Memorandum

Cooperative Agreement Justification

To:	Jeffrey Tumlin, Director of Transportation, SFMTA
From:	Julie Kirschbaum, Director of Transit, Transit Division
CC:	Becky Chen, Enoch Chu, Gary Chang, Janet Gallegos, Moiz Mansuri, Donnie Wong
Date:	March 28, 2024
Subject:	Procurement of 94 40' Low Floor Hybrid Coaches from New Flyer of America, Inc., using the Washington State Cooperative Purchasing Contract: Justification and Request for Determination

Executive Summary

The SFMTA intends to purchase 94 40' Low Floor Hybrid coaches to replace coaches that have reached the end of useful life, and the SFMTA intends to make this purchase from New Flyer of America, Inc., using the Washington State Cooperative Purchasing Schedule Master Contract No. 06719-01. This memo provides the justification for the purchase and a request for a determination by the Director of Transportation under 21.16(b) that (i) the purchase cooperative's procurement process was competitive, and (ii) the use of that procurement would be in the City's best interests.

Justification Based on Purchaser's Regulation 21.16(b): Use of Cooperative Agreements and Contract Held by other Government Agencies

Although the SFMTA is not required to follow the Purchaser's Regulations under the City Charter section 8A.102(b)1's assignment to the SFMTA of exclusive authority over contracting, Purchaser's Regulation 21.16(b) provides a useful framework for describing why using another agency's procurement is in the City's interests. To justify the use of the procurement using the cooperative agreement, SFMTA Transit Program Delivery performed the following assessments suggested by the Purchaser's Regulations:

1. An overview of the competitive process or sole source process utilized by the cooperative agency, other government entity in procuring the contract: The Washington State Cooperative Purchasing Schedule is a cooperative purchasing agreement that facilitates the procurement of transit coaches by other public transit agencies. The Washington State Department of Enterprise Services completed a competitive process in procuring the contract. The State of Washington, acting by and through Enterprise Services, is a member of and the lead procurement agency for the Washington State Transit Bus Cooperative. The Washington State Transit Bus Cooperative is a cooperative purchasing agreement for eligible participants to procure transit buses through a competitively solicited and awarded Cooperative Master Contract. On behalf of the State of Washington, Enterprise Services, as part of a competitive governmental procurement, issued a Competitive Solicitation No. 06719-01 dated March 4, 2020 regarding Heavy Duty Transit Buses. The RFP and the specifications were published and presented to the industry, allowing responsive bidders to offer a coach that meets the specification. Enterprise Services evaluated all responses to the Competitive Solicitation and identified New Flyer as an apparent successful bidder. Once the responses were evaluated, the Washington State Department of Enterprise Services awarded the contracts to the qualified contractors. Under the Cooperative Purchasing Schedule, New Flyer offers a "baseline" configuration that conforms with the specification. The cooperative agreement also offers a list of options above the baseline. These options are also pre-negotiated. The procuring agency can also request "unlisted options".

2. Why the pricing offered under the contract is better than what the City can otherwise obtain, or that the administrative benefits of using the contract outweighs any likely cost difference: The Washington State Cooperative Purchasing Schedule serves multiple agencies both within and outside of the State of Washington that together buy hundreds of coaches. This gives the Washington State Department of Enterprise Services great purchasing power. SFMTA Transit Program Delivery determined that there were pricing benefits offered by the Washington State contract, compared to preparing a City RFP. These included:
    a. A pre-negotiated, lower coach price achieved by seeking a larger number of coaches.
    b. Although the coach manufacturers may pass through the State of Washington's administrative fees in their prices, those fees are still lower than the internal labor costs the SFMTA would pay in preparing a City RFP.
    c. Significant time saved by using the pre-negotiated contract instead of the City RFP process.

3. An assessment of whether Cooperative Contract will materially hinder the City's ability to meet its LBE participation goals: In the case of low floor hybrid coaches, there are no qualifying manufacturers in the City & County of San Francisco, therefore there is no impact on LBE participation goals.

