenue consists of revenue earned from vehicles and charging systems, battery systems and powertrain components, installation of charging systems, and revenue from leased vehicles, charging systems, and batteries under operating leases. Leasing revenue recognized over time was approximately \$2.3 million, \$3.8 million and \$3.0 million for the years ended December 31, 2020, 2019 and 2018, respectively. Parts and other service revenue includes revenue earned from spare parts, the design and development of battery systems and drive systems for other vehicle manufacturers, and extended warranties.

Goods and services that are promised in our contracts include vehicles, charging systems, battery systems and powertrain components to other vehicle manufacturers, installation of charging systems, spare parts, and extended warranty. We assess the products and services promised in contracts at contract inception, and identify performance obligations for each promise to transfer to the customer a product or service that is distinct. If a product or service is separately identifiable from other items in the bundled arrangement and a customer can benefit from the product or service on its own or with other resources that are readily available to the customer, then such product or service is considered distinct. Customer contracts typically have multiple performance obligations. Generally, our goods and services are considered separate performance obligations. Depending on the contractual arrangement, the charging systems and related installation services if purchased by customer are typically considered as one performance obligation, as they represent inputs of a combined integrated output which benefits the customer. Development services are typically sold on a stand-alone basis and are not bundled with other goods or services.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies (cont.)

The transaction price of the contract is allocated to each performance obligation in a manner depicting the amount of consideration to which the Company expects to be entitled in exchange for transferring the goods or services to the customer (the “allocation objective”). If the allocation objective is met at contractual prices, no further allocations are made. Otherwise, the Company allocates the transaction price to each performance obligation identified in the contract on a relative standalone selling price basis.

To determine the standalone selling price of its promised products or services, we conduct an analysis to determine whether its products or services have an observable standalone selling price. In determining the observable standalone selling price, the Company requires that a substantial majority of the standalone selling prices for a product or service fall within a reasonably narrow range. If there is no directly observable standalone selling price for a particular product or service, then we estimate a standalone selling price by using the estimated cost plus margin or by reviewing external and internal market factors including, but not limited to, pricing practices including historical discounting, major service groups, and the geographies in which we offer products and services.

We recognize revenue when or as it satisfies a performance obligation by transferring control of a product or service to a customer.

Revenue from product sales is recognized when control of the underlying performance obligations is transferred to the customer. Revenue from vehicles and charging systems, and installation of charging systems is typically recognized upon acceptance by the customer. Under certain contract arrangements, the control of the performance obligations related to the charging systems is transferred over time, and the associated revenue is recognized over the installation period using an input measure based on costs incurred to date relative to total estimated costs to completion. Spare parts revenue is recognized upon shipment. Extended warranty revenue is recognized over the life of the extended warranty using the time elapsed method. Development service contracts typically include the delivery of prototype products to customers. The performance obligation associated with the development of prototype products as well as battery systems and powertrain components to other vehicle manufacturers, is satisfied at a point in time, typically upon shipping.

Revenue derived from performance obligations satisfied over time from charging systems and installation was \$6.0 million, \$7.2 million and \$0.6 million in the years ended December 31, 2020, 2019, and 2018, respectively. Extended warranty revenue is not material to date.

Typically, the Company does not have contract assets, as rights to consideration in exchange for goods or services that have transferred to a customer are not conditional on anything other than the passage of time. In certain cases, there is a condition that requires a contract asset to be recognized. As of December 31, 2020 and 2019, the contract assets balance was \$2.8 million and \$0.6 million, respectively. The contract assets are expected to be billed within the next twelve months and are recorded in the prepaid expenses and other current assets on the balance sheets.

As of December 31, 2020, the amount of remaining performance obligations that have not been recognized as revenue was \$229.4 million, of which 67% was expected to be recognized as revenue over the next 12 months and the remainder thereafter. This amount excludes the value of remaining performance obligations for contracts with an original expected length of one year or less.

Lease Arrangements

The Company offers customers leasing alternatives outside of the standard sales contracts for vehicles, charging equipment and batteries used in the vehicles. The leasing arrangements are typically bundled together with the sales contracts. We assessed the nature of the bundled arrangements under the revenue accounting standard. For arrangements that contain a lease, we determined the classification of the lease in accordance with Topic 840, Leases, prior to the adoption of Topic 842, Leases, on January 1, 2020. A lease arrangement that transfers substantially all of the benefits and risks incident to ownership of the products is classified as a sales-type lease based on the criteria established by the accounting standard; otherwise the lease is classified as an operating lease.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies (cont.)

For sales-type leases, product revenue is recognized upon customer acceptance of the underlying leased assets. The current portion of net investment in sales-type leases is recorded in Accounts Receivable, and the non-current portion is recorded in Other Assets on the Company's balance sheets. The discounted unguaranteed residual value of underlying leased assets is not material to the net investment in lease balance.

For operating leases, the leasing revenue is recognized on a straight-line basis over the lease term, which is commenced upon customer acceptance.

We monitor the performance of customers who leased batteries and are subject to ongoing payments. No allowance was recorded for the receivables under the leasing arrangements.

We adopted the new lease accounting standard, Topic 842, Leases, on January 1, 2020. We determine whether an arrangement is or contains a lease at inception. Short-term leases with a term of less than 12 months will not be recognized in the right-of-use assets or lease liabilities. The lease and non-lease components are not separated for all leases regardless of whether the Company is the lessee or a lessor to the lease. Refer to Note 6, Leases, for additional information.

Cost of Goods Sold

Cost of goods sold includes direct material and labor costs, manufacturing overhead including depreciation expense, freight costs, and reserves for estimated warranty expenses. Cost of goods sold also includes charges to write-down the carrying value of inventory when it exceeds its estimated net realizable value and to provide for on-hand inventory that is either obsolete or in excess of forecasted demand. Costs of development services are expensed as incurred. Costs of development services incurred in periods prior to the finalization of an agreement are recorded as research and development expense. Once an agreement is finalized, these costs are recorded in cost of goods sold.

Sales and Other Taxes

Taxes assessed by various government entities, such as sales, use, and value added taxes, collected at the time of sale are excluded from revenue.

Shipping Costs

Amounts billed to customers related to shipping and handling are classified as revenue, and the related shipping and handling costs are included in cost of goods sold.

Research and Development Costs

Research and development costs are expensed as incurred. Research and development expense consists primarily of payroll and benefits of those employees engaged in research, design, and development activities, costs related to prototype parts and design tools, license expenses related to intellectual property, supplies and services, depreciation, and other occupancy costs.

Advertising Expenses

Advertising costs are expensed as incurred. Advertising expenses were \$0.6 million, \$0.9 million, and \$0.8 million for the year ended December 31, 2020, 2019 and 2018, respectively.

Product Warranties

The Company provides a limited warranty to customers on vehicles, charging systems, and battery systems. The limited warranty ranges from one to 12 years depending on the components. Separately, the Company also periodically performs field service actions related to product service campaigns. Pursuant to these warranties and

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies (cont.)

field service actions, we will repair, replace, or adjust the parts on the products that are defective in factory-supplied materials or workmanship. A warranty reserve for the products sold is recorded at the point of revenue recognition, which includes the best estimate of the projected costs to repair or replace items under the limited warranty and field service actions. These estimates are based on actual claims incurred to date and an estimate of the nature, frequency and costs of future claims. These estimates are inherently uncertain given the relatively short history of sales. Changes to the historical or projected warranty experience may cause material changes to the warranty reserve in the future. The warranty reserve does not include projected warranty costs associated with the vehicles under operating leases, as the costs to repair these warranty claims are expensed as incurred. The portion of the warranty reserve expected to be incurred within the next 12 months is included within accrued liabilities while the remaining balance is included within other long-term liabilities on the balance sheets.

Warranty expense is recorded as a component of cost of goods sold. Accrued warranty activity consisted of the following (in thousands):

	Year Ended December 31,		
	2020	2019	2018
Warranty reserve – beginning of period	\$ 14,926	\$ 10,602	\$ 2,581
Warranty costs incurred	(4,214)	(6,031)	(2,653)
Net changes in liability for pre-existing warranties, including expirations.	(3,392)	(840)	—
Provision for warranty	11,262	11,195	10,674
Warranty reserve – end of period	<u>\$ 18,582</u>	<u>\$ 14,926</u>	<u>\$ 10,602</u>

Stock-Based Compensation

The Company uses the fair value method for recording stock-based compensation expense. Stock-based compensation expense for stock options is estimated at the grant date based on each stock option's fair value as calculated using the Black-Scholes option pricing model. The stock-based compensation expense for stock option grants is recognized on a straight-line basis over the requisite service period for the entire award.

Income Taxes

Income taxes are computed using the asset and liability method, under which deferred tax assets and liabilities are determined based on the difference between the financial statement and tax bases of assets and liabilities using enacted tax rates in effect for the year in which the differences are expected to affect taxable income. Valuation allowances are established when necessary to reduce deferred tax assets to the amount expected to be realized.

The Company recognizes tax benefits from uncertain tax positions only if it is more likely than not that the tax position will be sustained on examination by the taxing authorities based on the technical merits of the position. The Company adjusts these reserves when facts and circumstances change, such as the closing of a tax audit or the refinement of an estimate. The provision for income taxes includes the effects of any reserves that are considered appropriate.

Accrued interest and penalties related to unrecognized tax benefits are classified as income tax expense.

Government Incentives

The Company receives incentives from the federal and state government agencies in the form of grants. Incentives are recorded in the financial statements in accordance with their purposes, either as a reduction of expense or a reduction of the cost of the capital investment. The benefit of these incentives is recorded when performance is complete and all conditions as specified in the agreement are fulfilled.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies (cont.)

California and certain other states provide incentives to accelerate the purchase of cleaner, more efficient buses in the form of point-of-sale discounts to vehicle purchasers. These incentives are included in the customer contract value, and recognized as revenue once all revenue recognition criteria are met.

Other Comprehensive Income (Loss)

The Company did not have other comprehensive income (loss) for the years ended December 31, 2020, 2019 and 2018, respectively.

2. Adoption of New Accounting Standards

Topic 842, *Leases*. This standard provides guidance on the recognition, measurement, presentation, and disclosure of leases. The new standard supersedes the present U.S. GAAP standard on leases and requires substantially all leases to be reported on the balance sheet as right-of-use assets and lease obligations. The Company elected to adopt the new lease accounting standard on January 1, 2020 using the optional transition method, recognizing a cumulative-effect adjustment to the balance sheet and not adjusting comparative information for prior periods. Refer to Note 6, *Leases*, for additional information.

ASU No. 2016-13, *Financial Instruments — Credit Losses (Topic 326): Measurement of Credit Losses on Financial Instruments*. This standard requires the measurement and recognition of expected credit losses for financial assets held at amortized cost. The Company adopted this standard on January 1, 2020, and it had no material impact on the financial statements.

ASU No. 2018-13, *Changes to Disclosure Requirements for Fair Value Measurement (Topic 820)*. This standard improves the effectiveness of disclosure requirements for recurring and nonrecurring fair value measurements. This standard removes, modifies, and adds certain disclosure requirements. The Company adopted this standard on January 1, 2020, and it had no material impact on the financial statements.

ASU No. 2018-15, *Intangibles — Goodwill and Other — Internal-Use Software (Subtopic 350-40): Customer's Accounting for Implementation Costs Incurred in a Cloud Computing Arrangement That Is a Service Contract*. This standard aligns the requirements for capitalizing implementation costs incurred in a hosting arrangement that is a service contract requiring the capitalization of implementation costs incurred to develop or obtain internal-use software (and hosting arrangements that include an internal-use software license). The Company adopted this standard on January 1, 2020, and it had no material impact on the financial statements.

ASU No. 2020-04, *Reference Rate Reform (Topic 848): Facilitation of the Effects of Reference Rate Reform on Financial Reporting*. The amendments in this standard provide optional guidance for a limited time to ease the potential burden in accounting for reference rate reform. The new guidance provides optional expedients and exceptions for applying U.S. GAAP to contracts, hedging relationships and other transactions affected by reference rate reform if certain criteria are met. The amendments apply only to contracts and hedging relationships that reference the London Interbank Offered Rate (LIBOR) or another reference rate expected to be discontinued due to reference rate reform. These amendments are effective from March 2020 through December 31, 2022. The amendments have no material impact on the financial statements.

Recent Accounting Pronouncements Not Yet Adopted

ASU No. 2019-12, *Income Taxes (Topic 740): Simplifying the Accounting for Income Taxes*. This standard simplifies the accounting for income taxes, eliminates certain exceptions within Topic 740, *Income Taxes*, and clarifies certain aspects of the current guidance to promote consistency among reporting entities. The Company will adopt this standard on January 1, 2021, and expect no material impact on the financial statements.

ASU No. 2020-06, *Accounting for Convertible Instruments and Contracts in an Entity's Own Equity*. This standard simplifies the accounting for convertible instruments by removing certain separation models in ASC 470-20, *Debt — Debt with Conversion and Other Options*. This standard updates the guidance on certain embedded

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

2. Adoption of New Accounting Standards (cont.)

conversion features that are not required to be accounted for as derivatives under Topic 815, *Derivatives and Hedging*, or that do not result in substantial premiums accounted for as paid-in capital, such that those features are no longer required to be separated from the host contract. The convertible debt instruments will be accounted for as a single liability measured at amortized cost. This will also result in the interest expense recognized for convertible debt instruments to be typically closer to the coupon interest rate when applying the guidance in Topic 835, *Interest*. Further, this standard made amendments to the EPS guidance in Topic 260 for convertible instruments, the most significant impact of which is requiring the use of the if-converted method for diluted earnings per share calculation, and no longer allowing the net share settlement method. This standard also made revisions to Topic 815-40, which provides guidance on how an entity must determine whether a contract qualifies for a scope exception from derivative accounting. The amendments to Topic 815-40 change the scope of contracts that are recognized as assets or liabilities. This standard is effective for interim and annual periods beginning after December 15, 2021, with early adoption permitted after December 15, 2020. Adoption of this standard can either be on a modified retrospective or full retrospective basis. The Company is currently evaluating this standard but expect no material impact on the financial statements.

3. Fair Value of Financial Instruments

The Company measures certain financial assets and liabilities at fair value. Fair value is determined based on the exit price that would be received from selling an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. Fair value is estimated by applying the following hierarchy:

Level 1 — Quoted prices in active markets for identical assets or liabilities;

Level 2 — Observable inputs other than quoted prices in active markets for identical assets and liabilities, quoted prices for identical or similar assets or liabilities in inactive markets, or other inputs that are observable or can be corroborated by observable market data for substantially the full term of the assets or liabilities; and

Level 3 — Inputs that are generally unobservable and typically reflect management's estimate of assumptions that market participants would use in pricing the asset or liability.

Financial assets measured at fair value on a recurring basis using the above input categories were as follows (in thousands):

		Fair Value at	
	Pricing	December 31,	
	Category	2020	2019
Assets:			
Cash equivalents:			
Money market funds	Level 1	\$ 744	\$ 3,334
U.S. Treasury securities.	Level 1	64,997	29,957
Short-term investments:			
U.S. Treasury securities.	Level 1	68,990	39,877
Total		<u>\$ 134,731</u>	<u>\$ 73,168</u>
Liabilities:			
Other non-current liabilities:			
Derivative liability.	Level 3	\$ 70,870	\$ —
Warrant liability	Level 3	39,670	—
Total		<u>\$ 110,540</u>	<u>\$ —</u>

As of December 31, 2020 and 2019, short-term investments were primarily comprised of U.S. Treasury securities. The unrealized gain/losses related to fixed income debt securities were immaterial and primarily due to changes in interest rates, which are temporary in nature.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

3. Fair Value of Financial Instruments (cont.)

As of December 31, 2020 and 2019, the contractual maturities of the short-term investments were less than one year.

In August 2020, the Company issued Convertible Notes that contain embedded features subject to derivative accounting. Refer to Note 5, Debt, for additional information on the Convertible Notes.

The embedded derivatives are recognized as a derivative liability on the balance sheet, and are measured at fair value, subject to remeasurement at each balance sheet date. The fair value of derivative liability is measured as the difference between the estimated value of the Convertible Notes with and without such conversion features utilizing Monte Carlo simulation pricing model.

The warrants issued in connection with the Convertible Notes are classified as a liability because they can become exercisable into common stock upon a QIPO or into convertible preferred stock after five years from issuance date in the event that there is no QIPO during such period. Such warrants are measured at fair value, subject to remeasurement at each balance sheet date. The fair value of the warrant liability is measured using Monte Carlo Simulation pricing model.

The fair value of the Convertible Notes was \$365.9 million as of December 31, 2020. The carrying value of the Convertible Notes of \$106.4 million, net of \$97.1 million unamortized debt discount and issuance costs, as of December 31, 2020, was recorded in Debt, non-current on the balance sheets.

The valuation of derivative and warranty liabilities and the Convertible Notes are based on significant inputs not observable in the market, and thus represents a level 3 measure. The key inputs to the valuation model include fair value of equity, equity volatility, expected term until a liquidity event to exit, expected term until exercise, and risk-free interest rate.

A summary of the changes in the fair value of the derivative liability is as follows (in thousands):

	Amount
Derivative liability – at issuance	\$ 68,514
Change in fair value	2,356
Derivative liability – December 31, 2020	<u>\$ 70,870</u>

A summary of the changes in the fair value of the warrant liability is as follows (in thousands):

	Amount
Warrant liability – at issuance	\$ 29,037
Change in fair value	10,633
Warrant liability – December 31, 2020	<u>\$ 39,670</u>

The change in fair value of derivative and warrant liabilities is recorded in the statement of operations.

4. Balance Sheet Components

Cash and cash equivalents consisted of the following (in thousands):

	December 31,	
	2020	2019
Cash	\$ 44,978	\$ 6,949
Cash equivalents	65,741	33,291
Total cash and cash equivalents	<u>\$ 110,719</u>	<u>\$ 40,240</u>

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

4. Balance Sheet Components (cont.)

The following table provides a reconciliation of cash, cash equivalents, and restricted cash reported within the balance sheets to the total of such amounts shown on the statements of cash flows.

	December 31,	
	2020	2019
Cash and cash equivalents.	\$ 110,719	\$ 40,240
Restricted cash, current portion	8,397	5,970
Restricted cash, net of current portion	4,581	7,439
Total restricted cash	12,978	13,409
Total cash and cash equivalents, and restricted cash.	<u>\$ 123,697</u>	<u>\$ 53,649</u>

Inventories consisted of the following (in thousands):

	December 31,	
	2020	2019
Raw materials	\$ 31,148	\$ 46,495
Work in progress	8,042	23,197
Finished goods	47,756	19,400
Service parts	5,384	4,950
Total inventories	<u>\$ 92,330</u>	<u>\$ 94,042</u>

The Company recorded a write-down of excess or obsolete inventories to cost of goods sold of \$3.0 million, \$4.9 million and \$4.2 million in the years ended December 31, 2020, 2019 and 2018, respectively.

Property, plant, and equipment, net, consisted of the following (in thousands):

	December 31,	
	2020	2019
Computer hardware.	\$ 4,708	\$ 3,830
Computer software	8,849	6,558
Internally used vehicles and charging systems	19,136	12,936
Leased vehicles and batteries	7,081	10,715
Leasehold improvements	10,234	8,275
Machinery and equipment	26,026	14,237
Office furniture and equipment	1,854	1,876
Tooling	21,727	17,918
Finance lease right-of-use assets.	179	—
Construction in progress	1,830	6,642
	101,624	82,987
Less: Accumulated depreciation and amortization	(48,037)	(35,472)
Total	<u>\$ 53,587</u>	<u>\$ 47,515</u>

Construction in progress was comprised of various assets that are not available for their intended use as of the balance sheet date.

Depreciation and amortization expense were \$15.5 million, \$12.6 million and \$9.3 million for the years ended December 31, 2020, 2019 and 2018, respectively.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

4. Balance Sheet Components (cont.)

Accrued liabilities consisted of the following (in thousands):

	December 31,	
	2020	2019
Accrued payroll and related expenses	\$ 6,695	\$ 2,799
Accrued sales and use tax	975	1,254
Warranty reserve	6,121	7,697
Financing obligation	3,056	850
Accrued interest	127	174
Accrued audit and accounting related expenses	428	419
Accrued charger installation costs	769	547
Other accrued expenses	1,565	895
Total	<u>\$ 19,736</u>	<u>\$ 14,635</u>

Other long-term liabilities consisted of the following (in thousands):

	December 31,	
	2020	2019
Financing obligation	\$ —	\$ 3,056
Accrued interest	—	120
Warranty reserve	12,461	7,229
Deferred rent	—	793
Finance lease liabilities, non-current	117	—
Total	<u>\$ 12,578</u>	<u>\$ 11,198</u>

In July 2016, we entered into a bus sale and lease transaction for ten Catalyst buses. These buses are leased to other parties for five years by the customer. At the end of the lease term, the fourth quarter of 2021, we have an obligation to repurchase the buses back from the customer. We make a portion of the monthly lease payments directly to the customer and also provided a guarantee to the customer on the remaining lease payments if the lessee fails to pay. We received \$6.0 million from the customer directly upon delivery in 2016. Under U.S. GAAP, this sales transaction is considered as a borrowing and the lease transaction is considered as an operating lease.

The financing obligation was \$3.1 million and \$3.9 million as of December 31, 2020 and 2019, respectively. Interest expense on the financing obligation is recognized using the effective interest method. The monthly lease payment is recognized as leasing revenue. The costs of the buses are recorded as leased vehicles in property, plant, and equipment on the balance sheets.

5. Debt

Debt, net of debt discount and issuance costs, consisted of the following (in thousands):

	December 31,	
	2020	2019
Hercules Credit Facility	\$ —	\$ 9,640
Senior Credit Facility	16,809	14,934
PPP loan	10,000	—
Convertible Notes	106,443	—
Total Debt, non-current	<u>\$ 133,252</u>	<u>\$ 24,574</u>

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

5. Debt (cont.)

Loan and Security Agreement

The Company entered into a loan and security agreement with Hercules Capital, Inc. (“Hercules Credit Facility”) in 2015, and amendments in 2016 and 2017. In May 2019, the Company entered into an amendment to the Hercules Credit Facility to repay \$20.0 million in principal, and extend the maturity date of the remaining \$10.0 million outstanding principal to May 2021. The interest rate was composed of a cash interest rate of the greater of 10.55% or 10.55% plus the prime rate minus 5.5% and a PIK interest rate of 1.75% per annum. The loan had an interest only period through its maturity date. The \$2.3 million end-of-term charge under the Amended Hercules Credit Facility was paid on June 1, 2019. The \$0.8 million accrued PIK interest under the existing Hercules Credit Facility and \$0.2 million prepayment penalty were paid at the closing of the amendment. As of December 31, 2019, the outstanding balance under the Hercules Credit Facility was \$10.0 million, and the cash interest rate was 10.55% per annum.

In connection with entering into the Hercules Credit Facility in 2015, the Company issued to Hercules a warrant to purchase 397,932 shares of Series 4 convertible preferred stock. The Company determined the fair value of the convertible preferred stock warrant shares was \$0.3 million, which was recorded as a debt discount and a convertible preferred stock warrant liability, as discussed further in Note 8. In connection with the first amendment, the Company issued to Hercules an additional warrant to purchase 79,587 shares of Series 4 convertible preferred stock. The Company determined the fair value of the convertible preferred stock warrant was \$0.1 million, which was recorded as a debt discount and a convertible preferred stock warrant liability, as discussed further in Note 8. In connection with the Amended Hercules Credit Facility in 2019, the Company issued to Hercules a warrant to purchase 36,630 shares of common stock warrants. The Company determined the fair value of the common stock warrant was \$0.1 million, which was recorded as a debt discount and classified as equity in additional paid-in capital. The warrant is exercisable for 10 years, and will automatically exercise upon the initial public offering.

The end-of-term charge was accreted to accrued interest using the effective-interest method from the funding date to its payment due date. As of December 31, 2019, the accrued PIK interest balance was \$0.1 million.

The balance of debt issuance costs and discounts was \$0.4 million as of December 31, 2019. The debt issuance cost and debt discounts were amortized to interest expense over the terms of the Hercules Credit Facility using the effective interest method. The amortization of debt issuance cost and debt discounts to interest expense was \$0.2 million, \$0.3 million and \$0.2 million for 2020, 2019 and 2018, respectively.

The Company’s obligations under the Hercules Credit Facility were secured by a security interest and amended to a second security interest under the Amended Hercules Credit Facility on substantially all the Company’s assets except for intellectual property and other restricted property.

In August 2020, the Company made the repayment in full of its obligations of \$10.3 million under the Hercules Credit Facility, as amended, including principal and accrued interest. The Hercules Credit Facility was terminated upon payoff and the remaining unamortized debt issuance cost and debt discounts of \$0.2 million were recorded to interest expense.

Senior Credit Facility

In May 2019, the Company entered into a Loan, Guaranty and Security Agreement for a senior secured asset-based lending facility (“Senior Credit Facility”) with borrowing capacity up to \$75.0 million. The commitment under the Senior Credit Facility is available to the Company on a revolving basis through the earlier of May 2024 or 91 days prior to the stated maturity of any subordinated debt in aggregate amount of \$7.5 million or more. The maximum availability under the Senior Credit Facility is based on certain specified percentages of eligible accounts receivable and inventory, subject to certain reserves, to be determined in accordance with the Senior Credit Facility. The commitment under the Senior Credit Facility includes a \$10.0 million letter of credit sub-line. Subject to certain conditions, the commitment may be increased by \$50.0 million upon approval by the lender, and at the Company’s option, the commitment can be reduced to \$25.0 million or terminated upon at least 15 days written notice.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

5. Debt (cont.)

The Senior Credit Facility is secured by a security interest in substantially all of the Company's assets except for intellectual property and other restricted property.

Borrowings under the Senior Credit Facility bear interest at per annum rates equal to, at the Company's option, either (i) the base rate plus an applicable margin for base rate loan, or (ii) the London Interbank Offered Rate ("LIBOR") plus an applicable margin for LIBOR loan. The base rate is calculated as the greater of (a) the Lender prime rate, (b) the federal funds rate plus 0.5%, and (c) one-month LIBOR plus 1.0%. The applicable margin is calculated based on a pricing grid linked to quarterly average excess availability (as a percentage of borrowing capacity). For base rate loans, the applicable margin ranges from 0.0% to 1.5%, and for LIBOR Loans, it ranges from 1.5% to 3.0%. The Senior Credit Facility contains certain customary non-financial covenants. In addition, the Senior Credit Facility requires the Company to maintain a Fixed Charge Coverage Ratio of at least 1.00:1.00 during such times as a covenant trigger event shall exist.

As of December 31, 2020 and 2019, the outstanding balance under the Senior Credit Facility was \$17.1 million and \$15.3 million, respectively, with maturity of May 2024. The Company incurred approximately \$0.4 million debt issuance costs under this facility, and will amortize these costs to interest expense over the borrowing term. The interest rate was 3.09% and 4.89% per annum as of December 31, 2020 and 2019, respectively.

Small Business Administration Loan

In May 2020, the Company received Small Business Administration ("SBA") loan proceeds of \$10.0 million from Town Center Bank pursuant to the Paycheck Protection Program ("the PPP loan") under the "Coronavirus Aid, Relief and Economic Security (CARES) Act". The PPP loan was in the form of a note and matures on May 6, 2022. The interest rate is 1.00% per annum and payable monthly commencing in December 2020. All or a portion of the PPP loan may be forgiven by the SBA upon application with supporting documentation of expenditures in accordance with SBA requirements, which include employees being kept on the payroll for eight weeks after the date of the loan and the proceeds being used for payroll, rent, mortgage interest, or utilities.

Convertible Notes

In August 2020, the Company entered into a Note Purchase Agreement for Secured Convertible Promissory Notes ("Convertible Notes"). The Convertible Notes have an aggregate principal amount of \$200.0 million, with a cash interest of 5.0% per annum payable at each quarter end and a paid-in-kind interest of 4.5% per annum payable by increasing the principal balance at each quarter end. The Convertible Notes will mature in August 2025, and the Company may not make prepayment unless approved by the required holders of the Convertible Notes.

At or after an underwritten initial public offering in which the Company receives gross proceeds of not less than \$100 million ("QIPO"), or at the time of a merger, acquisition or other combination between the Company and a publicly-traded special purpose acquisition company ("SPAC transaction"), the holders may elect to convert the Convertible Notes into shares of common stock.

At the next bona fide equity financing following the Note Purchase Agreement, or 36 months after the date of the Note Purchase Agreement if no such equity financing shall have occurred (a "Qualified Financing"), the holders may elect to convert the Convertible Notes into shares of the most senior series of the Company's preferred stock.

The conversion price will be an amount equal to:

- i) if the conversion stock is being issued at or following a QIPO, the QIPO price per share multiplied by the Discount Coefficient (as defined in the Convertible Notes), which is initially equal to 90% and will decrease by 2.75% every 6 months following the first anniversary of the closing date of the Convertible Notes, in effect on the date of QIPO (the "QIPO Conversion Price"); or

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

5. Debt (cont.)

- ii) if the conversion stock is being issued following a Qualified Financing, 75% of the lowest per share cash purchase price of the common stock or preferred stock sold by the Company in the Qualified Financing; or
- iii) if the conversion stock is being issued following a SPAC transaction, 75% of the SPAC Transaction Price Per Share (as defined in the Note Purchase Agreement) (the “SPAC Conversion Price”).

The Convertible Notes will automatically be converted into common stock at any time after the expiration of the lock-up period of a QIPO or SPAC transaction, if the following conditions are met:

- if the QIPO price per share equals or exceeds \$6.9075, then upon the volume-weighted average price of the Company’s publicly-traded common stock over a period of 20 consecutive trading days exceeds 150% of the QIPO Conversion Price; or if the QIPO price per share is lower than \$6.9075, then upon the volume-weighted average price of the Company’s publicly-traded common stock over a period of 20 consecutive trading days exceeds 150% of an amount equal to \$6.9075 multiplied by the Discount Coefficient at the time of the QIPO.
- if the SPAC Transaction Price Per Share equals or exceeds \$6.9075, then upon the volume-weighted average price of the Company’s publicly-traded common stock over a period of 20 consecutive trading days commencing after the six month anniversary of the closing of the SPAC transaction exceeding 150% of the SPAC Conversion Price; or if the SPAC Transaction Price Per Share is lower than \$6.9075, then upon volume-weighted average price of the Company’s publicly-traded common stock over a period of 20 consecutive trading days commencing after the six month anniversary of the closing of the SPAC transaction and over which the Conversion Stock would be freely tradable exceeding 175% of an amount equal to \$6.9075 multiplied by 75%.

Each of the Convertible Notes shall rank equally without preference or priority of any kind over one another, but senior in all rights, privileges and preferences to all other shares of the Company’s capital stock and all other securities of the Company that are convertible into or exercisable for the Company’s capital stock directly or indirectly.

Prior to the maturity date or prior to the payment or conversion of the entire balance of the Convertible Notes, in the event of a liquidation or sale of the Company, the Company shall pay to the holders of Convertible Notes the greater of (i) 150% of the principal balance of the Convertible Notes or (ii) the consideration that the holders would have received had the holders elected to convert the Convertible Notes into preferred stock immediately prior to such liquidation event.

The Convertible Notes do not entitle the holders to any voting rights or other rights as a stockholder of the Company, unless and until the Convertible Notes are actually converted into shares of the Company’s capital stock in accordance with their terms.

The Note Purchase Agreement contains certain customary non-financial covenants. In addition, the Note Purchase Agreement requires the Company to maintain liquidity at quarter end of not less than the greater of (i) \$75.0 million and (ii) four times of cash burn for the three-month period then ended.

In connection with the issuance of the Convertible Notes, the Company issued warrants to the holders of Convertible Notes to purchase 5.1 million shares of Company stock at an exercise price of \$0.01 per share. The stock issuable upon exercise of the warrants shall be (1) common stock, or (2) in the event that a QIPO has not occurred within five years of the Note Purchase Agreement or in the event of a liquidation or sale of the Company, the most senior series of the Company’s convertible preferred stock (or in the event that the Company is consolidated or merges with one or more other corporations, the stock that the holder of the warrant would have been entitled to receive if holder would have exercised the warrant prior to such event). The warrants are exercisable for 7 years, and will be automatically exercised in the event of a change of control transaction or the expiration of the warrants.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

5. Debt (cont.)

The warrants are freestanding financial instruments and classified as liability due to the possibility that they can become exercisable into convertible preferred stock. The warrant liability of \$29.0 million is initially measured at fair value on its issuance date and recorded as a debt discount, and will be amortized during the term of the Convertible Notes to interest expense using the effective-interest method. The warrant liability will be remeasured on a recurring basis at each reporting period date, with the change in fair value reported in the statement of operations.

The embedded features are composed of conversion options that have the economic characteristics of a contingent early redemption feature settled in a variable number of shares of Company stock. These conversion options are bifurcated and accounted for separately from the host debt instrument. The derivative liability of \$68.5 million was initially measured at fair value on the issuance date of the Convertible Notes and recorded as a debt discount and will be amortized during the term of the Convertible Notes to interest expense using the effective-interest method. The derivative liability will be remeasured on a recurring basis at each reporting period date, with the change in fair value reported in the statement of operations.

The issuance costs of \$5.1 million were recorded as debt discount and will be amortized during the term of the Convertible Notes to interest expense using the effective interest method. The amortization expense of debt discount and issuance costs was \$5.6 million for the year ended December 31, 2020.

The Convertible Notes will mature in August 2025 or will be settled by issuing equity stock, and accordingly are classified as a non-current liability on the Company's balance sheets. As of December 31, 2020, the Convertible Notes, net of debt discount and issuance costs, consisted of the following (in thousands):

Principal	\$ 200,000
PIK interest	3,501
Total principal	203,501
Less debt discount and issuance costs	(97,058)
Total Convertible Notes	<u>\$ 106,443</u>

As of December 31, 2020, the contractual future principal repayments of the total debt were as follows (in thousands):

2022	\$ 10,000
2024	17,074
2025 ⁽¹⁾	203,501
Total	<u>\$ 230,575</u>

(1) Including PIK interest added to principal balance through December 31, 2020.

The Company was in compliance with all of the covenants contained in the Senior Credit Facility and Convertible Notes as of December 31, 2020.

6. Leases

The Company adopted the new lease accounting standard on January 1, 2020 using the modified retrospective transition method, recognizing a cumulative-effect adjustment to the balance sheet and not adjusting comparative information for prior periods. In addition, the Company elected the package of practical expedients permitted under the transition guidance, which allowed the Company not to reassess (1) whether any expired or existing contracts are or contain leases, (2) lease classification for any expired or existing leases, and (3) initial direct costs for any existing leases. The Company did not elect the use of hindsight practical expedients in determining the lease term for existing leases. Topic 842 also provides practical expedients for an entity's ongoing accounting. The Company has elected the short-term lease recognition exemption for all leases that qualify. As a result, for those leases with a term of less

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

6. Leases (cont.)

than 12 months, it will not recognize right-of-use assets or lease liabilities. The Company also elected the practical expedient to not separate lease and non-lease components for all its leases regardless of whether the Company is the lessee or a lessor to the lease.

The adoption resulted in a recognition of \$13.8 million of operating lease assets and \$14.3 million of operating lease liabilities on the balance sheet on January 1, 2020. The difference represents prepaid rent expense and deferred rent for leases existed on the date of adoption, which was an offset to the opening balance of operating lease assets. The adoption has no impact on the Company's operating expenses and cash flows.

As a Lessor

The net investment in leases are as follows:

	December 31,	
	2020	2019
Net investment in leases, current	\$ 398	\$ 343
Net investment in leases, non-current.	3,101	3,809
Total net investment in leases	<u>\$ 3,499</u>	<u>\$ 4,152</u>

Interest income from accretion of net investment in lease is not material.

In the year ended December 31, 2020, the Company assigned one operating lease and three sales-type leases. The Company received a total of \$3.7 million in cash, and recorded \$0.9 million in product revenue for the assigned operating lease, and an aggregate loss of assignment of \$1.2 million for the sales-type leases in the other expense (income), net on the statement of operations.

Future minimum payments receivable from operating and sales-type leases as of December 31, 2020 for each of the next five years are as follows:

	Operating leases	Sales-type leases
2021.	\$ 726	\$ 395
2022.	105	395
2023.	105	296
2024.	105	135
2025.	105	408
Thereafter	222	2,282
Total minimum lease payments.	<u>\$ 1,368</u>	<u>\$ 3,911</u>

As a Lessee

The Company leases its office and manufacturing facilities in Burlingame, California, Greenville, South Carolina, City of Industry, California, and Rochester Hills, Michigan under operating lease agreements with various expiration dates through 2026.

In June 2018, the Company entered into an agreement to sublease its office facilities in Rochester Hills, Michigan from July 2018 to October 2023. The total sublease payments are approximately \$2.3 million for the lease term. The sublease income is recorded in the other expense (income), net on the statement of operations.

The Company had no material capital leases as of December 31, 2020.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

6. Leases (cont.)

Maturities of operating lease liabilities as of December 31, 2020 were as follows (in thousands):

2021.....	\$	3,622
2022.....		3,133
2023.....		2,300
2024.....		1,648
2025.....		1,039
Thereafter		443
Total undiscounted lease payment		12,185
Less: imputed interest		(1,141)
Total lease liabilities	\$	<u>11,044</u>

Future minimum payments for noncancellable operating leases, based on previous lease accounting standard, as of December 31, 2019 were as follows (in thousands):

2020.....	\$	3,912
2021.....		3,619
2022.....		3,128
2023.....		2,300
2024.....		1,648
Thereafter		1,482
Total minimum lease payments.....		16,089
Less proceeds from sublease rental.....		(1,853)
Net operating lease obligation.....	\$	<u>14,236</u>

Operating lease expense was \$4.0 million, \$3.4 million, and \$3.1 million for the years ended December 31, 2020, 2019 and 2018, respectively.

Short-term and variable lease expenses for the year ended December 31, 2020 were not significant.

Supplemental cash flow information related to leases were as follows (in thousands):

	Year Ended December 31, 2020
Cash paid for amounts included in the measurement of lease liabilities:	
Operating cash flows from operating leases	(3,855)

In the year ended December 31, 2020, the cash flow from financing leases and right-of-use assets obtained in exchange for lease obligations were not significant.

Operating lease right-of-use assets and liabilities consist of the following (in thousands):

	December 31, 2020
Operating leases	
Operating lease right-of-use assets	\$ 10,310
Operating lease liabilities, current	\$ 3,153
Operating lease liabilities, non-current.....	7,891
Total operating lease liabilities	<u>\$ 11,044</u>

The weighted average remaining lease term and discount rate of operating leases are 4.0 years and 4.9%, respectively, as of December 31, 2020.

As of December 31, 2020, the Company had no significant additional operating leases and finance leases that have not yet commenced.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

7. Commitments and Contingencies

Purchase Commitments

As of December 31, 2020, the Company had outstanding inventory and other purchase commitments of \$215.7 million.

Letters of Credit

As of December 31, 2020, the Company had letters of credit outstanding totaling \$0.5 million, which will expire over various dates in 2021.

Guarantees

The Company provides guarantees of lease payments for vehicles under the financing transaction discussed in Note 4, in the event the lessee does not make payments to the financing company.

The Company regularly reviews its performance risk under the arrangement, and in the event that it becomes probable that it will be required to perform under a guarantee, the fair value of probable payment will be recorded. No guarantee liability was recorded as of December 31, 2020 and 2019.

Legal Proceedings

The Company accrues contingent liabilities when it is probable that future expenditures will be made and such expenditures can be reasonably estimated. From time to time in the normal course of business, various claims and litigation have been asserted or commenced. Due to uncertainties inherent in litigation and other claims, the Company can give no assurance that it will prevail in any such matters, which could subject the Company to significant liability or damages. Any claims or litigation could have an adverse effect on the Company's business, financial position, operating results, or cash flows in or following the period that claims or litigation are resolved.

As of December 31, 2020, the Company was not a party to any legal proceedings that would have a material adverse effect on its business.

8. Convertible Preferred Stock

In August and September 2019, the Company completed a private placement and issuance of a total of 10,857,762 shares of Series 8 convertible preferred stock at \$6.9075 per share for proceeds of \$74.8 million, net of issuance costs of approximately \$0.2 million. In October 2019, the Company completed an additional private placement and issuance of 1,719,145 shares of Series 8 convertible preferred stock at \$6.9075 per share for gross proceeds of \$11.9 million.

In June 2018, the Company completed the private placement and issuance of a total of 15,307,518 shares of Series 7 convertible preferred stock at \$6.526419 per share for proceeds of \$98.8 million, net of issuance costs of approximately \$1.1 million. In September 2018, the Company completed the private placement and issuance of a total of 8,442,102 additional shares of Series 7 convertible preferred stock at \$6.526419 per share for proceeds of \$53.0 million, net of issuance costs of approximately \$2.1 million.

In January 2018, the Company completed an additional private placement and issuance of 4,512,743 shares of Series 6 convertible preferred stock at \$5.539864 per share for proceeds of \$24.9 million, net of issuance costs of \$0.1 million. The \$5.0 million prepayment for the sale of Series 6 convertible preferred stock, which was recorded as a non-current liability as of December 31, 2017, was converted to equity upon closing of this transaction.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

8. Convertible Preferred Stock (cont.)

The following table summarizes convertible preferred stock authorized and issued and outstanding as of December 31, 2020 and 2019:

	Shares Authorized	Shares Issued and Outstanding	Net Carrying Value	Aggregate Liquidation Preference
			(in thousands)	
Series 1 ⁽¹⁾	27,567,694	27,476,120	\$ 79,564	\$ 75,006
Series 2	6,069,073	6,069,073	24,868	24,953
Series 3	7,617,704	7,617,704	36,096	36,475
Series 4	9,159,674	8,682,155	29,901	30,000
Series 5	28,391,526	28,391,526	138,747	142,987
Series 6	14,440,784	14,440,784	79,085	80,000
Series 7	23,749,620	23,749,620	151,770	155,000
Series 8	12,576,907	12,576,907	86,648	86,875
Total	<u>129,572,982</u>	<u>129,003,889</u>	<u>\$ 626,679</u>	<u>\$ 631,296</u>

- (1) Including Series 1 convertible preferred stock issued through exercise of warrants to purchase 197,315 shares. The proceeds from exercise of the warrants was \$0.5 million.

The rights, preferences, and privileges of the convertible preferred stock are as follows:

Dividends

The holders of convertible preferred stock are entitled to receive noncumulative dividends equal to 8% of the original issue price per share, when and if declared by the board of directors, prior and in preference to dividends on common stock. The holders of convertible preferred stock are also entitled to participate in dividends on common stock held on an as-if converted basis. No dividends on convertible preferred stock or common stock had been declared by the board of directors as of December 31, 2020.

Conversion Rights

Each share of convertible preferred stock is convertible at the option of the holder into shares of common stock at any time. The conversion rate for convertible preferred stock is equal to the quotient obtained by dividing the applicable original issue price by the applicable conversion price in effect at the time of conversion. The original issue price for the Series 1, 2, 3, 4, 5, 6, 7, and 8 convertible preferred stock is \$2.729862, \$4.11146, \$4.78821, \$3.45536, \$5.03624, \$5.539864, \$6.526419, and \$6.9075 per share, respectively, as adjusted for stock splits, stock dividends, combinations, subdivisions, recapitalizations, or similar transactions. The conversion price of the Series 1, 2, 3, 4, 5, 6, 7, and 8 convertible preferred stock is \$2.729862, \$4.01068, \$4.58348, \$3.45536, \$5.03624, \$5.539864, \$6.526419, and \$6.9075 per share, respectively, as adjusted for certain dilutive issuances, splits and combinations.