4. A summation of any fees that must be paid by the City to the entity that established the contract in question: The State of Washington's contract does not charge any direct fees to the agencies that use the cooperative agreement. The coach prices from the State of Washington Cooperative Purchasing Contract deems to be a fair market price if SFMTA would have issued our own RFP. SFMTA Transit Program Delivery evaluated the administrative costs and fees to purchase the low floor hybrid coaches and concluded that the cost of using the State of Washington Cooperative Purchasing Schedule is far less than the costs the SFMTA would incur in preparing its own RFP for the same vehicles.

5. A description of due diligence undertaken prior to seeking a piggyback approval: The due diligence required for Cooperative Contract approval included:
    a. *Comparing the contracts available for the required product or service, conducting market research, and evaluating whether the use of another agency's contract is in the best interest of the City*: SFMTA Transit Program Delivery researched available cooperative agreements and identified those that offered a low floor hybrid coach meeting the specification requirements of the agency. They concluded that a procurement using the proposed purchasing agreement was best since it had a low floor hybrid coach meeting the SFMTA specification, and the price was reasonable in comparison to other State cooperative purchasing agreements. Overall, they concluded that the Washington State Cooperative Purchasing Schedule provides a cost-effective way to procure these coaches.
    b. *Reviewing the contract for conformance with applicable laws and best practices:* The cooperative agreement selected meets all the FTA requirements and offers a reputable low floor hybrid coach manufacturer at a reasonable price.
    c. *Analyzing the product or service specifications, price, terms and conditions and other factors such as: cost to utilize the contract, shipping, minimum spending requirements, and availability of contract documentation, to ensure that the contract produces best value*: The low floor hybrid coaches offered were selected because they met all the

requirements of the SFMTA specification. Pricing, availability, terms, conditions, delivery, and warranty were competitive with the same factors on other available state cooperative purchasing agreements.

d. *Contacting the lead agency to verify contract application and eligibility*: The contract administrator for the Washington State Department of Enterprise Services was contacted to ensure SFMTA meets all conformance and eligibility requirements. The administrator determined that SFMTA is eligible to purchase the low floor hybrid coaches from the cooperative agreement.

Request for Director of Transportation Determination

Under San Francisco Administrative Code section 21.16(b) and Charter section 8A.102(b)1, the SFMTA may use the competitive procurement process of any other public agency when the Director of Transportation makes a determination that: (i) the other agency's procurement process was competitive or the result of a sole source award; and (ii) the use of the other agency's procurement would be in the City's best interests. SFMTA Program Delivery staff request that you make those determinations based on the justifications presented in this memo. Overall, procuring the low floor hybrid coaches using the State of Washington Cooperative Purchasing Schedule Master Contract No. 06719-01 is in the City's best interests. Using the Washington State Cooperative Purchasing Schedule will ensure that the SFMTA receives a low floor hybrid coach that meets all SFMTA specifications, from a reputable manufacturer, and at a reasonable cost based on a fair competition.

Thank you,

March 30, 2024

Julie Kirschbaum
Director of Transit, Transit Division

Director of Transportation Determination

I determine that, in connection with the SFMTA's proposed purchase of 94 40' low floor hybrid coaches (i) the Washington State Cooperative Purchasing Schedule Master Contract No. 06719-01 procurement process was competitive; and (ii) the use of that contract would be in the City's best interests.

March 30, 2024

Jeffrey P. Tumlin
Director of Transportation

City and County of San Francisco
Municipal Transportation Agency
One South Van Ness Ave., 7th Floor
San Francisco, California 94103

Agreement between the City and County of San Francisco and New Flyer of America Inc. (Through the State of Washington) For Procurement of 94 40-Foot Hybrid Electric Buses Contract No. SFMTA-2024-03-FTA

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City and County of San Francisco
Municipal Transportation Agency
One South Van Ness Ave., 7th Floor
San Francisco, California 94103

Agreement between the City and County of San Francisco
and
New Flyer of America Inc.
Contract No. SFMTA-2024-03-FTA

This Agreement is made as of _____, in the City and County of San Francisco (City), State of California, by and between New Flyer of America Inc. (Contractor), a North Dakota corporation with its principal place of business located at 6200 Glenn Carlson Drive, St. Cloud, Minnesota 56301, and the City and County of San Francisco, a municipal corporation, acting by and through its Municipal Transportation Agency (SFMTA).

Recitals

A. The SFMTA wishes to procure 94 40-foot Hybrid Electric Coaches and associated spare parts, special tools, manuals, training, and Telematics licenses from Contractor through the Washington State Cooperative Purchasing Schedule Master Contract No. 06719-01 with New Flyer of America Inc. (attached as Appendix A).

B. Under S.F. Administrative Code Section 21.16(b), the SFMTA may utilize the competitive procurement process of any other public agency to make purchases of commodities under the terms established in that agency's competitive procurement process upon a finding that the procurement is in the City's best interests.

C. In March 2020, the State of Washington Department of Enterprise Services issued a competitive solicitation for a cooperative procurement for Heavy Duty Low Floor Hybrid Electric Coaches. The procurement complied with the third-party procurement requirements of the Federal Transit Administration (FTA).

D. In 2020, Contractor submitted a bid in response to the competitive solicitation. The State of Washington accepted the proposal and awarded State Cooperative Purchasing Schedule Master Contract No. 06719-01 to Contractor as of April 1, 2021.

E. Contract No. 06719-01 Amendment 1 was executed on June 1, 2022, Amendment 2 was executed on April 1, 2023, Amendment 3 was executed on April 24, 2024 and Amendment 4 was executed on July 19, 2024. All Contract Amendments modified pricing as permitted by section 3.4 Economic Pricing Adjustment, and Amendments 2 and 3 also exercised options to extend the term by one year each.

F. Under the authority of Administrative Code Section 21.16, the SFMTA now wishes to obtain the services of a qualified firm to procure 94 40-foot Hybrid Electric Coaches, and associated spare parts, special tools, manuals, training, and Telematics licenses, from Contractor

through the Washington State Cooperative Purchasing Schedule Master Contract No. 06719-01, as supplemented by the provisions of the Agreement.

G. The SFMTA has requested various optional features for the buses and has negotiated with Contractor the price for these features on a cost basis, in accordance with the Washington State contract. Contractor has also agreed to additional terms and conditions as consideration for this Agreement.

H. The SFMTA finds that this procurement is in the City's best interests.

I. Contractor represents and warrants that it is qualified to deliver the Goods required by City as set forth under this Agreement.

J. This Contract is primarily for Commodities and funded through Federal funds and, as such, deemed exempt from the Subcontracting Requirements of Chapter 14B of the San Francisco Administrative Code.

Now, THEREFORE, the parties agree as follows:

Article 1 Definitions

The following definitions apply to this Agreement:

1.1 "**Acceptance**" means the formal written acceptance by the City that all Goods and Services, or a specific portion thereof, under the Contract has been satisfactorily completed.

1.2 "**Agreement** or **Contract**" means this contract document, including all attached appendices, any future amendments, and all applicable City Ordinances and Mandatory City Requirements specifically incorporated into this Agreement by reference as provided herein.

1.3 "**Award**" means notification from the City to Contractor of acceptance of Contractor's Proposal, subject to the execution and approval of a satisfactory Contract and bond to secure the performance of the Contract, and to such other conditions as may be specified or otherwise required by law.

1.4 "**Buses**" or "**Coaches**" or "**Vehicles**" means the vehicles procured under this Contract.

1.5 "**CCO**" means the SFMTA Contract Compliance Office.

1.6 "**City**" or "**the City**" means the City and County of San Francisco, a municipal corporation, acting by and through its Municipal Transportation Agency.

1.7 "**City Data**" means that data as described in Article 14 of this Agreement which includes, without limitation, all data collected, used, maintained, processed, stored, or generated by or on behalf of the City in connection with this Agreement. City Data includes, without limitation, Confidential Information.