Each share of convertible preferred stock automatically converts into shares of common stock at the then-effective conversion price upon the Company's sale of its common stock in a firm commitment underwriting pursuant to a registration statement filed under the Securities Act of 1933, as amended, at an aggregate public offering price of not less than \$50.0 million. In addition, all shares of convertible preferred stock (other than the Series 7 preferred stock and Series 8 preferred stock) will automatically convert into shares of common stock upon a vote by the holders of a majority of the outstanding shares of convertible preferred stock voting together as a single class on an as-converted basis; the Series 7 preferred stock may not be converted without the vote or written consent of the holders of at least a majority of the then outstanding shares of Series 7 convertible preferred stock and the Series 8 preferred stock may not be converted without the vote or written consent of the holders of at least a majority of the then outstanding shares of Series 8 convertible preferred stock.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

8. Convertible Preferred Stock (cont.)

In the event that the initial offering price to the public (prior to any underwriting discount), under the Securities Act of 1933, as amended, at an aggregate public offering price of not less than \$50.0 million (IPO), is less than the original issuance price of the Series 8 convertible preferred stock, the conversion price of the Series 8 shall be adjusted to the higher of the IPO price or the original issuance price of the Series 7 convertible preferred stock.

Voting Rights

Holders of convertible preferred stock have voting rights equal to the number of shares of common stock into which their respective convertible preferred shares are then convertible. Holders of convertible preferred stock, as a separate class, voting on an as-converted basis, shall be entitled to elect seven directors of the Company. Holders of the common stock, as a separate class, shall be entitled to elect one director of the Company. The holders of common stock and convertible preferred stock, voting together as a single class on an as-converted basis, shall be entitled to elect the remaining number of directors of the Company.

Liquidation Preferences

In the event of a liquidation or sale of the Company, either voluntary or involuntary, distributions to the stockholders shall be made in the following manner: the holders of Series 8 preferred stock shall be entitled, before holders of other series of preferred stock and before holders of common stock, to an amount per share equal to the greater of (1) the original issue price of Series 8 preferred stock plus any declared but unpaid dividends and (2) the amount that would have been payable had all shares of Series 8 preferred stock been converted into common stock immediately prior to such event. After payment to the holders of Series 8 preferred stock, the holders of Series 7 preferred stock shall be entitled, before holders of other series of preferred stock, an amount per share equal to the greater of (1) the original issue price of Series 7 preferred stock plus any declared but unpaid dividends and (2) the amount that would have been payable had all shares of Series 7 preferred stock been converted into common stock immediately prior to such event. After payment to the holders of Series 8 and Series 7 preferred stock, the holders of Series 5 and 6 convertible preferred stock then outstanding shall be entitled, on a pari passu basis, an amount per share equal to the greater of (1) the applicable original issue price for such series of convertible preferred stock plus any declared but unpaid dividends and (2) the amount that would have been payable had all shares of such series convertible preferred stock been converted into common stock immediately prior to such event. After payment to the holders of Series 8, Series 7, and Series 5 and 6 convertible preferred stock, the holders of Series 1, 2, 3, and 4 convertible preferred stock then outstanding shall be entitled, on a pari passu basis, an amount per share equal to the greater of (1) the applicable original issue price for such series of convertible preferred stock plus any declared but unpaid dividends and (2) the amount that would have been payable had all shares of such series convertible preferred stock been converted into common stock immediately prior to such event. After payment of all preferential amounts required to be paid to the holders of convertible preferred stock, the remaining funds and assets available for distribution shall be distributed among the holders of common stock, pro rata based on the number of shares of common stock held.

Redemption

Convertible preferred stock is not redeemable by the Company or at the option of the preferred stockholders.

Convertible Preferred Stock Warrants

Warrants for Series 4 Preferred Stock

In May 2016, in connection with the first amendment to the Hercules Credit Facility, the Company issued warrants to purchase an additional 79,587 shares of Series 4 convertible preferred stock to Hercules at an exercise price of \$3.45536 per share, subject to certain adjustments. The warrants expire at the earlier of May 2023 and three years from the Company's qualified initial public offering.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

8. Convertible Preferred Stock (cont.)

During 2015, the Company issued warrants to purchase 397,932 shares of Series 4 convertible preferred stock to Hercules at an exercise price of \$3.45536 per share, subject to certain adjustments. The warrants expire in the earlier of May 2022 or three years from the Company's qualified initial public offering.

Warrants for Series 1 Preferred Stock

In each of October 2011 and March 2012, the Company issued warrants to purchase 45,787 shares of Series 1 convertible preferred stock at an exercise price of \$2.729862 per share to a bank in connection with a debt arrangement. The warrants expire in October 2021.

The warrants for Series 1 and Series 4 convertible preferred stock are recorded as a warrant liability included in other long-term liabilities on the balance sheets prior to January 1, 2018.

The Company adopted ASU No. 2017-11, *Earnings per Share (Topic 260); Distinguishing Liabilities from Equity (Topic 480); Derivatives and Hedging (Topic 815)* on January 1, 2018, and reclassified its warrant liability of \$0.6 million to additional paid-in capital upon adoption. As of December 31, 2020, a total of 569,093 shares of the Series 1 and Series 4 convertible preferred stock warrants were outstanding.

9. Common Stock

As of December 31, 2020, the Company was authorized to issue 304,672,982 shares of capital stock with a par value of \$0.0001 per share. The authorized shares consisted of 175,100,000 shares of common stock and 129,572,982 shares of convertible preferred stock. There were 6,361,952 shares and 4,400,247 shares of common stock issued and outstanding as of December 31, 2020 and 2019, respectively.

The Company had reserved shares of common stock, on an as-if-converted basis, for issuance as follows:

	December 31,	
	2020	2019
Exercise of stock options to purchase common stock.	26,359,796	20,401,985
Exercise of common stock warrants to purchase common stock	5,149,716	117,630
Issuances of shares available under stock option plans.	442,891	2,362,407
Conversion of convertible preferred stock	129,496,639	129,496,639
Conversion of convertible preferred stock warrants	569,093	569,093
Total	<u>162,018,135</u>	<u>152,947,754</u>

Common Stock Warrants

In August 2020, in connection with the issuance of Convertible Notes, the Company issued warrants to purchase 5,112,086 shares of common stock to purchasers of the Convertible Notes. The warrants have an exercise price of \$0.01 per share. The stock issuable upon exercise of the warrants shall be (1) common stock, or (2) in the event that a QIPO has not occurred within five years of the Note Purchase Agreement or in the event of a liquidation or sale of the Company, the most senior series of the Company's preferred stock (or in the event that the Company consolidated or merges with one or more other corporation, the stock that the holder of the warrant would have been entitled to receive if holder would have exercised the warrant prior to such event). The warrants are exercisable for 7 years, and will be automatically exercised in the event of a change of control transaction or the expiration of the warrants. These warrants are classified as liability in the balance sheets. Refer to Note 5 for further details.

In May 2019, in connection with the 2019 Amended Hercules Credit Facility, the Company issued to Hercules a warrant to purchase 36,630 shares of common stock. The warrants have an exercise price of \$5.46 per share, which are exercisable for 10 years and will automatically exercise upon the initial public offering. See Note 5, Debt.

In the fourth quarter of 2020, 80,000 shares of the common stock warrants expired.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

10. Stock Option Plan

In 2010, the Company adopted the 2010 Equity Incentive Plan (the “Plan”). The Plan provides for the issuance of incentive stock options, non-statutory stock options, stock appreciation rights, restricted stock, and restricted stock units. Non-statutory stock options, stock appreciation rights, restricted stock, and restricted stock units may be granted to employees, directors, and consultants, but only employees may be granted incentive stock options. No stock appreciation rights, restricted stock, or restricted stock units had been issued under the Plan as of December 31, 2020.

The exercise price per share of all stock options granted under the Plan must equal at least 100% of the fair market value per share of the Company’s common stock on the date of grant as determined by the board of directors. If, at the time the Company grants an incentive stock option, the optionee owns stock representing more than 10% of the total combined voting power of all classes of stock of the Company, the exercise price per share must be at least 110% of the fair market value per share of the Company’s common stock on the date of grant and the stock options will expire five years after the date of grant. Except as noted above, stock options expire no more than ten years after the date of grant.

Generally, a terminated service provider may exercise stock options within three months of termination. Awards that expire or are cancelled without delivery of shares generally become available for re-issuance under the 2010 Plan.

Stock option awards generally vest over a four-year period, with 25% vesting after one year from date of grant and quarterly thereafter. Certain awards have shorter vesting periods.

During 2020, the board of directors approved an increase in the number of shares of common stock reserved under the 2010 Equity Incentive Plan by 6,000,000 shares to 31,994,478 shares.

The shares available for grant under the Plan were as follows:

	Year Ended December 31,		
	2020	2019	2018
Balance at the beginning of period	2,362,407	3,627,104	2,751,406
Additional shares authorized.	6,000,000	1,519,075	6,847,235
Granted	(10,281,875)	(3,359,941)	(7,312,022)
Repurchased	—	9,000	—
Cancelled/forfeited	2,362,359	567,169	1,340,485
Balance at the ending of period	<u>442,891</u>	<u>2,362,407</u>	<u>3,627,104</u>

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

10. Stock Option Plan (cont.)

A summary of the Company's stock option activity and related information was as follows:

	Options Outstanding			
	Number of Stock Options Outstanding	Weighted- Average Exercise Price	Weighted- Average Remaining Contractual Life (Years)	Aggregate Intrinsic Value (in thousands)
Balance as of December 31, 2017.	13,764,812	\$ 1.67	8.3	\$ 9,498
Granted	7,312,022	4.11		
Exercised.	(1,217,877)	1.60		
Cancelled/forfeited/expired.	(1,340,485)	2.06		
Balance as of December 31, 2018.	18,518,472	\$ 2.61	8.3	\$ 42,951
Granted	3,359,941	5.23		
Exercised.	(909,259)	1.90		
Cancelled/forfeited/expired.	(567,169)	3.50		
Balance as of December 31, 2019.	20,401,985	\$ 3.05	7.6	\$ 34,723
Granted ⁽¹⁾	6,531,875	4.36		
Exercised.	(1,961,705)	2.14		
Cancelled/forfeited/expired.	(2,362,359)	4.11		
Balance as of December 31, 2020 ⁽¹⁾	22,609,796	\$ 3.40	7.4	\$ 65,056
Exercisable as of December 31, 2020.	12,637,973	\$ 2.63	6.2	\$ 46,004

(1) Excluding CEO Equity Awards of 3,000,000 shares and Milestone Options of 750,000 shares, of which 562,500 shares exercisable as of December 31, 2020. Refer to section below for further details.

In March 2020, in conjunction with Mr. Allen's appointment as the President and Chief Executive Officer, the board of directors approved a grant to Mr. Allen of stock option awards with respect to 5,250,000 shares, comprised of (1) 1,500,000 shares of time-based award with an exercise price of \$4.75 per share vesting quarterly over 4 years, (2) 3,000,000 shares of time-based award consists of 4 tranches with an exercise price of \$10, \$15, \$20 and \$25 per share, respectively, and vesting quarterly over 4 years ("Equity Awards"), and (3) 750,000 shares of milestone-based award with exercise price of \$4.75 per share will vest entirely and become exercisable on the first trading day following the expiration of the lockup period of the Company's initial public offering or the consummation of a change in control of the Company ("Milestone Options"). The Milestone Options shall vest in full and become exercisable upon the consummation of a merger involving a Special Purpose Acquisition Company.

The stock-based compensation expense for Milestone Options will be recognized at the time the performance milestone becomes probable of achievement. No stock-based compensation expense related to the Milestone Options was recognized as of December 31, 2020 as the performance condition was not considered probable of achievement. The unrecognized stock-based compensation expense associated with the Milestone Options was \$2.1 million on the grant date and as of December 31, 2020.

The weighted average fair value of stock options granted, excluding the 3,000,000 shares underlying the Equity Awards with exercise price of \$10, \$15, \$20 or \$25 per share and 750,000 shares underlying the Milestone Options, was \$3.13 per share for 2020. The weighted average fair value of stock options granted was \$3.14 per share for 2019 and \$2.64 per share for 2018. Aggregate intrinsic value represents the difference between the estimated fair value of the underlying common stock and the exercise price of outstanding, in-the-money stock options. The total intrinsic value of stock options exercised was \$4.3 million for 2020, \$2.9 million for 2019 and \$2.3 million for 2018. The total estimated grant date fair value of stock options vested was \$9.9 million for 2020, \$8.3 million for 2019 and \$4.7 million for 2018. As of December 31, 2020, the total unrecognized stock-based compensation expense related to outstanding stock options was \$34.8 million, which is expected to be recognized over a weighted-average period of 2.9 years.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

10. Stock Option Plan (cont.)

Determining Fair Value of Stock Options

The Company uses the Black-Scholes option pricing model to determine the fair value of stock options. The fair value of each stock option grant is estimated on the date of the grant. The fair value of the common stock underlying the stock options has historically been determined by the board of directors. There has been no public market for the Company's common stock. Therefore, the board of directors has determined the fair value of the common stock at the time of the stock option grant by considering a number of objective and subjective factors including independent third-party valuation reports, valuations of comparable companies, sales of convertible preferred stock and common stock to unrelated third parties, operating and financial performance, lack of liquidity of capital stock and general and industry-specific economic outlook, among other factors. The fair value of the underlying common stock shall be determined by the board of directors until such time that the Company's common stock is listed on an established stock exchange or national market system.

The fair value of stock options granted is estimated on the date of grant using the following assumptions:

	Year Ended December 31,		
	2020	2019	2018
Expected term (in years)	6.1	6.1	6.0
Risk-free interest rate	0.5%	1.8%	2.8%
Expected volatility	69.1%	65.4%	71.5%
Expected dividend rate	—	—	—

Expected Term — The Company estimates the expected term consistent with the simplified method. The Company elected to use the simplified method because of its limited history of stock option exercise activity. The simplified method calculates the expected term as the average of the vesting and contractual terms of the award.

Volatility — Since the Company has no trading history by which to determine the volatility of its own common stock price, the expected volatility being used is derived from the historical stock volatility of a representative industry peer group of comparable publicly listed companies over a period approximately equal to the expected term of the stock options.

Risk-Free Interest Rate — The risk-free interest rate is based on U.S. Treasury zero coupon issues with remaining terms similar to the expected term on the options.

Expected Dividend — The Company has never declared or paid any cash dividends and does not plan to pay cash dividends in the foreseeable future, and, therefore, used an expected dividend yield of zero in the valuation model.

Forfeiture — All stock-based payment awards are amortized on a straight-line basis over the requisite service periods of the awards, which are generally the vesting periods. Under the ASU No. 2016-09, *Compensation — Stock Compensation: Improvements to Employee Share-Based Payment Accounting*, the Company elected to account for forfeitures when they occur.

Stock-based Compensation Expense

Stock-based compensation expense included in operating results was as follows (in thousands):

	Year Ended December 31,		
	2020	2019	2018
Cost of goods sold.	\$ 929	\$ 826	\$ 553
Research and development	1,616	1,436	1,227
Selling, general and administrative.	7,737	6,258	3,596
Total stock-based compensation expense	<u>\$ 10,282</u>	<u>\$ 8,520</u>	<u>\$ 5,376</u>

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

11. Net Loss Per Share

Basic net loss per share is computed by dividing the net loss by the weighted-average number of shares of common stock outstanding during the period, less the weighted-average unvested common stock subject to repurchase or forfeiture as they are not deemed to be issued for accounting purposes. Diluted net loss per share is computed by giving effect to all potential shares of common stock, including convertible preferred stock, stock options, and warrants, to the extent they are dilutive.

The computation of basic and diluted net loss per share of common stock under the two-class method attributable to common stockholders was as follows (in thousands, except for per share data):

	Year Ended December 31,		
	2020	2019	2018
Numerator:			
Net loss	\$ (127,007)	\$ (101,552)	\$ (91,622)
Denominator:			
Weighted-average shares used in computing net loss per share of common stock, basic and diluted	4,913	4,052	2,831
Net loss per share of common stock, basic and diluted	<u>\$ (25.85)</u>	<u>\$ (25.06)</u>	<u>\$ (32.36)</u>

We applied the two-class method to calculate its basic and diluted net loss per share of common stock, as the convertible preferred stock are participating securities. The two-class method is an earnings allocation formula that treats a participating security as having rights to earnings that otherwise would have been available to common stock holders. However, the two-class method does not impact the net loss per share of common stock as we were in a loss position for each of the periods presented and holders of convertible preferred stock do not have to participate in losses.

Since we were in a loss position for each of the periods presented, diluted net loss per share is the same as basic net loss per share for each period as the inclusion of all potential common stock shares outstanding would have been anti-dilutive. The potentially dilutive securities that were excluded from the diluted per share calculation because they would have been anti-dilutive were as follows:

	Year Ended December 31,		
	2020	2019	2018
Convertible preferred stock ⁽¹⁾	129,496,639	129,496,639	116,919,732
Warrants to purchase convertible preferred stock.	569,093	569,093	569,093
Stock options to purchase common stock.	26,359,796	20,401,985	18,518,472
Warrants to purchase common stock	5,149,716	117,630	81,000
Common stock subject to repurchase	—	—	14,000
	<u>161,575,244</u>	<u>150,585,347</u>	<u>136,102,297</u>

(1) Represents the shares of common stock that the convertible preferred stock is convertible into.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

12. Income Tax

The components of the net loss before the provision for income taxes were as follows (in thousands):

	Year Ended December 31,		
	2020	2019	2018
Domestic	\$ (126,985)	\$ (101,552)	\$ (91,622)

The provision for income taxes consisted of the following (in thousands):

	Year Ended December 31,		
	2020	2019	2018
Current:			
Federal	\$ —	\$ —	\$ —
State	13	—	—
Foreign	9	—	—
Total current provision	22	—	—
Deferred:	—	—	—
Federal	—	—	—
State	—	—	—
Foreign	—	—	—
Total deferred provision	—	—	—
Total provision for income taxes	<u>\$ 22</u>	<u>\$ —</u>	<u>\$ —</u>

A reconciliation of the U.S. federal statutory income tax rates to our effective tax rate is as follows (in percentages):

	Year Ended December 31,		
	2020	2019	2018
U.S. federal statutory rate	21.0%	21.0%	21.0%
State income taxes, net of federal benefit	1.7	3.4	6.1
Change in valuation allowance	(17.5)	(23.9)	(27.0)
Research and development credit	0.2	0.3	0.6
Fair market adjustment	(2.1)	—	—
Non-deductible Convertible Notes interest expense	(2.2)	—	—
Other	(1.1)	(0.8)	(0.7)
Effective income tax rate	<u>—%</u>	<u>—%</u>	<u>—%</u>

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

12. Income Tax (cont.)

Our deferred tax assets (liabilities) are as follows (in thousands):

	December 31,	
	2020	2019
Deferred tax assets:		
Net operating loss carryforwards	\$ 113,643	\$ 96,047
Deferred revenue	6,731	4,695
Stock-based compensation	3,560	2,509
Accruals and reserves, not currently deductible for tax purposes	8,351	7,612
Research and development credit	2,761	2,458
Goodwill	1,014	1,277
Interest expense	2,097	1,576
Lease liability	2,738	—
Other	44	39
Gross deferred tax assets	140,939	116,213
Less valuation allowance	(137,437)	(115,175)
Net deferred tax assets	<u>\$ 3,502</u>	<u>\$ 1,038</u>
Deferred tax liabilities:		
Property, plant and equipment	\$ (1,008)	\$ (1,050)
ROU assets	(2,494)	—
Other	—	12
Gross deferred tax liabilities	(3,502)	(1,038)
Net deferred tax asset (liabilities)	<u>\$ —</u>	<u>\$ —</u>

The net valuation allowance increased by \$22.3 million and \$24.3 million for 2020 and 2019, respectively.

As of December 31, 2020 and 2019, the Company's net deferred tax assets and liabilities were zero. The deferred tax assets consist primarily of the federal and state net operating losses. Realization of deferred tax assets is dependent upon future taxable income, if any, the amount and timing of which are uncertain. In assessing the realizability of deferred tax assets, management determined that it is more likely than not that no deferred tax assets will be realized. Therefore, the Company has provided a full valuation allowance against these deferred tax assets.

The Company had net operating loss carryforwards as follows (in thousands):

	December 31,	
	2020	2019
Federal (Prior to 2018)	\$ 237,850	\$ 237,850
Federal (Post December 31, 2017)	216,724	145,480
State	317,801	272,029
Total	<u>\$ 772,375</u>	<u>\$ 655,359</u>

Net operating loss carryforwards are available to offset future federal and state taxable income. The federal net operating loss carryforwards generated prior to 2018 will begin to expire in 2030 and the net operating loss carryforwards generated after December 31, 2017 do not expire. The state net operating loss carryforwards will begin to expire in 2023.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

12. Income Tax (cont.)

The Company had research and development credit carryforwards as follows (in thousands):

	December 31,	
	2020	2019
Federal.	\$ 2,020	\$ 1,728
State.	1,231	1,099
Total	<u>\$ 3,251</u>	<u>\$ 2,827</u>

The research and development credit carryforwards are available to reduce future regular income taxes. The federal research and development credit carryforwards will begin to expire in 2037, while the South Carolina research and development credit carryforwards will begin to expire in 2027. California research and development credit carryforwards have no expiration date.

Utilization of the Company's net operating loss carryforwards and research tax credit carryforwards may be subject to substantial annual limitations due to the ownership change limitations provided by the Internal Revenue Code and similar state provisions. The annual limitation could result in the expiration of the net operating loss carryforwards and research tax credit carryforwards before utilization.

The Company's policy is to recognize interest or penalties related to income tax matters in income tax expense. As of December 31, 2020 and 2019, the Company had no accrued interest or penalties. The unrecognized tax benefits may change during the next year for items that arise in the ordinary course of business. In the event that any unrecognized tax benefits are recognized, the effective tax rate will not be affected.

A reconciliation of the beginning and ending amount of unrecognized tax benefits for 2020, 2019 and 2018 was as follows (in thousands):

	Year Ended December 31,		
	2020	2019	2018
Beginning balance.	\$ 707	\$ 527	\$ 165
Increase – tax positions in current period.	106	180	316
Increase – tax positions in prior periods.	—	—	46
Ending balance	<u>\$ 813</u>	<u>\$ 707</u>	<u>\$ 527</u>

The Company files tax returns in the United States and certain states. Due to the losses being carried forward, the tax years from 2011 forward remain open to examination.

In March 2020, the "Coronavirus Aid, Relief and Economic Security (CARES) Act" was signed into law. The CARES Act includes provisions relating to refundable payroll tax credits, deferment of the employer portion of certain payroll taxes, net operating loss carryback periods, alternative minimum tax credit refunds, modifications to the net interest deduction limitations and technical corrections to tax depreciation methods for qualified improvement property. These provisions are not expected to have a material effect on the Company's financial statements.

13. 401(k) Plan

The Company sponsors a 401(k) defined contribution plan covering all eligible employees and provides matching contribution for the first 4% of their salaries. The matching contribution costs incurred were \$1.9 million, \$1.7 million, and \$1.2 million for the years ended December 31, 2020, 2019 and 2018, respectively.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

14. Subsequent Events

On January 11, 2021, the Company entered into an Agreement and Plan of Merger (“Merger Agreement”) with ArcLight Clean Transition Corp., a publicly traded special purpose acquisition company (“SPAC”) and Cayman Islands exempted company (“ArcLight”) and Phoenix Merger Sub, Inc., a Delaware corporation and a wholly-owned subsidiary of ArcLight (“Phoenix Merger Sub”).

At the closing, ArcLight will become a Delaware corporation, and Phoenix Merger Sub will merge with and into Proterra, with Proterra as the surviving company and continuing as a wholly-owned subsidiary of ArcLight. ArcLight’s name will be changed to Proterra Inc (“New Proterra”).

Upon closing of the merger,

- Proterra’s outstanding convertible preferred stock of 129,003,889 shares will convert into 129,496,639 shares of common stock. Each share of Proterra common stock (including shares issuable upon conversion of Proterra convertible preferred stock) will be converted into the right to receive 0.8925 shares of New Proterra Common Stock, as a result of applying the Exchange Ratio;
- each Proterra option will be converted into an option to purchase shares of New Proterra Common Stock by multiplying the number of underlying shares by the exchange ratio, rounded down to the nearest whole share; the exercise price of each converted option will be determined by dividing the per share exercise price of the respective Proterra options by the Exchange Ratio, rounded up to the nearest whole cent;
- each Proterra warrant to purchase common stock and convertible preferred stock will be converted into a warrant to purchase shares of New Proterra Common Stock by multiplying the number of underlying shares by the Exchange Ratio, rounded down to the nearest whole share; the exercise price of each converted warrant will be determined by dividing the per share exercise price of the respective Proterra warrant by the Exchange Ratio, rounded up to the nearest whole cent;
- each outstanding Convertible Note that was not optionally converted immediately prior to the consummation of the merger will remain outstanding and become convertible into shares of New Proterra Common Stock in accordance with the terms of such Convertible Notes.

In the event that the closing sale price of New Proterra common stock exceeds certain price thresholds for 20 out of any 30 consecutive trading days or in any transaction resulting in a change in control with a valuation of the New Proterra Common Stock exceeds certain price thresholds during the first five years following the closing of the merger, up to an additional 22,809,500 shares of New Proterra Common Stock may be issued to holders of Proterra convertible preferred stock, common stock, warrants, vested options and Convertible Notes as of immediately prior to the closing of the merger.

In connection with the merger, ArcLight entered into subscription agreements with certain investors (“PIPE Investors”) to purchase an aggregate of 41.5 million shares of New Proterra common stock, immediately following the closing of merger, at a purchase price of \$10.00 per share, for aggregate gross proceeds of \$415.0 million (“PIPE Financing”).

In connection with the execution of the Merger Agreement, ArcLight entered into the Sponsor Letter Agreement with the ArcLight Sponsor providing that 10% of the New Proterra Common Stock received by Sponsor upon consummation of the merger in exchange for its outstanding shares of ArcLight class B ordinary shares, excluding 140,000 shares owned by ArcLight board of directors, will be subject to vesting and forfeiture.

ArcLight public shareholders have rights to redeem their shares for cash upon the closing of the merger. The Merger Agreement includes as a condition to close the merger that, at the closing of the merger, ArcLight will have a minimum of \$350.0 million of funds, net of any unpaid liabilities.

We have evaluated subsequent events through April 7, 2021.



Schedule Five

Proterra Inc does not intend to utilize Subcontractors for the Pinellas Suncoast Transit Authority's RFP 21-980369.

Headquarters

1815 Rollins Road, Burlingame, CA 94010

East Coast Manufacturing

1 Whitlee Court, Greenville, SC 29607

West Coast Manufacturing

383 Cheryl Lane, City of Industry, CA 91789

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PROTERRA

Pinellas Suncoast Transit Authority

2. Three Most Recent Audited Financial Statements

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Stockholders and Board of Directors
Proterra Inc:

Opinion on the Financial Statements

We have audited the accompanying balance sheets of Proterra Inc (the Company) as of December 31, 2020 and 2019, the related statements of operations, stockholders' equity, and cash flows for each of the years in the three-year period ended December 31, 2020, and the related notes (collectively, the financial statements). In our opinion, the financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2020 and 2019, and the results of its operations and its cash flows for each of the years in the three-year period ended December 31, 2020, in conformity with U.S. generally accepted accounting principles.

Change in Accounting Principle

As discussed in note 2 to the financial statements, the Company changed its method of accounting for leases as of January 1, 2020 due to the adoption of Accounting Standards Codification Topic 842, *Leases*.

Basis for Opinion

These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on these financial statements based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB and in accordance with auditing standards generally accepted in the United States of America. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ KPMG LLP

We have served as the Company's auditor since 2012.

Santa Clara, California
April 7, 2021

PROTERRA INC
BALANCE SHEETS
(in thousands, except share and per share data)

	December 31,	
	2020	2019
Assets:		
Cash and cash equivalents	\$ 110,719	\$ 40,240
Accounts receivable, net	51,716	44,500
Short-term investments	68,990	39,877
Inventory	92,330	94,042
Prepaid expenses and other current assets	7,455	6,684
Deferred cost of goods sold	2,037	1,240
Restricted cash, current	8,397	5,970
Total current assets	341,644	232,553
Property, plant, and equipment, net	53,587	47,515
Operating lease right-of-use assets	10,310	—
Restricted cash, non-current	4,581	7,439
Other assets	4,789	6,366
Total assets	<u>\$ 414,911</u>	<u>\$ 293,873</u>
Liabilities and Stockholders' Equity:		
Accounts payable	\$ 25,074	\$ 37,865
Accrued liabilities	19,736	14,635
Deferred revenue, current	16,015	10,358
Operating lease liabilities, current	3,153	—
Debt, current	—	—
Total current liabilities	63,978	62,858
Debt, non-current	133,252	24,574
Derivative liability	70,870	—
Warrant liability	39,670	—
Deferred revenue, non-current	12,206	8,264
Operating lease liabilities, non-current	7,891	—
Other long-term liabilities	12,578	11,198
Total liabilities	340,445	106,894
Commitments and contingencies (Note 7)		
Stockholders' equity:		
Convertible preferred stock, \$0.0001 par value; 129,572,982 shares authorized and 129,003,889 shares issued and outstanding as of December 31, 2020 and 2019; liquidation preference \$631.3 million as of December 31, 2020 and 2019	13	13
Common stock, \$0.0001 par value; 175,100,000 shares authorized and 6,361,952 shares issued and outstanding as of December 31, 2020; 170,000,000 shares authorized and 4,400,247 shares issued and outstanding as of December 31, 2019	1	—
Additional paid-in capital	682,671	668,178
Accumulated deficit	(608,219)	(481,212)
Total stockholders' equity	74,466	186,979
Total liabilities and stockholders' equity	<u>\$ 414,911</u>	<u>\$ 293,873</u>

See accompanying notes to financial statements.

PROTERRA INC
STATEMENTS OF OPERATIONS
(in thousands, except per share data)

	Year Ended December 31,		
	2020	2019	2018
Product revenue.	\$ 190,411	\$ 172,295	\$ 119,314
Parts and other service revenue.	6,532	8,989	3,896
Total revenue.	196,943	181,284	123,210
Product cost of goods sold	181,987	173,428	130,660
Parts and other service cost of goods sold	7,417	9,467	3,767
Total cost of goods sold	189,404	182,895	134,427
Gross profit (loss)	7,539	(1,611)	(11,217)
Research and development	36,233	35,477	31,504
Selling, general and administrative.	67,139	56,132	46,343
Asset impairment charge.	121	6,440	—
Total operating expenses.	103,493	98,049	77,847
Loss from operations.	(95,954)	(99,660)	(89,064)
Interest expense, net	15,413	2,704	3,476
Loss on valuation of derivative and warrant liabilities	12,989	—	—
Other expense (income), net	2,629	(812)	(918)
Loss before income taxes	(126,985)	(101,552)	(91,622)
Provision for income taxes	22	—	—
Net loss	\$ (127,007)	\$ (101,552)	\$ (91,622)
Net loss per share of common stock, basic and diluted	\$ (25.85)	\$ (25.06)	\$ (32.36)
Shares used in computing net loss per share of common stock, basic and diluted	4,913	4,052	2,831

See accompanying notes to financial statements.

PROTERRA INC
STATEMENTS OF STOCKHOLDERS' EQUITY
(in thousands)

	Convertible Preferred Stock		Common Stock		Additional Paid-in Capital	Accumulated Deficit	Total
	Shares	Amount	Shares	Amount			
Balance, December 31, 2017 . . .	88,165	\$ 9	2,282	\$ —	\$ 386,541	\$ (288,038)	\$ 98,512
Adoption of accounting standards	—	—	—	—	587	—	587
Issuance of stock, net of costs . . .	28,262	2	1,218	—	178,625	—	178,627
Stock-based compensation	—	—	—	—	5,376	—	5,376
Net loss	—	—	—	—	—	(91,622)	(91,622)
Balance, December 31, 2018 . . .	116,427	11	3,500	—	571,129	(379,660)	191,480
Issuance of stock, net of costs . . .	12,577	2	900	—	88,388	—	88,390
Issuance of warrants	—	—	—	—	141	—	141
Stock-based compensation	—	—	—	—	8,520	—	8,520
Net loss	—	—	—	—	—	(101,552)	(101,552)
Balance, December 31, 2019 . . .	129,004	13	4,400	—	668,178	(481,212)	186,979
Issuance of stock, net of costs . . .	—	—	1,962	1	4,211	—	4,212
Stock-based compensation	—	—	—	—	10,282	—	10,282
Net loss	—	—	—	—	—	(127,007)	(127,007)
Balance, December 31, 2020 . . .	<u>129,004</u>	<u>\$ 13</u>	<u>6,362</u>	<u>\$ 1</u>	<u>\$ 682,671</u>	<u>\$ (608,219)</u>	<u>\$ 74,466</u>

See accompanying notes to financial statements.

PROTERRA INC
STATEMENTS OF CASH FLOWS
(in thousands)

	Year Ended December 31,		
	2020	2019	2018
Cash flows from operating activities:			
Net loss	\$ (127,007)	\$ (101,552)	\$ (91,622)
Adjustments to reconcile net loss to net cash used in operating activities:			
Depreciation and amortization	15,536	12,643	9,254
Loss on disposal of fixed assets	143	527	793
Asset impairment charge	121	6,440	—
Stock-based compensation	10,282	8,520	5,376
Amortization of debt discount and issuance costs	6,045	306	247
Accretion of debt end of term charge and PIK interest	3,501	604	1,196
Loss on valuation of derivative and warrant liabilities	12,989	—	—
Others	(153)	(284)	(335)
Changes in operating assets and liabilities:			
Accounts receivable	(7,216)	(9,005)	(23,196)
Inventory	2,182	(15,692)	(23,642)
Prepaid expenses and other current assets	(1,043)	563	(5,002)
Deferred cost of goods sold	(797)	4,207	(3,356)
Operating lease right-of-use assets and liabilities	87	—	—
Other assets	1,575	(4,746)	(718)
Accounts payable and accrued liabilities	(4,090)	(1,025)	12,545
Deferred revenue, current and non-current	9,599	132	11,780
Other non-current liabilities	2,176	1,068	3,001
Net cash used in operating activities	(76,070)	(97,294)	(103,679)
Cash flows from investing activities:			
Purchase of investments	(108,960)	(71,817)	(34,152)
Proceeds from maturities of investments	80,000	50,400	16,200
Purchase of property and equipment	(25,565)	(13,810)	(16,698)
Net cash used in investing activities	(54,525)	(35,227)	(34,650)
Cash flows from financing activities:			
Proceeds from debt, net of issuance costs	219,471	21,362	—
Repayment of debt	(22,787)	(26,708)	—
Repayment of finance obligation	(484)	(452)	(452)
Proceeds from government grants	275	522	1,507
Proceeds from exercise of stock options	4,168	1,726	1,916
Proceeds from issuance of stock, net of issuance costs	—	86,746	173,659
Net cash provided by financing activities	200,643	83,196	176,630
Net increase (decrease) in cash and cash equivalents, and restricted cash	70,048	(49,325)	38,301
Cash and cash equivalents, and restricted cash at the beginning of period	53,649	102,974	64,673
Cash and cash equivalents, and restricted cash at the end of period	\$ 123,697	\$ 53,649	\$ 102,974
Supplemental disclosures of cash flow information:			
Cash paid for interest	\$ 5,827	\$ 4,881	\$ 2,648
Cash paid for income taxes	9	—	—
Non-cash investing and financing activity:			
Issuance of warrants in connection with debt borrowing	\$ —	\$ 141	\$ —
Assets acquired through accounts payable and accrued liabilities	659	4,017	1,146
Non-cash transfer of vehicles from inventory to internal use	—	967	—
Non-cash transfer of leased assets to inventory	635	—	—

See accompanying notes to financial statements.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies

Organization and Description of Business

Proterra Inc (“Proterra” or the “Company”) is a leading developer and producer of electric vehicle technology for commercial application. Proterra designs, develops, manufactures, and sells electric transit buses as an original equipment manufacturer for North American public transit agencies, airports, universities, and other commercial transit fleets. It also designs, develops, manufactures, sells, and integrates proprietary battery systems and electrification solutions for global commercial vehicle manufacturers. Additionally, Proterra provides fleet-scale, high-power charging solutions for our customers. Proterra was originally formed in June 2004 as a Colorado limited liability company and converted to a Delaware corporation in February 2010. The Company operates from its headquarters and battery production facility in Burlingame, California. The Company also has manufacturing and product development facilities in Greenville, South Carolina and City of Industry, California.

The Company has incurred net losses and negative cash flows from operations since inception. As of December 31, 2020, the Company has an accumulated deficit of \$608.2 million, and \$179.7 million of cash and cash equivalents and short-term investments. The Company has funded operations primarily through a combination of equity and debt financing. Management believes that the Company’s currently available resources will be sufficient to fund its cash requirements for at least the next twelve months. However, there can be no assurance that future financings will be successfully completed or completed on terms acceptable to the Company. These financial statements do not include any adjustments that may result from the outcome of this uncertainty.

Basis of Presentation

The Company prepared the financial statements in accordance with U.S. generally accepted accounting principles (“U.S. GAAP”).

The Company has not experienced any significant impact to estimates or assumptions as a result of the COVID-19 pandemic. We will continue to monitor impacts of the pandemic on an ongoing basis. While the COVID-19 pandemic has not had a material adverse impact on our financial condition and results of operations to date, the future impact of the COVID-19 pandemic on our operational and financial performance will depend on certain developments, including the duration and spread of the pandemic, impact on our customers and effect on our suppliers, all of which are uncertain and cannot be predicted.

Segments

The Company operates in the United States and started to expand its business to the European Union in 2018 and Canada in 2019. The revenue generated outside of the United States was not material for the years ended December 31, 2018 and 2019. The revenue generated outside of the United States was about 28% of total revenue or \$55.9 million for the year ended December 31, 2020, which was primarily generated from Canada.

The Company’s chief operating decision maker is its Chief Executive Officer (CEO), who reviews financial information presented at the entity level. Accordingly, the Company has determined that it has a single reportable segment.

Use of Estimates

The preparation of financial statements in conformity with U.S. GAAP requires the use of estimates and judgments that affect the reported amounts in the financial statements and accompanying notes. U.S. GAAP requires the Company to make estimates and judgments in several areas including, but not limited to, those related to revenue recognition, collectability of accounts receivable, valuation of inventories, valuation of Convertible Notes (See Note 3), warranty liability, contingent liabilities, stock-based compensation expense, useful lives of property, plant, and equipment, recoverability of assets, residual value of leased assets, and the valuation of deferred tax assets. These estimates are based on historical facts and various other assumptions that the Company believes are reasonable. Actual results could differ materially from those estimates.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies (cont.)

Foreign Currency Transactions

The U.S. dollar is the Company's functional currency. Monetary assets and liabilities denominated in currencies other than the U.S. dollar are remeasured to the U.S. dollar at period end, and transaction gains and losses are recorded in other expense (income), net in the statements of operations. Net gains or losses resulting from foreign exchange transactions were not material for the years ended December 31, 2018 and 2019. The net losses resulting from foreign exchange transactions were \$1.1 million for the year ended December 31, 2020.

Cash and Cash Equivalents

The Company considers all highly liquid investments purchased with original maturities of three months or less to be cash equivalents.

Accounts Receivable and Allowance for Credit Losses

Accounts receivable are recorded at the invoiced amount and do not bear interest. The Company determines the allowance for credit losses based on historical write-off experience, an analysis of the aging of outstanding receivables, customer payment patterns and expectations of changes in macroeconomic conditions that may affect the collectability of outstanding receivables. The allowance for credit losses was not material as of December 31, 2020 and 2019.

Short-Term Investments

The Company's primary objectives for investment activities are to preserve principal, provide liquidity, and maximize income without significantly increasing risk. The Company classifies its short-term investments as available-for-sale at the time of purchase because it is intended that these investments are available for current operations. Investments with maturities of one year or less from the balance sheet date are classified as short-term investments.

Investments are reported at fair value and are subject to periodic impairment review. Unrealized gains and losses related to changes in the fair value of these securities are recognized in accumulated other comprehensive loss. The ultimate value realized on these securities is subject to market price volatility until they are sold. Realized gains or losses from short-term investments are recorded in other expense (income), net.

As of December 31, 2020 and 2019, short-term investments were \$69.0 million and \$39.9 million, respectively.

Restricted Cash

The Company maintains certain cash amounts restricted as to withdrawal or use. The restricted cash is primarily collateral for performance bonds issued to certain customers. The collateral is provided in the form of a cash deposit to either support the bond directly or to collateralize a letter of credit that supports the performance bonds. As of December 31, 2020 and 2019, restricted cash was \$13.0 million and \$13.4 million, respectively.

Credit Risk and Concentration

Our financial instruments that are potentially subject to concentrations of credit risk consist primarily of cash, cash equivalents, restricted cash, short-term investments, and accounts receivable. Cash and cash equivalents and short-term investments are maintained primarily at two financial institutions, and deposits exceed federally insured limits. Risks associated with cash and cash equivalents, and short-term investments are mitigated by banking with creditworthy financial institutions. The Company has not experienced any losses on its deposits of cash and cash equivalents or its short-term investments.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies (cont.)

Cash equivalents consist of short-term money market funds, corporate debt securities, and debt securities issued by the U.S. Treasury, which are deposited with reputable financial institutions. The Company's cash management and investment policy limits investment instruments to investment-grade securities with the objective to preserve capital and to maintain liquidity until the funds can be used in business operations.

Accounts receivable are typically unsecured and are generally derived from revenue earned from transit agencies, universities and airports in North America and global commercial vehicle manufacturers in both North America and the European Union. The Company periodically evaluates the collectability of its accounts receivable and provides an allowance for potential credit losses as necessary.

Given the large order value for customers and the relatively low number of customers, revenue and accounts receivable have typically been concentrated with a limited number of customers.

	Revenue			Accounts Receivable	
	Year Ended December 31,			December 31,	
	2020	2019	2018	2020	2019
Number of customers accounted for 10% or more*	1	—	3	2	4

* One customer accounted for 21% of total revenue for year ended December 31, 2020 and 33% of the accounts receivable, net as of December 31, 2020. No other individual customer accounted for more than 20% of total revenue for years ended December 31, 2020, 2019 and 2018, or accounts receivable, net as of December 31, 2020 and 2019.

Single source suppliers provide the Company with a number of components that are required for manufacturing of our current products. In other instances, although there may be multiple suppliers available, many of the components are purchased from a single source. If these single source suppliers fail to meet the Company's requirements on a timely basis at competitive prices, the Company could suffer manufacturing delays, a possible loss of revenue, or incur higher cost of sales, any of which could adversely impact the Company's operating results.

Fair Value of Financial Instruments

The carrying value of the Company's financial instruments, including cash and cash equivalents, accounts receivable, short-term investments, accounts payable, and accrued and other current liabilities, approximates fair value due to the short period of time to maturity, receipt, or payment. The carrying amount of the Company's debt, except for Convertible Notes, approximates its fair value as the stated interest rates approximate market rates currently available to the Company.