1.8 "**Conditional Acceptance**" means the circumstances in which a Bus has been delivered to the SFMTA and placed in revenue service despite not having met all requirements for Acceptance.

1.9 "**Confidential Information**" means confidential City information including, but not limited to, personally-identifiable information (PII), protected health information (PHI), or individual financial information (collectively, Proprietary or Confidential Information) that is subject to local, state or federal laws restricting the use and disclosure of such information, including, but not limited to, Article 1, Section 1 of the California Constitution; the California Information Practices Act (Civil Code § 1798 et seq.); the California Confidentiality of Medical Information Act (Civil Code § 56 et seq.); the federal Gramm-Leach-Bliley Act (15 U.S.C. §§ 6801(b) and 6805(b)(2)); the privacy and information security aspects of the Administrative Simplification provisions of the federal Health Insurance Portability and Accountability Act (45 CFR Part 160 and Subparts A, C, and E of part 164); and San Francisco Administrative Code Chapter 12M (Chapter 12M). Confidential Information includes, without limitation, City Data.

1.10 "**Conformed Contract Documents**" means the Contract documents, revised to incorporate information included in the Contractor's Proposal and accepted by the City.

1.11 "**Contract Administrator**" means the contract administrator assigned to the Contract by the SFMTA, or his or her designated agent.

1.12 "**Contract Modification**" means a written amendment to the Contract, agreed to by the City and Contractor, covering changes in the Conformed Contract Documents within the general scope of the Contract and establishing the basis of payment and time adjustments for the Goods and Services affected by the changes.

1.13 "**Contractor**" or "**Consultant**" means New Flyer of America Inc., located at 6200 Glenn Carlson Drive, St. Cloud, Minnesota 56301.

1.14 "**Controller**" means the Controller of the City.

1.15 "**Correction**" means the elimination of a Defect.

1.16 "**Day**" (whether or not capitalized) means a calendar day, unless otherwise designated.

1.17 "**Defect**" means any patent or latent malfunctions or failures in manufacture or design of any component or subsystem.

1.18 "**Deliverables**" mean Contractor's work product resulting from the Services provided by Contractor to City during the course of Contractor's performance of the Agreement, including without limitation, the work product described in the "Technical Specifications."

1.19 "**Director of Transportation**" means the Director of Transportation of the SFMTA or his or her designee.

1.20 "**Effective Date**" means the date upon which the City's Controller certifies the availability of funds for this Agreement as provided in Section 3.1.

1.21 "**Final Acceptance**" means the formal written Acceptance by the Director of Transportation or his or her designee that all Contract Deliverables for the Contract have been satisfactorily completed and accepted.

1.22 "**FTA**" means the Federal Transit Administration.

1.23 "**Goods**" or "**Commodities**" means the products, materials, equipment or supplies to be provided by Contractor under this Agreement.

1.24 "**Mandatory City Requirements**" means those City laws set forth in the San Francisco Municipal Code, including the duly authorized rules, regulations, and guidelines implementing such laws that impose specific duties and obligations upon Contractor.

1.25 "**Party**" and "**Parties**" mean the City and Contractor either collectively or individually.

1.26 "**Project Manager**" means the project manager assigned to the Contract for the SFMTA, or his or her designated agent.

1.27 "**Proposal**" means the technical and management information and prices submitted by Contractor to the City during the process of negotiating the Agreement.

1.28 "**Purchase Order**" means the written order issued by the City to the Contractor, authorizing the Effective Date as provided in Section 2.1.

1.29 **"Resident Inspector"** means any inspector or inspectors who may be assigned by the SFMTA Project Manager for the inspection of Goods to be provided under this Contract.

1.30 "**San Francisco Municipal Transportation Agency**" or "**SFMTA**" means the agency of City with jurisdiction over surface transportation in San Francisco, as provided under Article VIIIA of the City's Charter.