In August 2020, the Company issued Convertible Notes that contain embedded features subject to derivative accounting. These embedded features are composed of conversion options that have the economic characteristics of a contingent early redemption feature settled in a variable number of shares of the Company's stock. These conversion options are bifurcated and accounted for as a derivative liability separately from the host debt instrument. Embedded derivatives are recognized as a derivative liability on the balance sheet. The derivative liability is measured at fair value and subject to remeasurement at each balance sheet date.

The warrants issued in connection with the Convertible Notes are classified as a liability because they can become exercisable into common stock upon a Qualified Initial Public Offering ("QIPO") or into convertible preferred stock after 5 years from issuance date in the event that there is no QIPO during such period. Such warrants are measured at fair value, subject to remeasurement at each balance sheet date.

Inventories

Inventories are recorded at the lower of cost and net realizable value using the first-in, first-out method. Inventory costs consist primarily of the cost of materials, manufacturing support costs, including labor and factory overhead associated with such production, and shipping costs. The costs of vehicles, charger equipment or prototype

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies (cont.)

products delivered to customers that have not yet met revenue recognition criteria are also included in inventories. We assess the valuation of inventory and periodically record a provision to adjust inventory to its estimated net realizable value, including when we determine inventory to be obsolete or in excess of anticipated demand. Once inventory has been written-off or written-down, it creates a new cost basis for the inventory that is not subsequently written-up.

Deferred Cost of Goods Sold

Deferred cost of goods sold primarily includes incurred costs for charging system installations that have not met revenue recognition criteria.

Property, Plant, and Equipment

Property, plant, and equipment, including leasehold improvements, are stated at cost. Depreciation is computed using the straight-line method over the estimated useful lives of the respective assets, as follows:

Property, Plant, and Equipment	Estimated Useful Life
Computer hardware	3 years
Computer software	3 to 5 years
Internally used vehicles and charging systems	over the shorter of their estimated useful lives or 5 years
Machinery and equipment	5 to 12 years
Office furniture and equipment	5 years
Tooling	5 years
Leasehold improvements	over the shorter of their estimated useful lives or the terms of the related leases
Leased batteries	over the shorter of the terms of the related leases or 12 years
Leased vehicles and charging systems	over the shorter of the terms of the related leases or 5 years

In the fourth quarter of 2019, we completed a review of the estimated useful lives of vehicles and charging equipment used for demonstration purposes. Based on this review, we revised the estimated useful lives of demo vehicles from 12 years to five years effective on November 1, 2019, after considering the condition of assets and our long-term strategy for operating such assets. We believe this change in estimate is appropriate, as it is based on actual experience and the expectations for the ongoing productive use of these assets. The impact to depreciation expense caused by this change in estimate is not material to selling, general and administrative expense on the statement of operations for the year ended December 31, 2019 or future periods.

If the estimated useful life of an asset is less than the stated number of years in our capitalization policy, the depreciation expense will be recorded over the shorter period.

Upon the retirement or sale of property, plant, and equipment, the cost and associated accumulated depreciation are removed from the balance sheet, and the resulting gain or loss is reflected on the statement of operations. Maintenance and repair expenditures are expensed as incurred while major improvements that increase the functionality, output, or expected life of an asset are capitalized and depreciated ratably over the identified useful life.

Impairment of Long-Lived Assets

The Company evaluates the recoverability of property, plant, and equipment and right-of-use assets for possible impairment whenever events or circumstances indicate that the carrying amount of such assets may not be recoverable. Recoverability of these assets is measured by a comparison of the carrying amounts to the future undiscounted cash flows the assets are expected to generate. If such review indicates that the carrying amount of long-lived assets is not recoverable, the carrying amount of such assets is reduced to fair value.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies (cont.)

In addition to the recoverability assessment, the Company periodically reviews the remaining estimated useful lives of property, plant, and equipment. If the estimated useful life assumption for any asset is reduced, the remaining net book value is depreciated over the revised estimated useful life.

The Company reviews long-lived assets for impairment at the lowest level for which separate cash flows can be identified. During the fourth quarter of 2019, due to the introduction of new products and related technology advancements, we determined that an impairment analysis of certain assets leased to customers was required to be performed. The estimated undiscounted future cash flows generated by these assets were less than their carrying amounts. The carrying amounts of the assets were reduced to fair value, which resulted in an impairment charge of \$6.4 million recorded in the statement of operations for the year ended December 31, 2019.

No impairment charge was recognized in 2018. We recorded \$0.1 million impairment charge associated with a facility lease for the year ended December 31, 2020.

Deferred Revenue

Deferred revenue consists of billings or payments received in advance of revenue recognition that are recognized as revenue once the revenue recognition criteria are met. In some instances, progress billings are issued upon meeting certain milestones stated in the contracts. Accordingly, the deferred revenue balance does not represent the total contract value of non-cancelable arrangements. Invoices are typically due within 30 to 40 days.

Deferred revenue was \$28.2 million and \$18.6 million as of December 31, 2020 and 2019, respectively. For the year ended December 31, 2020, \$16.5 million revenue was recognized from the deferred revenue balance as of December 31, 2019. The reduction in deferred revenue was offset by new billings for products and extended warranty services for which revenue had not been recognized as of December 31, 2020. The current portion of deferred revenue represents the amount that is expected to be recognized as revenue within one year from the balance sheet date.

Revenue Recognition

We derive revenue primarily from the sale of vehicles and charging systems, the installation of charging systems, the sale of battery systems and powertrain components to other vehicle manufacturers, as well as the sale of spare parts and other services provided to customers. Product revenue consists of revenue earned from vehicles and charging systems, battery systems and powertrain components, installation of charging systems, and revenue from leased vehicles, charging systems, and batteries under operating leases. Leasing revenue recognized over time was approximately \$2.3 million, \$3.8 million and \$3.0 million for the years ended December 31, 2020, 2019 and 2018, respectively. Parts and other service revenue includes revenue earned from spare parts, the design and development of battery systems and drive systems for other vehicle manufacturers, and extended warranties.

Goods and services that are promised in our contracts include vehicles, charging systems, battery systems and powertrain components to other vehicle manufacturers, installation of charging systems, spare parts, and extended warranty. We assess the products and services promised in contracts at contract inception, and identify performance obligations for each promise to transfer to the customer a product or service that is distinct. If a product or service is separately identifiable from other items in the bundled arrangement and a customer can benefit from the product or service on its own or with other resources that are readily available to the customer, then such product or service is considered distinct. Customer contracts typically have multiple performance obligations. Generally, our goods and services are considered separate performance obligations. Depending on the contractual arrangement, the charging systems and related installation services if purchased by customer are typically considered as one performance obligation, as they represent inputs of a combined integrated output which benefits the customer. Development services are typically sold on a stand-alone basis and are not bundled with other goods or services.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies (cont.)

The transaction price of the contract is allocated to each performance obligation in a manner depicting the amount of consideration to which the Company expects to be entitled in exchange for transferring the goods or services to the customer (the “allocation objective”). If the allocation objective is met at contractual prices, no further allocations are made. Otherwise, the Company allocates the transaction price to each performance obligation identified in the contract on a relative standalone selling price basis.

To determine the standalone selling price of its promised products or services, we conduct an analysis to determine whether its products or services have an observable standalone selling price. In determining the observable standalone selling price, the Company requires that a substantial majority of the standalone selling prices for a product or service fall within a reasonably narrow range. If there is no directly observable standalone selling price for a particular product or service, then we estimate a standalone selling price by using the estimated cost plus margin or by reviewing external and internal market factors including, but not limited to, pricing practices including historical discounting, major service groups, and the geographies in which we offer products and services.

We recognize revenue when or as it satisfies a performance obligation by transferring control of a product or service to a customer.

Revenue from product sales is recognized when control of the underlying performance obligations is transferred to the customer. Revenue from vehicles and charging systems, and installation of charging systems is typically recognized upon acceptance by the customer. Under certain contract arrangements, the control of the performance obligations related to the charging systems is transferred over time, and the associated revenue is recognized over the installation period using an input measure based on costs incurred to date relative to total estimated costs to completion. Spare parts revenue is recognized upon shipment. Extended warranty revenue is recognized over the life of the extended warranty using the time elapsed method. Development service contracts typically include the delivery of prototype products to customers. The performance obligation associated with the development of prototype products as well as battery systems and powertrain components to other vehicle manufacturers, is satisfied at a point in time, typically upon shipping.

Revenue derived from performance obligations satisfied over time from charging systems and installation was \$6.0 million, \$7.2 million and \$0.6 million in the years ended December 31, 2020, 2019, and 2018, respectively. Extended warranty revenue is not material to date.

Typically, the Company does not have contract assets, as rights to consideration in exchange for goods or services that have transferred to a customer are not conditional on anything other than the passage of time. In certain cases, there is a condition that requires a contract asset to be recognized. As of December 31, 2020 and 2019, the contract assets balance was \$2.8 million and \$0.6 million, respectively. The contract assets are expected to be billed within the next twelve months and are recorded in the prepaid expenses and other current assets on the balance sheets.

As of December 31, 2020, the amount of remaining performance obligations that have not been recognized as revenue was \$229.4 million, of which 67% was expected to be recognized as revenue over the next 12 months and the remainder thereafter. This amount excludes the value of remaining performance obligations for contracts with an original expected length of one year or less.

Lease Arrangements

The Company offers customers leasing alternatives outside of the standard sales contracts for vehicles, charging equipment and batteries used in the vehicles. The leasing arrangements are typically bundled together with the sales contracts. We assessed the nature of the bundled arrangements under the revenue accounting standard. For arrangements that contain a lease, we determined the classification of the lease in accordance with Topic 840, Leases, prior to the adoption of Topic 842, Leases, on January 1, 2020. A lease arrangement that transfers substantially all of the benefits and risks incident to ownership of the products is classified as a sales-type lease based on the criteria established by the accounting standard; otherwise the lease is classified as an operating lease.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies (cont.)

For sales-type leases, product revenue is recognized upon customer acceptance of the underlying leased assets. The current portion of net investment in sales-type leases is recorded in Accounts Receivable, and the non-current portion is recorded in Other Assets on the Company's balance sheets. The discounted unguaranteed residual value of underlying leased assets is not material to the net investment in lease balance.

For operating leases, the leasing revenue is recognized on a straight-line basis over the lease term, which is commenced upon customer acceptance.

We monitor the performance of customers who leased batteries and are subject to ongoing payments. No allowance was recorded for the receivables under the leasing arrangements.

We adopted the new lease accounting standard, Topic 842, Leases, on January 1, 2020. We determine whether an arrangement is or contains a lease at inception. Short-term leases with a term of less than 12 months will not be recognized in the right-of-use assets or lease liabilities. The lease and non-lease components are not separated for all leases regardless of whether the Company is the lessee or a lessor to the lease. Refer to Note 6, Leases, for additional information.

Cost of Goods Sold

Cost of goods sold includes direct material and labor costs, manufacturing overhead including depreciation expense, freight costs, and reserves for estimated warranty expenses. Cost of goods sold also includes charges to write-down the carrying value of inventory when it exceeds its estimated net realizable value and to provide for on-hand inventory that is either obsolete or in excess of forecasted demand. Costs of development services are expensed as incurred. Costs of development services incurred in periods prior to the finalization of an agreement are recorded as research and development expense. Once an agreement is finalized, these costs are recorded in cost of goods sold.

Sales and Other Taxes

Taxes assessed by various government entities, such as sales, use, and value added taxes, collected at the time of sale are excluded from revenue.

Shipping Costs

Amounts billed to customers related to shipping and handling are classified as revenue, and the related shipping and handling costs are included in cost of goods sold.

Research and Development Costs

Research and development costs are expensed as incurred. Research and development expense consists primarily of payroll and benefits of those employees engaged in research, design, and development activities, costs related to prototype parts and design tools, license expenses related to intellectual property, supplies and services, depreciation, and other occupancy costs.

Advertising Expenses

Advertising costs are expensed as incurred. Advertising expenses were \$0.6 million, \$0.9 million, and \$0.8 million for the year ended December 31, 2020, 2019 and 2018, respectively.

Product Warranties

The Company provides a limited warranty to customers on vehicles, charging systems, and battery systems. The limited warranty ranges from one to 12 years depending on the components. Separately, the Company also periodically performs field service actions related to product service campaigns. Pursuant to these warranties and

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies (cont.)

field service actions, we will repair, replace, or adjust the parts on the products that are defective in factory-supplied materials or workmanship. A warranty reserve for the products sold is recorded at the point of revenue recognition, which includes the best estimate of the projected costs to repair or replace items under the limited warranty and field service actions. These estimates are based on actual claims incurred to date and an estimate of the nature, frequency and costs of future claims. These estimates are inherently uncertain given the relatively short history of sales. Changes to the historical or projected warranty experience may cause material changes to the warranty reserve in the future. The warranty reserve does not include projected warranty costs associated with the vehicles under operating leases, as the costs to repair these warranty claims are expensed as incurred. The portion of the warranty reserve expected to be incurred within the next 12 months is included within accrued liabilities while the remaining balance is included within other long-term liabilities on the balance sheets.

Warranty expense is recorded as a component of cost of goods sold. Accrued warranty activity consisted of the following (in thousands):

	Year Ended December 31,		
	2020	2019	2018
Warranty reserve – beginning of period	\$ 14,926	\$ 10,602	\$ 2,581
Warranty costs incurred	(4,214)	(6,031)	(2,653)
Net changes in liability for pre-existing warranties, including expirations.	(3,392)	(840)	—
Provision for warranty	11,262	11,195	10,674
Warranty reserve – end of period	<u>\$ 18,582</u>	<u>\$ 14,926</u>	<u>\$ 10,602</u>

Stock-Based Compensation

The Company uses the fair value method for recording stock-based compensation expense. Stock-based compensation expense for stock options is estimated at the grant date based on each stock option's fair value as calculated using the Black-Scholes option pricing model. The stock-based compensation expense for stock option grants is recognized on a straight-line basis over the requisite service period for the entire award.

Income Taxes

Income taxes are computed using the asset and liability method, under which deferred tax assets and liabilities are determined based on the difference between the financial statement and tax bases of assets and liabilities using enacted tax rates in effect for the year in which the differences are expected to affect taxable income. Valuation allowances are established when necessary to reduce deferred tax assets to the amount expected to be realized.

The Company recognizes tax benefits from uncertain tax positions only if it is more likely than not that the tax position will be sustained on examination by the taxing authorities based on the technical merits of the position. The Company adjusts these reserves when facts and circumstances change, such as the closing of a tax audit or the refinement of an estimate. The provision for income taxes includes the effects of any reserves that are considered appropriate.

Accrued interest and penalties related to unrecognized tax benefits are classified as income tax expense.

Government Incentives

The Company receives incentives from the federal and state government agencies in the form of grants. Incentives are recorded in the financial statements in accordance with their purposes, either as a reduction of expense or a reduction of the cost of the capital investment. The benefit of these incentives is recorded when performance is complete and all conditions as specified in the agreement are fulfilled.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies (cont.)

California and certain other states provide incentives to accelerate the purchase of cleaner, more efficient buses in the form of point-of-sale discounts to vehicle purchasers. These incentives are included in the customer contract value, and recognized as revenue once all revenue recognition criteria are met.

Other Comprehensive Income (Loss)

The Company did not have other comprehensive income (loss) for the years ended December 31, 2020, 2019 and 2018, respectively.

2. Adoption of New Accounting Standards

Topic 842, *Leases*. This standard provides guidance on the recognition, measurement, presentation, and disclosure of leases. The new standard supersedes the present U.S. GAAP standard on leases and requires substantially all leases to be reported on the balance sheet as right-of-use assets and lease obligations. The Company elected to adopt the new lease accounting standard on January 1, 2020 using the optional transition method, recognizing a cumulative-effect adjustment to the balance sheet and not adjusting comparative information for prior periods. Refer to Note 6, *Leases*, for additional information.

ASU No. 2016-13, *Financial Instruments — Credit Losses (Topic 326): Measurement of Credit Losses on Financial Instruments*. This standard requires the measurement and recognition of expected credit losses for financial assets held at amortized cost. The Company adopted this standard on January 1, 2020, and it had no material impact on the financial statements.

ASU No. 2018-13, *Changes to Disclosure Requirements for Fair Value Measurement (Topic 820)*. This standard improves the effectiveness of disclosure requirements for recurring and nonrecurring fair value measurements. This standard removes, modifies, and adds certain disclosure requirements. The Company adopted this standard on January 1, 2020, and it had no material impact on the financial statements.

ASU No. 2018-15, *Intangibles — Goodwill and Other — Internal-Use Software (Subtopic 350-40): Customer's Accounting for Implementation Costs Incurred in a Cloud Computing Arrangement That Is a Service Contract*. This standard aligns the requirements for capitalizing implementation costs incurred in a hosting arrangement that is a service contract requiring the capitalization of implementation costs incurred to develop or obtain internal-use software (and hosting arrangements that include an internal-use software license). The Company adopted this standard on January 1, 2020, and it had no material impact on the financial statements.

ASU No. 2020-04, *Reference Rate Reform (Topic 848): Facilitation of the Effects of Reference Rate Reform on Financial Reporting*. The amendments in this standard provide optional guidance for a limited time to ease the potential burden in accounting for reference rate reform. The new guidance provides optional expedients and exceptions for applying U.S. GAAP to contracts, hedging relationships and other transactions affected by reference rate reform if certain criteria are met. The amendments apply only to contracts and hedging relationships that reference the London Interbank Offered Rate (LIBOR) or another reference rate expected to be discontinued due to reference rate reform. These amendments are effective from March 2020 through December 31, 2022. The amendments have no material impact on the financial statements.

Recent Accounting Pronouncements Not Yet Adopted

ASU No. 2019-12, *Income Taxes (Topic 740): Simplifying the Accounting for Income Taxes*. This standard simplifies the accounting for income taxes, eliminates certain exceptions within Topic 740, *Income Taxes*, and clarifies certain aspects of the current guidance to promote consistency among reporting entities. The Company will adopt this standard on January 1, 2021, and expect no material impact on the financial statements.

ASU No. 2020-06, *Accounting for Convertible Instruments and Contracts in an Entity's Own Equity*. This standard simplifies the accounting for convertible instruments by removing certain separation models in ASC 470-20, *Debt — Debt with Conversion and Other Options*. This standard updates the guidance on certain embedded

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

2. Adoption of New Accounting Standards (cont.)

conversion features that are not required to be accounted for as derivatives under Topic 815, *Derivatives and Hedging*, or that do not result in substantial premiums accounted for as paid-in capital, such that those features are no longer required to be separated from the host contract. The convertible debt instruments will be accounted for as a single liability measured at amortized cost. This will also result in the interest expense recognized for convertible debt instruments to be typically closer to the coupon interest rate when applying the guidance in Topic 835, *Interest*. Further, this standard made amendments to the EPS guidance in Topic 260 for convertible instruments, the most significant impact of which is requiring the use of the if-converted method for diluted earnings per share calculation, and no longer allowing the net share settlement method. This standard also made revisions to Topic 815-40, which provides guidance on how an entity must determine whether a contract qualifies for a scope exception from derivative accounting. The amendments to Topic 815-40 change the scope of contracts that are recognized as assets or liabilities. This standard is effective for interim and annual periods beginning after December 15, 2021, with early adoption permitted after December 15, 2020. Adoption of this standard can either be on a modified retrospective or full retrospective basis. The Company is currently evaluating this standard but expect no material impact on the financial statements.

3. Fair Value of Financial Instruments

The Company measures certain financial assets and liabilities at fair value. Fair value is determined based on the exit price that would be received from selling an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. Fair value is estimated by applying the following hierarchy:

Level 1 — Quoted prices in active markets for identical assets or liabilities;

Level 2 — Observable inputs other than quoted prices in active markets for identical assets and liabilities, quoted prices for identical or similar assets or liabilities in inactive markets, or other inputs that are observable or can be corroborated by observable market data for substantially the full term of the assets or liabilities; and

Level 3 — Inputs that are generally unobservable and typically reflect management's estimate of assumptions that market participants would use in pricing the asset or liability.

Financial assets measured at fair value on a recurring basis using the above input categories were as follows (in thousands):

		Fair Value at	
		December 31,	
	Pricing Category	2020	2019
Assets:			
Cash equivalents:			
Money market funds	Level 1	\$ 744	\$ 3,334
U.S. Treasury securities.	Level 1	64,997	29,957
Short-term investments:			
U.S. Treasury securities.	Level 1	68,990	39,877
Total		\$ 134,731	\$ 73,168
Liabilities:			
Other non-current liabilities:			
Derivative liability.	Level 3	\$ 70,870	\$ —
Warrant liability	Level 3	39,670	—
Total		\$ 110,540	\$ —

As of December 31, 2020 and 2019, short-term investments were primarily comprised of U.S. Treasury securities. The unrealized gain/losses related to fixed income debt securities were immaterial and primarily due to changes in interest rates, which are temporary in nature.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

3. Fair Value of Financial Instruments (cont.)

As of December 31, 2020 and 2019, the contractual maturities of the short-term investments were less than one year.

In August 2020, the Company issued Convertible Notes that contain embedded features subject to derivative accounting. Refer to Note 5, Debt, for additional information on the Convertible Notes.

The embedded derivatives are recognized as a derivative liability on the balance sheet, and are measured at fair value, subject to remeasurement at each balance sheet date. The fair value of derivative liability is measured as the difference between the estimated value of the Convertible Notes with and without such conversion features utilizing Monte Carlo simulation pricing model.

The warrants issued in connection with the Convertible Notes are classified as a liability because they can become exercisable into common stock upon a QIPO or into convertible preferred stock after five years from issuance date in the event that there is no QIPO during such period. Such warrants are measured at fair value, subject to remeasurement at each balance sheet date. The fair value of the warrant liability is measured using Monte Carlo Simulation pricing model.

The fair value of the Convertible Notes was \$365.9 million as of December 31, 2020. The carrying value of the Convertible Notes of \$106.4 million, net of \$97.1 million unamortized debt discount and issuance costs, as of December 31, 2020, was recorded in Debt, non-current on the balance sheets.

The valuation of derivative and warranty liabilities and the Convertible Notes are based on significant inputs not observable in the market, and thus represents a level 3 measure. The key inputs to the valuation model include fair value of equity, equity volatility, expected term until a liquidity event to exit, expected term until exercise, and risk-free interest rate.

A summary of the changes in the fair value of the derivative liability is as follows (in thousands):

	Amount
Derivative liability – at issuance	\$ 68,514
Change in fair value	2,356
Derivative liability – December 31, 2020	<u>\$ 70,870</u>

A summary of the changes in the fair value of the warrant liability is as follows (in thousands):

	Amount
Warrant liability – at issuance	\$ 29,037
Change in fair value	10,633
Warrant liability – December 31, 2020	<u>\$ 39,670</u>

The change in fair value of derivative and warrant liabilities is recorded in the statement of operations.

4. Balance Sheet Components

Cash and cash equivalents consisted of the following (in thousands):

	December 31,	
	2020	2019
Cash	\$ 44,978	\$ 6,949
Cash equivalents	65,741	33,291
Total cash and cash equivalents	<u>\$ 110,719</u>	<u>\$ 40,240</u>

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

4. Balance Sheet Components (cont.)

The following table provides a reconciliation of cash, cash equivalents, and restricted cash reported within the balance sheets to the total of such amounts shown on the statements of cash flows.

	December 31,	
	2020	2019
Cash and cash equivalents.	\$ 110,719	\$ 40,240
Restricted cash, current portion	8,397	5,970
Restricted cash, net of current portion	4,581	7,439
Total restricted cash	12,978	13,409
Total cash and cash equivalents, and restricted cash.	<u>\$ 123,697</u>	<u>\$ 53,649</u>

Inventories consisted of the following (in thousands):

	December 31,	
	2020	2019
Raw materials	\$ 31,148	\$ 46,495
Work in progress	8,042	23,197
Finished goods	47,756	19,400
Service parts	5,384	4,950
Total inventories	<u>\$ 92,330</u>	<u>\$ 94,042</u>

The Company recorded a write-down of excess or obsolete inventories to cost of goods sold of \$3.0 million, \$4.9 million and \$4.2 million in the years ended December 31, 2020, 2019 and 2018, respectively.

Property, plant, and equipment, net, consisted of the following (in thousands):

	December 31,	
	2020	2019
Computer hardware.	\$ 4,708	\$ 3,830
Computer software	8,849	6,558
Internally used vehicles and charging systems	19,136	12,936
Leased vehicles and batteries	7,081	10,715
Leasehold improvements	10,234	8,275
Machinery and equipment	26,026	14,237
Office furniture and equipment	1,854	1,876
Tooling	21,727	17,918
Finance lease right-of-use assets.	179	—
Construction in progress	1,830	6,642
	101,624	82,987
Less: Accumulated depreciation and amortization	(48,037)	(35,472)
Total	<u>\$ 53,587</u>	<u>\$ 47,515</u>

Construction in progress was comprised of various assets that are not available for their intended use as of the balance sheet date.

Depreciation and amortization expense were \$15.5 million, \$12.6 million and \$9.3 million for the years ended December 31, 2020, 2019 and 2018, respectively.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

4. Balance Sheet Components (cont.)

Accrued liabilities consisted of the following (in thousands):

	December 31,	
	2020	2019
Accrued payroll and related expenses	\$ 6,695	\$ 2,799
Accrued sales and use tax	975	1,254
Warranty reserve	6,121	7,697
Financing obligation	3,056	850
Accrued interest	127	174
Accrued audit and accounting related expenses	428	419
Accrued charger installation costs	769	547
Other accrued expenses	1,565	895
Total	<u>\$ 19,736</u>	<u>\$ 14,635</u>

Other long-term liabilities consisted of the following (in thousands):

	December 31,	
	2020	2019
Financing obligation	\$ —	\$ 3,056
Accrued interest	—	120
Warranty reserve	12,461	7,229
Deferred rent	—	793
Finance lease liabilities, non-current	117	—
Total	<u>\$ 12,578</u>	<u>\$ 11,198</u>

In July 2016, we entered into a bus sale and lease transaction for ten Catalyst buses. These buses are leased to other parties for five years by the customer. At the end of the lease term, the fourth quarter of 2021, we have an obligation to repurchase the buses back from the customer. We make a portion of the monthly lease payments directly to the customer and also provided a guarantee to the customer on the remaining lease payments if the lessee fails to pay. We received \$6.0 million from the customer directly upon delivery in 2016. Under U.S. GAAP, this sales transaction is considered as a borrowing and the lease transaction is considered as an operating lease.

The financing obligation was \$3.1 million and \$3.9 million as of December 31, 2020 and 2019, respectively. Interest expense on the financing obligation is recognized using the effective interest method. The monthly lease payment is recognized as leasing revenue. The costs of the buses are recorded as leased vehicles in property, plant, and equipment on the balance sheets.

5. Debt

Debt, net of debt discount and issuance costs, consisted of the following (in thousands):

	December 31,	
	2020	2019
Hercules Credit Facility	\$ —	\$ 9,640
Senior Credit Facility	16,809	14,934
PPP loan	10,000	—
Convertible Notes	106,443	—
Total Debt, non-current	<u>\$ 133,252</u>	<u>\$ 24,574</u>

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

5. Debt (cont.)

Loan and Security Agreement

The Company entered into a loan and security agreement with Hercules Capital, Inc. (“Hercules Credit Facility”) in 2015, and amendments in 2016 and 2017. In May 2019, the Company entered into an amendment to the Hercules Credit Facility to repay \$20.0 million in principal, and extend the maturity date of the remaining \$10.0 million outstanding principal to May 2021. The interest rate was composed of a cash interest rate of the greater of 10.55% or 10.55% plus the prime rate minus 5.5% and a PIK interest rate of 1.75% per annum. The loan had an interest only period through its maturity date. The \$2.3 million end-of-term charge under the Amended Hercules Credit Facility was paid on June 1, 2019. The \$0.8 million accrued PIK interest under the existing Hercules Credit Facility and \$0.2 million prepayment penalty were paid at the closing of the amendment. As of December 31, 2019, the outstanding balance under the Hercules Credit Facility was \$10.0 million, and the cash interest rate was 10.55% per annum.

In connection with entering into the Hercules Credit Facility in 2015, the Company issued to Hercules a warrant to purchase 397,932 shares of Series 4 convertible preferred stock. The Company determined the fair value of the convertible preferred stock warrant shares was \$0.3 million, which was recorded as a debt discount and a convertible preferred stock warrant liability, as discussed further in Note 8. In connection with the first amendment, the Company issued to Hercules an additional warrant to purchase 79,587 shares of Series 4 convertible preferred stock. The Company determined the fair value of the convertible preferred stock warrant was \$0.1 million, which was recorded as a debt discount and a convertible preferred stock warrant liability, as discussed further in Note 8. In connection with the Amended Hercules Credit Facility in 2019, the Company issued to Hercules a warrant to purchase 36,630 shares of common stock warrants. The Company determined the fair value of the common stock warrant was \$0.1 million, which was recorded as a debt discount and classified as equity in additional paid-in capital. The warrant is exercisable for 10 years, and will automatically exercise upon the initial public offering.

The end-of-term charge was accreted to accrued interest using the effective-interest method from the funding date to its payment due date. As of December 31, 2019, the accrued PIK interest balance was \$0.1 million.

The balance of debt issuance costs and discounts was \$0.4 million as of December 31, 2019. The debt issuance cost and debt discounts were amortized to interest expense over the terms of the Hercules Credit Facility using the effective interest method. The amortization of debt issuance cost and debt discounts to interest expense was \$0.2 million, \$0.3 million and \$0.2 million for 2020, 2019 and 2018, respectively.

The Company’s obligations under the Hercules Credit Facility were secured by a security interest and amended to a second security interest under the Amended Hercules Credit Facility on substantially all the Company’s assets except for intellectual property and other restricted property.

In August 2020, the Company made the repayment in full of its obligations of \$10.3 million under the Hercules Credit Facility, as amended, including principal and accrued interest. The Hercules Credit Facility was terminated upon payoff and the remaining unamortized debt issuance cost and debt discounts of \$0.2 million were recorded to interest expense.

Senior Credit Facility

In May 2019, the Company entered into a Loan, Guaranty and Security Agreement for a senior secured asset-based lending facility (“Senior Credit Facility”) with borrowing capacity up to \$75.0 million. The commitment under the Senior Credit Facility is available to the Company on a revolving basis through the earlier of May 2024 or 91 days prior to the stated maturity of any subordinated debt in aggregate amount of \$7.5 million or more. The maximum availability under the Senior Credit Facility is based on certain specified percentages of eligible accounts receivable and inventory, subject to certain reserves, to be determined in accordance with the Senior Credit Facility. The commitment under the Senior Credit Facility includes a \$10.0 million letter of credit sub-line. Subject to certain conditions, the commitment may be increased by \$50.0 million upon approval by the lender, and at the Company’s option, the commitment can be reduced to \$25.0 million or terminated upon at least 15 days written notice.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

5. Debt (cont.)

The Senior Credit Facility is secured by a security interest in substantially all of the Company's assets except for intellectual property and other restricted property.

Borrowings under the Senior Credit Facility bear interest at per annum rates equal to, at the Company's option, either (i) the base rate plus an applicable margin for base rate loan, or (ii) the London Interbank Offered Rate ("LIBOR") plus an applicable margin for LIBOR loan. The base rate is calculated as the greater of (a) the Lender prime rate, (b) the federal funds rate plus 0.5%, and (c) one-month LIBOR plus 1.0%. The applicable margin is calculated based on a pricing grid linked to quarterly average excess availability (as a percentage of borrowing capacity). For base rate loans, the applicable margin ranges from 0.0% to 1.5%, and for LIBOR Loans, it ranges from 1.5% to 3.0%. The Senior Credit Facility contains certain customary non-financial covenants. In addition, the Senior Credit Facility requires the Company to maintain a Fixed Charge Coverage Ratio of at least 1.00:1.00 during such times as a covenant trigger event shall exist.

As of December 31, 2020 and 2019, the outstanding balance under the Senior Credit Facility was \$17.1 million and \$15.3 million, respectively, with maturity of May 2024. The Company incurred approximately \$0.4 million debt issuance costs under this facility, and will amortize these costs to interest expense over the borrowing term. The interest rate was 3.09% and 4.89% per annum as of December 31, 2020 and 2019, respectively.

Small Business Administration Loan

In May 2020, the Company received Small Business Administration ("SBA") loan proceeds of \$10.0 million from Town Center Bank pursuant to the Paycheck Protection Program ("the PPP loan") under the "Coronavirus Aid, Relief and Economic Security (CARES) Act". The PPP loan was in the form of a note and matures on May 6, 2022. The interest rate is 1.00% per annum and payable monthly commencing in December 2020. All or a portion of the PPP loan may be forgiven by the SBA upon application with supporting documentation of expenditures in accordance with SBA requirements, which include employees being kept on the payroll for eight weeks after the date of the loan and the proceeds being used for payroll, rent, mortgage interest, or utilities.

Convertible Notes

In August 2020, the Company entered into a Note Purchase Agreement for Secured Convertible Promissory Notes ("Convertible Notes"). The Convertible Notes have an aggregate principal amount of \$200.0 million, with a cash interest of 5.0% per annum payable at each quarter end and a paid-in-kind interest of 4.5% per annum payable by increasing the principal balance at each quarter end. The Convertible Notes will mature in August 2025, and the Company may not make prepayment unless approved by the required holders of the Convertible Notes.

At or after an underwritten initial public offering in which the Company receives gross proceeds of not less than \$100 million ("QIPO"), or at the time of a merger, acquisition or other combination between the Company and a publicly-traded special purpose acquisition company ("SPAC transaction"), the holders may elect to convert the Convertible Notes into shares of common stock.

At the next bona fide equity financing following the Note Purchase Agreement, or 36 months after the date of the Note Purchase Agreement if no such equity financing shall have occurred (a "Qualified Financing"), the holders may elect to convert the Convertible Notes into shares of the most senior series of the Company's preferred stock.

The conversion price will be an amount equal to:

- i) if the conversion stock is being issued at or following a QIPO, the QIPO price per share multiplied by the Discount Coefficient (as defined in the Convertible Notes), which is initially equal to 90% and will decrease by 2.75% every 6 months following the first anniversary of the closing date of the Convertible Notes, in effect on the date of QIPO (the "QIPO Conversion Price"); or

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

5. Debt (cont.)

- ii) if the conversion stock is being issued following a Qualified Financing, 75% of the lowest per share cash purchase price of the common stock or preferred stock sold by the Company in the Qualified Financing; or
- iii) if the conversion stock is being issued following a SPAC transaction, 75% of the SPAC Transaction Price Per Share (as defined in the Note Purchase Agreement) (the “SPAC Conversion Price”).

The Convertible Notes will automatically be converted into common stock at any time after the expiration of the lock-up period of a QIPO or SPAC transaction, if the following conditions are met:

- if the QIPO price per share equals or exceeds \$6.9075, then upon the volume-weighted average price of the Company’s publicly-traded common stock over a period of 20 consecutive trading days exceeds 150% of the QIPO Conversion Price; or if the QIPO price per share is lower than \$6.9075, then upon the volume-weighted average price of the Company’s publicly-traded common stock over a period of 20 consecutive trading days exceeds 150% of an amount equal to \$6.9075 multiplied by the Discount Coefficient at the time of the QIPO.
- if the SPAC Transaction Price Per Share equals or exceeds \$6.9075, then upon the volume-weighted average price of the Company’s publicly-traded common stock over a period of 20 consecutive trading days commencing after the six month anniversary of the closing of the SPAC transaction exceeding 150% of the SPAC Conversion Price; or if the SPAC Transaction Price Per Share is lower than \$6.9075, then upon volume-weighted average price of the Company’s publicly-traded common stock over a period of 20 consecutive trading days commencing after the six month anniversary of the closing of the SPAC transaction and over which the Conversion Stock would be freely tradable exceeding 175% of an amount equal to \$6.9075 multiplied by 75%.

Each of the Convertible Notes shall rank equally without preference or priority of any kind over one another, but senior in all rights, privileges and preferences to all other shares of the Company’s capital stock and all other securities of the Company that are convertible into or exercisable for the Company’s capital stock directly or indirectly.

Prior to the maturity date or prior to the payment or conversion of the entire balance of the Convertible Notes, in the event of a liquidation or sale of the Company, the Company shall pay to the holders of Convertible Notes the greater of (i) 150% of the principal balance of the Convertible Notes or (ii) the consideration that the holders would have received had the holders elected to convert the Convertible Notes into preferred stock immediately prior to such liquidation event.

The Convertible Notes do not entitle the holders to any voting rights or other rights as a stockholder of the Company, unless and until the Convertible Notes are actually converted into shares of the Company’s capital stock in accordance with their terms.

The Note Purchase Agreement contains certain customary non-financial covenants. In addition, the Note Purchase Agreement requires the Company to maintain liquidity at quarter end of not less than the greater of (i) \$75.0 million and (ii) four times of cash burn for the three-month period then ended.

In connection with the issuance of the Convertible Notes, the Company issued warrants to the holders of Convertible Notes to purchase 5.1 million shares of Company stock at an exercise price of \$0.01 per share. The stock issuable upon exercise of the warrants shall be (1) common stock, or (2) in the event that a QIPO has not occurred within five years of the Note Purchase Agreement or in the event of a liquidation or sale of the Company, the most senior series of the Company’s convertible preferred stock (or in the event that the Company is consolidated or merges with one or more other corporations, the stock that the holder of the warrant would have been entitled to receive if holder would have exercised the warrant prior to such event). The warrants are exercisable for 7 years, and will be automatically exercised in the event of a change of control transaction or the expiration of the warrants.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

5. Debt (cont.)

The warrants are freestanding financial instruments and classified as liability due to the possibility that they can become exercisable into convertible preferred stock. The warrant liability of \$29.0 million is initially measured at fair value on its issuance date and recorded as a debt discount, and will be amortized during the term of the Convertible Notes to interest expense using the effective-interest method. The warrant liability will be remeasured on a recurring basis at each reporting period date, with the change in fair value reported in the statement of operations.

The embedded features are composed of conversion options that have the economic characteristics of a contingent early redemption feature settled in a variable number of shares of Company stock. These conversion options are bifurcated and accounted for separately from the host debt instrument. The derivative liability of \$68.5 million was initially measured at fair value on the issuance date of the Convertible Notes and recorded as a debt discount and will be amortized during the term of the Convertible Notes to interest expense using the effective-interest method. The derivative liability will be remeasured on a recurring basis at each reporting period date, with the change in fair value reported in the statement of operations.

The issuance costs of \$5.1 million were recorded as debt discount and will be amortized during the term of the Convertible Notes to interest expense using the effective interest method. The amortization expense of debt discount and issuance costs was \$5.6 million for the year ended December 31, 2020.

The Convertible Notes will mature in August 2025 or will be settled by issuing equity stock, and accordingly are classified as a non-current liability on the Company's balance sheets. As of December 31, 2020, the Convertible Notes, net of debt discount and issuance costs, consisted of the following (in thousands):

Principal	\$ 200,000
PIK interest	3,501
Total principal	203,501
Less debt discount and issuance costs	(97,058)
Total Convertible Notes	<u>\$ 106,443</u>

As of December 31, 2020, the contractual future principal repayments of the total debt were as follows (in thousands):

2022	\$ 10,000
2024	17,074
2025 ⁽¹⁾	203,501
Total	<u>\$ 230,575</u>

(1) Including PIK interest added to principal balance through December 31, 2020.

The Company was in compliance with all of the covenants contained in the Senior Credit Facility and Convertible Notes as of December 31, 2020.

6. Leases

The Company adopted the new lease accounting standard on January 1, 2020 using the modified retrospective transition method, recognizing a cumulative-effect adjustment to the balance sheet and not adjusting comparative information for prior periods. In addition, the Company elected the package of practical expedients permitted under the transition guidance, which allowed the Company not to reassess (1) whether any expired or existing contracts are or contain leases, (2) lease classification for any expired or existing leases, and (3) initial direct costs for any existing leases. The Company did not elect the use of hindsight practical expedients in determining the lease term for existing leases. Topic 842 also provides practical expedients for an entity's ongoing accounting. The Company has elected the short-term lease recognition exemption for all leases that qualify. As a result, for those leases with a term of less

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

6. Leases (cont.)

than 12 months, it will not recognize right-of-use assets or lease liabilities. The Company also elected the practical expedient to not separate lease and non-lease components for all its leases regardless of whether the Company is the lessee or a lessor to the lease.

The adoption resulted in a recognition of \$13.8 million of operating lease assets and \$14.3 million of operating lease liabilities on the balance sheet on January 1, 2020. The difference represents prepaid rent expense and deferred rent for leases existed on the date of adoption, which was an offset to the opening balance of operating lease assets. The adoption has no impact on the Company's operating expenses and cash flows.

As a Lessor

The net investment in leases are as follows:

	December 31,	
	2020	2019
Net investment in leases, current	\$ 398	\$ 343
Net investment in leases, non-current.	3,101	3,809
Total net investment in leases	<u>\$ 3,499</u>	<u>\$ 4,152</u>

Interest income from accretion of net investment in lease is not material.

In the year ended December 31, 2020, the Company assigned one operating lease and three sales-type leases. The Company received a total of \$3.7 million in cash, and recorded \$0.9 million in product revenue for the assigned operating lease, and an aggregate loss of assignment of \$1.2 million for the sales-type leases in the other expense (income), net on the statement of operations.

Future minimum payments receivable from operating and sales-type leases as of December 31, 2020 for each of the next five years are as follows:

	Operating leases	Sales-type leases
2021.	\$ 726	\$ 395
2022.	105	395
2023.	105	296
2024.	105	135
2025.	105	408
Thereafter	222	2,282
Total minimum lease payments.	<u>\$ 1,368</u>	<u>\$ 3,911</u>

As a Lessee

The Company leases its office and manufacturing facilities in Burlingame, California, Greenville, South Carolina, City of Industry, California, and Rochester Hills, Michigan under operating lease agreements with various expiration dates through 2026.

In June 2018, the Company entered into an agreement to sublease its office facilities in Rochester Hills, Michigan from July 2018 to October 2023. The total sublease payments are approximately \$2.3 million for the lease term. The sublease income is recorded in the other expense (income), net on the statement of operations.

The Company had no material capital leases as of December 31, 2020.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

6. Leases (cont.)

Maturities of operating lease liabilities as of December 31, 2020 were as follows (in thousands):

2021.....	\$	3,622
2022.....		3,133
2023.....		2,300
2024.....		1,648
2025.....		1,039
Thereafter		443
Total undiscounted lease payment		12,185
Less: imputed interest		(1,141)
Total lease liabilities	\$	<u>11,044</u>

Future minimum payments for noncancellable operating leases, based on previous lease accounting standard, as of December 31, 2019 were as follows (in thousands):

2020.....	\$	3,912
2021.....		3,619
2022.....		3,128
2023.....		2,300
2024.....		1,648
Thereafter		1,482
Total minimum lease payments.....		16,089
Less proceeds from sublease rental.....		(1,853)
Net operating lease obligation.....	\$	<u>14,236</u>

Operating lease expense was \$4.0 million, \$3.4 million, and \$3.1 million for the years ended December 31, 2020, 2019 and 2018, respectively.

Short-term and variable lease expenses for the year ended December 31, 2020 were not significant.

Supplemental cash flow information related to leases were as follows (in thousands):

	Year Ended December 31, 2020
Cash paid for amounts included in the measurement of lease liabilities:	
Operating cash flows from operating leases	(3,855)

In the year ended December 31, 2020, the cash flow from financing leases and right-of-use assets obtained in exchange for lease obligations were not significant.

Operating lease right-of-use assets and liabilities consist of the following (in thousands):

	December 31, 2020
Operating leases	
Operating lease right-of-use assets	\$ 10,310
Operating lease liabilities, current	\$ 3,153
Operating lease liabilities, non-current	7,891
Total operating lease liabilities	<u>\$ 11,044</u>

The weighted average remaining lease term and discount rate of operating leases are 4.0 years and 4.9%, respectively, as of December 31, 2020.

As of December 31, 2020, the Company had no significant additional operating leases and finance leases that have not yet commenced.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

7. Commitments and Contingencies

Purchase Commitments

As of December 31, 2020, the Company had outstanding inventory and other purchase commitments of \$215.7 million.

Letters of Credit

As of December 31, 2020, the Company had letters of credit outstanding totaling \$0.5 million, which will expire over various dates in 2021.

Guarantees

The Company provides guarantees of lease payments for vehicles under the financing transaction discussed in Note 4, in the event the lessee does not make payments to the financing company.

The Company regularly reviews its performance risk under the arrangement, and in the event that it becomes probable that it will be required to perform under a guarantee, the fair value of probable payment will be recorded. No guarantee liability was recorded as of December 31, 2020 and 2019.

Legal Proceedings

The Company accrues contingent liabilities when it is probable that future expenditures will be made and such expenditures can be reasonably estimated. From time to time in the normal course of business, various claims and litigation have been asserted or commenced. Due to uncertainties inherent in litigation and other claims, the Company can give no assurance that it will prevail in any such matters, which could subject the Company to significant liability or damages. Any claims or litigation could have an adverse effect on the Company's business, financial position, operating results, or cash flows in or following the period that claims or litigation are resolved.

As of December 31, 2020, the Company was not a party to any legal proceedings that would have a material adverse effect on its business.

8. Convertible Preferred Stock

In August and September 2019, the Company completed a private placement and issuance of a total of 10,857,762 shares of Series 8 convertible preferred stock at \$6.9075 per share for proceeds of \$74.8 million, net of issuance costs of approximately \$0.2 million. In October 2019, the Company completed an additional private placement and issuance of 1,719,145 shares of Series 8 convertible preferred stock at \$6.9075 per share for gross proceeds of \$11.9 million.

In June 2018, the Company completed the private placement and issuance of a total of 15,307,518 shares of Series 7 convertible preferred stock at \$6.526419 per share for proceeds of \$98.8 million, net of issuance costs of approximately \$1.1 million. In September 2018, the Company completed the private placement and issuance of a total of 8,442,102 additional shares of Series 7 convertible preferred stock at \$6.526419 per share for proceeds of \$53.0 million, net of issuance costs of approximately \$2.1 million.

In January 2018, the Company completed an additional private placement and issuance of 4,512,743 shares of Series 6 convertible preferred stock at \$5.539864 per share for proceeds of \$24.9 million, net of issuance costs of \$0.1 million. The \$5.0 million prepayment for the sale of Series 6 convertible preferred stock, which was recorded as a non-current liability as of December 31, 2017, was converted to equity upon closing of this transaction.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

8. Convertible Preferred Stock (cont.)

The following table summarizes convertible preferred stock authorized and issued and outstanding as of December 31, 2020 and 2019:

	Shares Authorized	Shares Issued and Outstanding	Net Carrying Value	Aggregate Liquidation Preference
			(in thousands)	
Series 1 ⁽¹⁾	27,567,694	27,476,120	\$ 79,564	\$ 75,006
Series 2	6,069,073	6,069,073	24,868	24,953
Series 3	7,617,704	7,617,704	36,096	36,475
Series 4	9,159,674	8,682,155	29,901	30,000
Series 5	28,391,526	28,391,526	138,747	142,987
Series 6	14,440,784	14,440,784	79,085	80,000
Series 7	23,749,620	23,749,620	151,770	155,000
Series 8	12,576,907	12,576,907	86,648	86,875
Total	<u>129,572,982</u>	<u>129,003,889</u>	<u>\$ 626,679</u>	<u>\$ 631,296</u>

- (1) Including Series 1 convertible preferred stock issued through exercise of warrants to purchase 197,315 shares. The proceeds from exercise of the warrants was \$0.5 million.

The rights, preferences, and privileges of the convertible preferred stock are as follows:

Dividends

The holders of convertible preferred stock are entitled to receive noncumulative dividends equal to 8% of the original issue price per share, when and if declared by the board of directors, prior and in preference to dividends on common stock. The holders of convertible preferred stock are also entitled to participate in dividends on common stock held on an as-if converted basis. No dividends on convertible preferred stock or common stock had been declared by the board of directors as of December 31, 2020.

Conversion Rights

Each share of convertible preferred stock is convertible at the option of the holder into shares of common stock at any time. The conversion rate for convertible preferred stock is equal to the quotient obtained by dividing the applicable original issue price by the applicable conversion price in effect at the time of conversion. The original issue price for the Series 1, 2, 3, 4, 5, 6, 7, and 8 convertible preferred stock is \$2.729862, \$4.11146, \$4.78821, \$3.45536, \$5.03624, \$5.539864, \$6.526419, and \$6.9075 per share, respectively, as adjusted for stock splits, stock dividends, combinations, subdivisions, recapitalizations, or similar transactions. The conversion price of the Series 1, 2, 3, 4, 5, 6, 7, and 8 convertible preferred stock is \$2.729862, \$4.01068, \$4.58348, \$3.45536, \$5.03624, \$5.539864, \$6.526419, and \$6.9075 per share, respectively, as adjusted for certain dilutive issuances, splits and combinations.

Each share of convertible preferred stock automatically converts into shares of common stock at the then-effective conversion price upon the Company's sale of its common stock in a firm commitment underwriting pursuant to a registration statement filed under the Securities Act of 1933, as amended, at an aggregate public offering price of not less than \$50.0 million. In addition, all shares of convertible preferred stock (other than the Series 7 preferred stock and Series 8 preferred stock) will automatically convert into shares of common stock upon a vote by the holders of a majority of the outstanding shares of convertible preferred stock voting together as a single class on an as-converted basis; the Series 7 preferred stock may not be converted without the vote or written consent of the holders of at least a majority of the then outstanding shares of Series 7 convertible preferred stock and the Series 8 preferred stock may not be converted without the vote or written consent of the holders of at least a majority of the then outstanding shares of Series 8 convertible preferred stock.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

8. Convertible Preferred Stock (cont.)

In the event that the initial offering price to the public (prior to any underwriting discount), under the Securities Act of 1933, as amended, at an aggregate public offering price of not less than \$50.0 million (IPO), is less than the original issuance price of the Series 8 convertible preferred stock, the conversion price of the Series 8 shall be adjusted to the higher of the IPO price or the original issuance price of the Series 7 convertible preferred stock.

Voting Rights

Holders of convertible preferred stock have voting rights equal to the number of shares of common stock into which their respective convertible preferred shares are then convertible. Holders of convertible preferred stock, as a separate class, voting on an as-converted basis, shall be entitled to elect seven directors of the Company. Holders of the common stock, as a separate class, shall be entitled to elect one director of the Company. The holders of common stock and convertible preferred stock, voting together as a single class on an as-converted basis, shall be entitled to elect the remaining number of directors of the Company.

Liquidation Preferences

In the event of a liquidation or sale of the Company, either voluntary or involuntary, distributions to the stockholders shall be made in the following manner: the holders of Series 8 preferred stock shall be entitled, before holders of other series of preferred stock and before holders of common stock, to an amount per share equal to the greater of (1) the original issue price of Series 8 preferred stock plus any declared but unpaid dividends and (2) the amount that would have been payable had all shares of Series 8 preferred stock been converted into common stock immediately prior to such event. After payment to the holders of Series 8 preferred stock, the holders of Series 7 preferred stock shall be entitled, before holders of other series of preferred stock, an amount per share equal to the greater of (1) the original issue price of Series 7 preferred stock plus any declared but unpaid dividends and (2) the amount that would have been payable had all shares of Series 7 preferred stock been converted into common stock immediately prior to such event. After payment to the holders of Series 8 and Series 7 preferred stock, the holders of Series 5 and 6 convertible preferred stock then outstanding shall be entitled, on a pari passu basis, an amount per share equal to the greater of (1) the applicable original issue price for such series of convertible preferred stock plus any declared but unpaid dividends and (2) the amount that would have been payable had all shares of such series convertible preferred stock been converted into common stock immediately prior to such event. After payment to the holders of Series 8, Series 7, and Series 5 and 6 convertible preferred stock, the holders of Series 1, 2, 3, and 4 convertible preferred stock then outstanding shall be entitled, on a pari passu basis, an amount per share equal to the greater of (1) the applicable original issue price for such series of convertible preferred stock plus any declared but unpaid dividends and (2) the amount that would have been payable had all shares of such series convertible preferred stock been converted into common stock immediately prior to such event. After payment of all preferential amounts required to be paid to the holders of convertible preferred stock, the remaining funds and assets available for distribution shall be distributed among the holders of common stock, pro rata based on the number of shares of common stock held.

Redemption

Convertible preferred stock is not redeemable by the Company or at the option of the preferred stockholders.

Convertible Preferred Stock Warrants

Warrants for Series 4 Preferred Stock

In May 2016, in connection with the first amendment to the Hercules Credit Facility, the Company issued warrants to purchase an additional 79,587 shares of Series 4 convertible preferred stock to Hercules at an exercise price of \$3.45536 per share, subject to certain adjustments. The warrants expire at the earlier of May 2023 and three years from the Company's qualified initial public offering.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

8. Convertible Preferred Stock (cont.)

During 2015, the Company issued warrants to purchase 397,932 shares of Series 4 convertible preferred stock to Hercules at an exercise price of \$3.45536 per share, subject to certain adjustments. The warrants expire in the earlier of May 2022 or three years from the Company's qualified initial public offering.

Warrants for Series 1 Preferred Stock

In each of October 2011 and March 2012, the Company issued warrants to purchase 45,787 shares of Series 1 convertible preferred stock at an exercise price of \$2.729862 per share to a bank in connection with a debt arrangement. The warrants expire in October 2021.

The warrants for Series 1 and Series 4 convertible preferred stock are recorded as a warrant liability included in other long-term liabilities on the balance sheets prior to January 1, 2018.

The Company adopted ASU No. 2017-11, *Earnings per Share (Topic 260); Distinguishing Liabilities from Equity (Topic 480); Derivatives and Hedging (Topic 815)* on January 1, 2018, and reclassified its warrant liability of \$0.6 million to additional paid-in capital upon adoption. As of December 31, 2020, a total of 569,093 shares of the Series 1 and Series 4 convertible preferred stock warrants were outstanding.

9. Common Stock

As of December 31, 2020, the Company was authorized to issue 304,672,982 shares of capital stock with a par value of \$0.0001 per share. The authorized shares consisted of 175,100,000 shares of common stock and 129,572,982 shares of convertible preferred stock. There were 6,361,952 shares and 4,400,247 shares of common stock issued and outstanding as of December 31, 2020 and 2019, respectively.

The Company had reserved shares of common stock, on an as-if-converted basis, for issuance as follows:

	December 31,	
	2020	2019
Exercise of stock options to purchase common stock.	26,359,796	20,401,985
Exercise of common stock warrants to purchase common stock	5,149,716	117,630
Issuances of shares available under stock option plans.	442,891	2,362,407
Conversion of convertible preferred stock	129,496,639	129,496,639
Conversion of convertible preferred stock warrants	569,093	569,093
Total	<u>162,018,135</u>	<u>152,947,754</u>

Common Stock Warrants

In August 2020, in connection with the issuance of Convertible Notes, the Company issued warrants to purchase 5,112,086 shares of common stock to purchasers of the Convertible Notes. The warrants have an exercise price of \$0.01 per share. The stock issuable upon exercise of the warrants shall be (1) common stock, or (2) in the event that a QIPO has not occurred within five years of the Note Purchase Agreement or in the event of a liquidation or sale of the Company, the most senior series of the Company's preferred stock (or in the event that the Company consolidated or merges with one or more other corporation, the stock that the holder of the warrant would have been entitled to receive if holder would have exercised the warrant prior to such event). The warrants are exercisable for 7 years, and will be automatically exercised in the event of a change of control transaction or the expiration of the warrants. These warrants are classified as liability in the balance sheets. Refer to Note 5 for further details.

In May 2019, in connection with the 2019 Amended Hercules Credit Facility, the Company issued to Hercules a warrant to purchase 36,630 shares of common stock. The warrants have an exercise price of \$5.46 per share, which are exercisable for 10 years and will automatically exercise upon the initial public offering. See Note 5, Debt.

In the fourth quarter of 2020, 80,000 shares of the common stock warrants expired.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

10. Stock Option Plan

In 2010, the Company adopted the 2010 Equity Incentive Plan (the “Plan”). The Plan provides for the issuance of incentive stock options, non-statutory stock options, stock appreciation rights, restricted stock, and restricted stock units. Non-statutory stock options, stock appreciation rights, restricted stock, and restricted stock units may be granted to employees, directors, and consultants, but only employees may be granted incentive stock options. No stock appreciation rights, restricted stock, or restricted stock units had been issued under the Plan as of December 31, 2020.

The exercise price per share of all stock options granted under the Plan must equal at least 100% of the fair market value per share of the Company’s common stock on the date of grant as determined by the board of directors. If, at the time the Company grants an incentive stock option, the optionee owns stock representing more than 10% of the total combined voting power of all classes of stock of the Company, the exercise price per share must be at least 110% of the fair market value per share of the Company’s common stock on the date of grant and the stock options will expire five years after the date of grant. Except as noted above, stock options expire no more than ten years after the date of grant.

Generally, a terminated service provider may exercise stock options within three months of termination. Awards that expire or are cancelled without delivery of shares generally become available for re-issuance under the 2010 Plan.

Stock option awards generally vest over a four-year period, with 25% vesting after one year from date of grant and quarterly thereafter. Certain awards have shorter vesting periods.

During 2020, the board of directors approved an increase in the number of shares of common stock reserved under the 2010 Equity Incentive Plan by 6,000,000 shares to 31,994,478 shares.

The shares available for grant under the Plan were as follows:

	Year Ended December 31,		
	2020	2019	2018
Balance at the beginning of period	2,362,407	3,627,104	2,751,406
Additional shares authorized.	6,000,000	1,519,075	6,847,235
Granted	(10,281,875)	(3,359,941)	(7,312,022)
Repurchased	—	9,000	—
Cancelled/forfeited	2,362,359	567,169	1,340,485
Balance at the ending of period	<u>442,891</u>	<u>2,362,407</u>	<u>3,627,104</u>

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

10. Stock Option Plan (cont.)

A summary of the Company's stock option activity and related information was as follows:

	Options Outstanding			
	Number of Stock Options Outstanding	Weighted- Average Exercise Price	Weighted- Average Remaining Contractual Life (Years)	Aggregate Intrinsic Value (in thousands)
Balance as of December 31, 2017.	13,764,812	\$ 1.67	8.3	\$ 9,498
Granted	7,312,022	4.11		
Exercised.	(1,217,877)	1.60		
Cancelled/forfeited/expired.	(1,340,485)	2.06		
Balance as of December 31, 2018.	18,518,472	\$ 2.61	8.3	\$ 42,951
Granted	3,359,941	5.23		
Exercised.	(909,259)	1.90		
Cancelled/forfeited/expired.	(567,169)	3.50		
Balance as of December 31, 2019.	20,401,985	\$ 3.05	7.6	\$ 34,723
Granted ⁽¹⁾	6,531,875	4.36		
Exercised.	(1,961,705)	2.14		
Cancelled/forfeited/expired.	(2,362,359)	4.11		
Balance as of December 31, 2020 ⁽¹⁾	22,609,796	\$ 3.40	7.4	\$ 65,056
Exercisable as of December 31, 2020.	12,637,973	\$ 2.63	6.2	\$ 46,004

(1) Excluding CEO Equity Awards of 3,000,000 shares and Milestone Options of 750,000 shares, of which 562,500 shares exercisable as of December 31, 2020. Refer to section below for further details.

In March 2020, in conjunction with Mr. Allen's appointment as the President and Chief Executive Officer, the board of directors approved a grant to Mr. Allen of stock option awards with respect to 5,250,000 shares, comprised of (1) 1,500,000 shares of time-based award with an exercise price of \$4.75 per share vesting quarterly over 4 years, (2) 3,000,000 shares of time-based award consists of 4 tranches with an exercise price of \$10, \$15, \$20 and \$25 per share, respectively, and vesting quarterly over 4 years ("Equity Awards"), and (3) 750,000 shares of milestone-based award with exercise price of \$4.75 per share will vest entirely and become exercisable on the first trading day following the expiration of the lockup period of the Company's initial public offering or the consummation of a change in control of the Company ("Milestone Options"). The Milestone Options shall vest in full and become exercisable upon the consummation of a merger involving a Special Purpose Acquisition Company.

The stock-based compensation expense for Milestone Options will be recognized at the time the performance milestone becomes probable of achievement. No stock-based compensation expense related to the Milestone Options was recognized as of December 31, 2020 as the performance condition was not considered probable of achievement. The unrecognized stock-based compensation expense associated with the Milestone Options was \$2.1 million on the grant date and as of December 31, 2020.

The weighted average fair value of stock options granted, excluding the 3,000,000 shares underlying the Equity Awards with exercise price of \$10, \$15, \$20 or \$25 per share and 750,000 shares underlying the Milestone Options, was \$3.13 per share for 2020. The weighted average fair value of stock options granted was \$3.14 per share for 2019 and \$2.64 per share for 2018. Aggregate intrinsic value represents the difference between the estimated fair value of the underlying common stock and the exercise price of outstanding, in-the-money stock options. The total intrinsic value of stock options exercised was \$4.3 million for 2020, \$2.9 million for 2019 and \$2.3 million for 2018. The total estimated grant date fair value of stock options vested was \$9.9 million for 2020, \$8.3 million for 2019 and \$4.7 million for 2018. As of December 31, 2020, the total unrecognized stock-based compensation expense related to outstanding stock options was \$34.8 million, which is expected to be recognized over a weighted-average period of 2.9 years.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

10. Stock Option Plan (cont.)

Determining Fair Value of Stock Options

The Company uses the Black-Scholes option pricing model to determine the fair value of stock options. The fair value of each stock option grant is estimated on the date of the grant. The fair value of the common stock underlying the stock options has historically been determined by the board of directors. There has been no public market for the Company's common stock. Therefore, the board of directors has determined the fair value of the common stock at the time of the stock option grant by considering a number of objective and subjective factors including independent third-party valuation reports, valuations of comparable companies, sales of convertible preferred stock and common stock to unrelated third parties, operating and financial performance, lack of liquidity of capital stock and general and industry-specific economic outlook, among other factors. The fair value of the underlying common stock shall be determined by the board of directors until such time that the Company's common stock is listed on an established stock exchange or national market system.

The fair value of stock options granted is estimated on the date of grant using the following assumptions:

	Year Ended December 31,		
	2020	2019	2018
Expected term (in years)	6.1	6.1	6.0
Risk-free interest rate	0.5%	1.8%	2.8%
Expected volatility	69.1%	65.4%	71.5%
Expected dividend rate	—	—	—

Expected Term — The Company estimates the expected term consistent with the simplified method. The Company elected to use the simplified method because of its limited history of stock option exercise activity. The simplified method calculates the expected term as the average of the vesting and contractual terms of the award.

Volatility — Since the Company has no trading history by which to determine the volatility of its own common stock price, the expected volatility being used is derived from the historical stock volatility of a representative industry peer group of comparable publicly listed companies over a period approximately equal to the expected term of the stock options.

Risk-Free Interest Rate — The risk-free interest rate is based on U.S. Treasury zero coupon issues with remaining terms similar to the expected term on the options.

Expected Dividend — The Company has never declared or paid any cash dividends and does not plan to pay cash dividends in the foreseeable future, and, therefore, used an expected dividend yield of zero in the valuation model.

Forfeiture — All stock-based payment awards are amortized on a straight-line basis over the requisite service periods of the awards, which are generally the vesting periods. Under the ASU No. 2016-09, *Compensation — Stock Compensation: Improvements to Employee Share-Based Payment Accounting*, the Company elected to account for forfeitures when they occur.

Stock-based Compensation Expense

Stock-based compensation expense included in operating results was as follows (in thousands):

	Year Ended December 31,		
	2020	2019	2018
Cost of goods sold.	\$ 929	\$ 826	\$ 553
Research and development	1,616	1,436	1,227
Selling, general and administrative.	7,737	6,258	3,596
Total stock-based compensation expense	<u>\$ 10,282</u>	<u>\$ 8,520</u>	<u>\$ 5,376</u>

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

11. Net Loss Per Share

Basic net loss per share is computed by dividing the net loss by the weighted-average number of shares of common stock outstanding during the period, less the weighted-average unvested common stock subject to repurchase or forfeiture as they are not deemed to be issued for accounting purposes. Diluted net loss per share is computed by giving effect to all potential shares of common stock, including convertible preferred stock, stock options, and warrants, to the extent they are dilutive.

The computation of basic and diluted net loss per share of common stock under the two-class method attributable to common stockholders was as follows (in thousands, except for per share data):

	Year Ended December 31,		
	2020	2019	2018
Numerator:			
Net loss	\$ (127,007)	\$ (101,552)	\$ (91,622)
Denominator:			
Weighted-average shares used in computing net loss per share of common stock, basic and diluted	4,913	4,052	2,831
Net loss per share of common stock, basic and diluted	<u>\$ (25.85)</u>	<u>\$ (25.06)</u>	<u>\$ (32.36)</u>

We applied the two-class method to calculate its basic and diluted net loss per share of common stock, as the convertible preferred stock are participating securities. The two-class method is an earnings allocation formula that treats a participating security as having rights to earnings that otherwise would have been available to common stock holders. However, the two-class method does not impact the net loss per share of common stock as we were in a loss position for each of the periods presented and holders of convertible preferred stock do not have to participate in losses.

Since we were in a loss position for each of the periods presented, diluted net loss per share is the same as basic net loss per share for each period as the inclusion of all potential common stock shares outstanding would have been anti-dilutive. The potentially dilutive securities that were excluded from the diluted per share calculation because they would have been anti-dilutive were as follows:

	Year Ended December 31,		
	2020	2019	2018
Convertible preferred stock ⁽¹⁾	129,496,639	129,496,639	116,919,732
Warrants to purchase convertible preferred stock.	569,093	569,093	569,093
Stock options to purchase common stock.	26,359,796	20,401,985	18,518,472
Warrants to purchase common stock	5,149,716	117,630	81,000
Common stock subject to repurchase	—	—	14,000
	<u>161,575,244</u>	<u>150,585,347</u>	<u>136,102,297</u>

(1) Represents the shares of common stock that the convertible preferred stock is convertible into.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

12. Income Tax

The components of the net loss before the provision for income taxes were as follows (in thousands):

	Year Ended December 31,		
	2020	2019	2018
Domestic	\$ (126,985)	\$ (101,552)	\$ (91,622)

The provision for income taxes consisted of the following (in thousands):

	Year Ended December 31,		
	2020	2019	2018
Current:			
Federal	\$ —	\$ —	\$ —
State	13	—	—
Foreign	9	—	—
Total current provision	22	—	—
Deferred:	—	—	—
Federal	—	—	—
State	—	—	—
Foreign	—	—	—
Total deferred provision	—	—	—
Total provision for income taxes	<u>\$ 22</u>	<u>\$ —</u>	<u>\$ —</u>

A reconciliation of the U.S. federal statutory income tax rates to our effective tax rate is as follows (in percentages):

	Year Ended December 31,		
	2020	2019	2018
U.S. federal statutory rate	21.0%	21.0%	21.0%
State income taxes, net of federal benefit	1.7	3.4	6.1
Change in valuation allowance	(17.5)	(23.9)	(27.0)
Research and development credit	0.2	0.3	0.6
Fair market adjustment	(2.1)	—	—
Non-deductible Convertible Notes interest expense	(2.2)	—	—
Other	(1.1)	(0.8)	(0.7)
Effective income tax rate	<u>—%</u>	<u>—%</u>	<u>—%</u>

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

12. Income Tax (cont.)

Our deferred tax assets (liabilities) are as follows (in thousands):

	December 31,	
	2020	2019
Deferred tax assets:		
Net operating loss carryforwards	\$ 113,643	\$ 96,047
Deferred revenue	6,731	4,695
Stock-based compensation	3,560	2,509
Accruals and reserves, not currently deductible for tax purposes	8,351	7,612
Research and development credit	2,761	2,458
Goodwill	1,014	1,277
Interest expense	2,097	1,576
Lease liability	2,738	—
Other	44	39
Gross deferred tax assets	140,939	116,213
Less valuation allowance	(137,437)	(115,175)
Net deferred tax assets	<u>\$ 3,502</u>	<u>\$ 1,038</u>
Deferred tax liabilities:		
Property, plant and equipment	\$ (1,008)	\$ (1,050)
ROU assets	(2,494)	—
Other	—	12
Gross deferred tax liabilities	(3,502)	(1,038)
Net deferred tax asset (liabilities)	<u>\$ —</u>	<u>\$ —</u>

The net valuation allowance increased by \$22.3 million and \$24.3 million for 2020 and 2019, respectively.

As of December 31, 2020 and 2019, the Company's net deferred tax assets and liabilities were zero. The deferred tax assets consist primarily of the federal and state net operating losses. Realization of deferred tax assets is dependent upon future taxable income, if any, the amount and timing of which are uncertain. In assessing the realizability of deferred tax assets, management determined that it is more likely than not that no deferred tax assets will be realized. Therefore, the Company has provided a full valuation allowance against these deferred tax assets.

The Company had net operating loss carryforwards as follows (in thousands):

	December 31,	
	2020	2019
Federal (Prior to 2018)	\$ 237,850	\$ 237,850
Federal (Post December 31, 2017)	216,724	145,480
State	317,801	272,029
Total	<u>\$ 772,375</u>	<u>\$ 655,359</u>

Net operating loss carryforwards are available to offset future federal and state taxable income. The federal net operating loss carryforwards generated prior to 2018 will begin to expire in 2030 and the net operating loss carryforwards generated after December 31, 2017 do not expire. The state net operating loss carryforwards will begin to expire in 2023.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

12. Income Tax (cont.)

The Company had research and development credit carryforwards as follows (in thousands):

	December 31,	
	2020	2019
Federal.	\$ 2,020	\$ 1,728
State.	1,231	1,099
Total	<u>\$ 3,251</u>	<u>\$ 2,827</u>

The research and development credit carryforwards are available to reduce future regular income taxes. The federal research and development credit carryforwards will begin to expire in 2037, while the South Carolina research and development credit carryforwards will begin to expire in 2027. California research and development credit carryforwards have no expiration date.

Utilization of the Company's net operating loss carryforwards and research tax credit carryforwards may be subject to substantial annual limitations due to the ownership change limitations provided by the Internal Revenue Code and similar state provisions. The annual limitation could result in the expiration of the net operating loss carryforwards and research tax credit carryforwards before utilization.

The Company's policy is to recognize interest or penalties related to income tax matters in income tax expense. As of December 31, 2020 and 2019, the Company had no accrued interest or penalties. The unrecognized tax benefits may change during the next year for items that arise in the ordinary course of business. In the event that any unrecognized tax benefits are recognized, the effective tax rate will not be affected.

A reconciliation of the beginning and ending amount of unrecognized tax benefits for 2020, 2019 and 2018 was as follows (in thousands):

	Year Ended December 31,		
	2020	2019	2018
Beginning balance.	\$ 707	\$ 527	\$ 165
Increase – tax positions in current period.	106	180	316
Increase – tax positions in prior periods.	—	—	46
Ending balance	<u>\$ 813</u>	<u>\$ 707</u>	<u>\$ 527</u>

The Company files tax returns in the United States and certain states. Due to the losses being carried forward, the tax years from 2011 forward remain open to examination.

In March 2020, the "Coronavirus Aid, Relief and Economic Security (CARES) Act" was signed into law. The CARES Act includes provisions relating to refundable payroll tax credits, deferment of the employer portion of certain payroll taxes, net operating loss carryback periods, alternative minimum tax credit refunds, modifications to the net interest deduction limitations and technical corrections to tax depreciation methods for qualified improvement property. These provisions are not expected to have a material effect on the Company's financial statements.

13. 401(k) Plan

The Company sponsors a 401(k) defined contribution plan covering all eligible employees and provides matching contribution for the first 4% of their salaries. The matching contribution costs incurred were \$1.9 million, \$1.7 million, and \$1.2 million for the years ended December 31, 2020, 2019 and 2018, respectively.

PROTERRA INC.
NOTES TO FINANCIAL STATEMENTS

14. Subsequent Events

On January 11, 2021, the Company entered into an Agreement and Plan of Merger (“Merger Agreement”) with ArcLight Clean Transition Corp., a publicly traded special purpose acquisition company (“SPAC”) and Cayman Islands exempted company (“ArcLight”) and Phoenix Merger Sub, Inc., a Delaware corporation and a wholly-owned subsidiary of ArcLight (“Phoenix Merger Sub”).

At the closing, ArcLight will become a Delaware corporation, and Phoenix Merger Sub will merge with and into Proterra, with Proterra as the surviving company and continuing as a wholly-owned subsidiary of ArcLight. ArcLight’s name will be changed to Proterra Inc (“New Proterra”).

Upon closing of the merger,

- Proterra’s outstanding convertible preferred stock of 129,003,889 shares will convert into 129,496,639 shares of common stock. Each share of Proterra common stock (including shares issuable upon conversion of Proterra convertible preferred stock) will be converted into the right to receive 0.8925 shares of New Proterra Common Stock, as a result of applying the Exchange Ratio;
- each Proterra option will be converted into an option to purchase shares of New Proterra Common Stock by multiplying the number of underlying shares by the exchange ratio, rounded down to the nearest whole share; the exercise price of each converted option will be determined by dividing the per share exercise price of the respective Proterra options by the Exchange Ratio, rounded up to the nearest whole cent;
- each Proterra warrant to purchase common stock and convertible preferred stock will be converted into a warrant to purchase shares of New Proterra Common Stock by multiplying the number of underlying shares by the Exchange Ratio, rounded down to the nearest whole share; the exercise price of each converted warrant will be determined by dividing the per share exercise price of the respective Proterra warrant by the Exchange Ratio, rounded up to the nearest whole cent;
- each outstanding Convertible Note that was not optionally converted immediately prior to the consummation of the merger will remain outstanding and become convertible into shares of New Proterra Common Stock in accordance with the terms of such Convertible Notes.

In the event that the closing sale price of New Proterra common stock exceeds certain price thresholds for 20 out of any 30 consecutive trading days or in any transaction resulting in a change in control with a valuation of the New Proterra Common Stock exceeds certain price thresholds during the first five years following the closing of the merger, up to an additional 22,809,500 shares of New Proterra Common Stock may be issued to holders of Proterra convertible preferred stock, common stock, warrants, vested options and Convertible Notes as of immediately prior to the closing of the merger.

In connection with the merger, ArcLight entered into subscription agreements with certain investors (“PIPE Investors”) to purchase an aggregate of 41.5 million shares of New Proterra common stock, immediately following the closing of merger, at a purchase price of \$10.00 per share, for aggregate gross proceeds of \$415.0 million (“PIPE Financing”).

In connection with the execution of the Merger Agreement, ArcLight entered into the Sponsor Letter Agreement with the ArcLight Sponsor providing that 10% of the New Proterra Common Stock received by Sponsor upon consummation of the merger in exchange for its outstanding shares of ArcLight class B ordinary shares, excluding 140,000 shares owned by ArcLight board of directors, will be subject to vesting and forfeiture.

ArcLight public shareholders have rights to redeem their shares for cash upon the closing of the merger. The Merger Agreement includes as a condition to close the merger that, at the closing of the merger, ArcLight will have a minimum of \$350.0 million of funds, net of any unpaid liabilities.

We have evaluated subsequent events through April 7, 2021.



PROTERRA

Pinellas Suncoast Transit Authority

3. Letter of Insurance

September 13, 2021

PSTA
Attn: Alvin R. Burns Jr.
Director of Procurement
3201 Scherer Drive.
St Petersburg, FL 33716

**RE: Florida Electric Transit Buses with Charging and Associated Equipment
RFP 21-980369**

Dear Mr. Burns Jr.:

We have reviewed the insurance requirements outlined in the Florida Electric Transit Buses with Charging and Associated Equipment, RFP 21-980369. This letter is confirming Proterra's current insurance program meets the type and limits of insurance required.

Therefore, the contractor has the ability to obtain the insurance coverage in accordance with the solicitation requirements.

Please do not hesitate to reach out with any questions regarding Proterra's insurance.

Regards,

Jeffery D. Friesen

Jeff Friesen
Senior Vice President
jfriesen@woodruff Sawyer.com

D 503.416.6816
M 503.548.8502

Woodruff Sawyer
1050 SW 6th Avenue, Suite 1000
Portland, OR 97204

woodruff Sawyer.com

Insurance Services
Risk Management
Employee Benefits

Woodruff-Sawyer & Co.
844.972.6326

1050 SW Sixth Avenue, Suite 1000
Portland, OR 97204

OR License 0100167994
AN ASSUREX GLOBAL & IBN PARTNER

woodruff Sawyer.com



PROTERRA

Pinellas Suncoast Transit Authority

4. Form for Proposal Deviation

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: None			
Rationale (pros and cons):			



PROTERRA

Pinellas Suncoast Transit Authority

5. Proposal Form

RFP 21-980369

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: Proterra Operating Company, Inc.

Street address: 1815 Rollins Rd.

City, state, ZIP: Burlingame, CA 94010

Name and title of Authorized Signer(s): John Walsh - Chief Commercial Officer

Name and title of Authorized Signer(s): _____

Phone: (256) 499-5696

DocuSigned by:  190E3CD36916412...	9/10/2021
Authorized signature	Date

_____	_____
Authorized signature	Date



PROTERRA

Pinellas Suncoast Transit Authority

6. All Federal Certifications

RFP 21-980369

CER 8. Federal Certifications**CER 8.1 Buy America Certification**

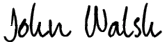
This form is to be submitted with an offer exceeding the small purchase threshold for federal assistance programs, currently set at \$150,000.

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: John Walsh - Chief Commercial Officer

Company: Proterra Operating Company, Inc.

DocuSigned by:

190E3CD36916412...
Authorized signature

9/10/2021

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

RFP 21-980369

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:

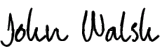
☒ The Proposer, John Walsh, certifies to the best of its knowledge and belief that it and its principals:

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 Greenville, SC.**Name:** John Walsh, Chief Commercial Officer

DocuSigned by:

190E3CD36916412...
Authorized signature

9/10/2021

Date

RFP 21-980369

CER 8.3 Debarment and Suspension Certification (Lower-Tier Covered Transaction)

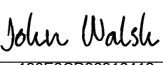
This form is to be submitted by each Subcontractor receiving an amount exceeding \$25,000.

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, John Walsh, C.C.O of Proterra Operating Company, Inc., 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: John Walsh - Chief Commercial Officer

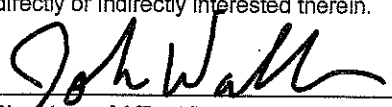
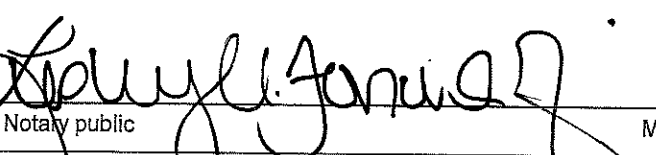
DocuSigned by:

190E3CD36916412...
Authorized signature

9/10/2021

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 <u>South Carolina</u> , County of <u>Greenville</u>	
I, <u>John Walsh</u> , being first duly sworn, do hereby state that (Name of Affiant)	
I am <u>Chief Commercial Officer</u> of <u>Proterra Operating Company, Inc.</u> (Capacity) (Name of Firm, Partnership or Corporation)	
whose business is <u>1815 Rollins Rd. Burlingame, CA 94010</u>	
and who resides at <u>1815 Rollins Rd. Burlingame, CA 94010</u>	
and that <u>Proterra Operating Company, Inc.</u> (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 <u>September 17, 2021</u>	
The foregoing instrument was sworn to before me by means of <input checked="" type="checkbox"/> physical presence or <input type="checkbox"/> online notarization this <u>17th</u> day of <u>September</u> , 2021 by <u>John Walsh</u> (name), as <u>Chief Commercial Officer</u> (type of authority) on behalf of the <u>Proterra Operating Company, Inc.</u> (type of business entity). She/he is <input checked="" type="checkbox"/> personally known to me or [] has produced <u>NA</u> (type of identification) as identification.	
 Notary public <u>June 30, 2025</u> My commission expires	
Lesley M. Fonokalafi Notary Public, State of South Carolina My Commission Expires June 30, 2025 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, Proterra Operating Company, Inc., 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:

John Walsh

Title:

Chief Commercial Officer

DocuSigned by:

John Walsh

190E3CD36916412...
Signature

9/10/2021

Date

Per paragraph 2 of the included form Lobbying Certification, add Standard Form–LLL, "Disclosure Form to Report Lobbying," if applicable.

RFP 21-980369

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. X The buses offered herewith have been tested in accordance with 49 CFR Part 665 on September 2020(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: Proterra Operating Company, Inc.

Name and title of the Proposer's authorized official: John Walsh - Chief Commercial Officer

DocuSigned by:

 190E3CD36916412...
 Authorized signature

9/10/2021

Date

RFP 21-980369

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: John Walsh - Chief Commercial Officer

DocuSigned by:  190E3CD36916412...	9/10/2021
Authorized signature	Date



U.S. Department
Of Transportation
**Federal Transit
Administration**

Headquarters

East Building, 5th Floor – TCR
1200 New Jersey Avenue, SE
Washington, DC 20590

May 10, 2021

Amy Cuny, DBELO
Proterra, Inc.
1 Whitlee Court
Greenville, SC 29607

Re: TVM DBE Goal Concurrence/Certification Letter – Fiscal Year 2021

Dear Ms. Cuny:

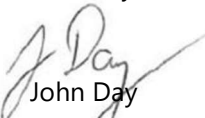
This letter is to inform you that the Federal Transit Administration's (FTA) Office of Civil Rights has received Proterra, Inc.'s Disadvantaged Business Enterprise (DBE) goal and methodology for FY 2021 for the period of October 1, 2020–September 30, 2021. This goal submission is required by the U.S. Department of Transportation's DBE regulations at 49 CFR Part 26 and must be implemented in good faith.

We have reviewed your firm's FY 2021 DBE goal and determined that it complies with DOT's DBE regulations. Your firm is eligible to bid on FTA-funded transit contracts. This letter or a copy of the TVM listing on FTA's website may be used to demonstrate your firm's compliance with DBE requirements when bidding on federally funded vehicle procurements.

FTA reserves the right to remove/suspend this concurrence if your DBE program or FY 2021 DBE goal is not implemented in good faith. In accordance with this good faith requirement, you must submit your DBE Uniform Report to FTA by June 1, 2021. This report should reflect all FTA-funded contracting activity for the first period of FY 2021 (i.e., from September 1 to March 31).

Also note that your FY 2022 DBE goal methodology must be submitted to FTA by August 1, 2021. Any significant updates to the program plan must be submitted to FTA as they occur. If you have any questions, please contact the FTA DBE Team via email at FTATVMSubmissions@dot.gov.

Sincerely,


John Day
Program Manager
Office of Civil Rights

RFP 21-980369

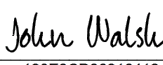
CER 8.8 Federal Motor Vehicle Safety Standards

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: Proterra Operating Company, Inc.

Name of signer: John Walsh

Title: Chief Commercial Officer

DocuSigned by:

190E3CD36916412...
Authorized signature

9/10/2021

Date



PROTERRA INC

SECRETARY'S CERTIFICATE

The undersigned certifies on behalf of Proterra Inc (the "*Company*") as follows:

1. The undersigned, JoAnn C. Covington, is the Secretary of the Company.
2. Attached hereto, as Exhibit A, is a true and complete copy of the resolutions adopted by the Board of Directors of the Company on February 24, 2021 ("*Authorizing Resolutions*"), authorizing John Walsh as an Officer to: (i) to prepare, execute, deliver and perform, as the case may be, such agreements, amendments, applications, approvals, certificates, communications, consents, demands, directions, documents, further assurances, instruments, notices, orders, requests, resolutions, supplements or undertakings, (ii) to pay or cause to be paid on behalf of the Company any related costs and expenses and (iii) to take such other actions, in the name and on behalf of the Company, as each such officer shall deem necessary or advisable to complete and effect the foregoing transactions or to carry out the intent and purposes of the foregoing resolutions and the transactions contemplated thereby, the preparation, execution, delivery and performance of any such agreements, amendments, applications, approvals, certificates, communications, consents, demands, directions, documents, further assurances, instruments, notices, orders, requests, resolutions, supplements or undertakings, the payment of any such costs or expenses and the performance of any such other acts shall be conclusive evidence of the approval of the Board thereof and all matters relating thereto.
3. The Authorizing Resolution was (i) adopted by the Board of Directors in compliance with the Company's certificate of incorporation and bylaws, (ii) have not been amended, modified, or rescinded since their adoption, and (iii) are in full force and effect as of the date hereof.

IN WITNESS WHEREOF, the undersigned has executed this Secretary's Certificate as of February 24, 2021.

PROTERRA INC

DocuSigned by:

2AC7FE021B63499...
JoAnn C. Covington, Secretary

[Privileged and Confidential]
Page 2 of 2

EXHIBIT A
(Authorizing Resolutions)

PROTERRA INC
BOARD OF DIRECTORS
RESOLUTIONS ADOPTED FEBRUARY 24, 2021

Authorization of John Walsh

WHEREAS, John Walsh is the Senior Vice President, Sales for Proterra.

WHEREAS, in as an officer of the Company, Mr. Walsh is called upon to submit responses to requests for proposals issued by transit agencies, and such agencies often require the Secretary of the Company to produce resolutions of the Board confirming Mr. Walsh's authority to respond to such requests for proposals.

WHEREAS, Board deems it advisable, and in the best interests of the Company and its stockholders, to confirm and ratify Mr. Walsh's authority to act on behalf of the Company as its Senior Vice President, Sales.

NOW, THEREFORE, BE IT RESOLVED: That, as an officer of the company, Mr. Walsh is authorized: (i) to prepare, execute, deliver and perform, as the case may be, such agreements, amendments, applications, approvals, certificates, communications, consents, demands, directions, documents, further assurances, instruments, notices, orders, requests, resolutions, supplements or undertakings, (ii) to pay or cause to be paid on behalf of the Company any related costs and expenses, and (iii) to take such other actions, in the name and on behalf of the Company, as such officer shall deem necessary or advisable to carry out his function as Senior Vice President, Sales for the Company.

RESOLVED FURTHER: That the preparation, execution, delivery and performance of any such agreements, amendments, applications, approvals, certificates, communications, consents, demands, directions, documents, further assurances, instruments, notices, orders, requests, resolutions, supplements or undertakings, the payment of any such costs or expenses and the performance of any such other acts shall be conclusive evidence of the approval of the Board thereof and all matters relating thereto.

RESOLVED FURTHER: That all actions heretofore taken by Mr. Walsh with respect to the foregoing authorization and all other matters contemplated by the foregoing resolutions are hereby approved, adopted, ratified and confirmed.