1.31 "**Services**" means the work performed by Contractor under this Agreement as specifically described in Appendix A, Washington State Cooperative Purchasing Schedule Master Contract No. 06719-01, Transit Buses: Heavy Duty, including all services, labor, supervision, materials, equipment, actions and other requirements to be performed and furnished by Contractor under this Agreement.

1.32 "**Subconsultant**", "**Subcontractor**" or "**Supplier**" means any firm under contract to the Contractor for services under this Agreement.

1.33 "**Technical Specifications**" means the specifications, provisions, and requirements that detail the Goods and the materials, products (including the assembly and testing), and other requirements relative to the manufacturing and construction of the Goods contained in the following documents:

- Appendix A: Exhibit A – Included Transit Buses (containing Solicitation Exhibit B-1 Specifications – Heavy Duty Bus)

- Appendix G: SFMTA's Technical Specifications
- Appendix H -- New Flyer Option Proposals Accepted by the SFMTA.

1.34 "**Working Days**" means those Days during which regular business is conducted, excluding Saturdays, Sundays, and all Federal, State, and municipal holidays that are observed by the SFMTA during the duration of the Contract.

Article 2 Term of the Agreement

2.1 The term of this Agreement shall commence on the Effective Date and expire five years later, unless earlier terminated as otherwise provided herein.

Article 3 Financial Matters

3.1 Certification of Funds; Budget and Fiscal Provisions; Termination in the Event of Non-Appropriation. This Agreement is subject to the budget and fiscal provisions of the City's Charter. Charges will accrue only after prior written authorization certified by the Controller in the form of a Purchase Order, and the amount of City's obligation hereunder shall not at any time exceed the amount certified for the purpose and period stated in such advance authorization. This Agreement will terminate without penalty, liability or expense of any kind to City at the end of any fiscal year if funds are not appropriated for the next succeeding fiscal year. If funds are appropriated for a portion of the fiscal year, this Agreement will terminate, without penalty, liability or expense of any kind at the end of the term for which funds are appropriated. City has no obligation to make appropriations for this Agreement in lieu of appropriations for new or other agreements. City budget decisions are subject to the discretion of the Mayor and the Board of Supervisors. Contractor's assumption of risk of possible non-appropriation is part of the consideration for this Agreement.

THIS SECTION CONTROLS AGAINST ANY AND ALL OTHER PROVISIONS OF THIS AGREEMENT.

3.2 Guaranteed Maximum Costs. The City's payment obligation to Contractor cannot at any time exceed the amount certified by City's Controller for the purpose and period stated in such certification. Absent an authorized Emergency per the City Charter or applicable Code, no City representative is authorized to offer or promise, nor is the City required to honor, any offered or promised payments to Contractor under this Agreement in excess of the certified maximum amount without the Controller having first certified the additional promised amount and the Parties having modified this Agreement as provided in Section 11.5 "Modification of this Agreement".

3.3 Compensation

3.3.1 Calculation of Charges. Contractor shall provide to the SFMTA an invoice pursuant to the Schedule set out in Appendix J (Payment Milestones). Compensation shall be made for Goods and Services identified in the invoice that the Director of Transportation, or his or her designee, in his or her sole discretion, concludes have been

satisfactorily delivered or performed. In no event shall the amount of this Agreement exceed One Hundred Seventeen Million, Seven Hundred Fifty-One Thousand, Three Hundred and Ninety-Eight Dollars ($**117,751,398**). The breakdown of charges associated with this Agreement appears in Appendix B, Calculation of Charges, Schedule 1 – Schedule of Prices. In no event shall City be liable for interest or late charges for any late payments. City will not honor minimum service order charges for any Services covered by this Agreement.

3.3.2 Progress Payments.

(a) Progress payments shall be conditioned on either (i) transfer of title, free of encumbrances, to the City for the portion of the components, equipment or material paid for by the progress payment, plus a certificate of insurance required by Section 5.1 of this Agreement; or (ii) issuance of a letter of credit in conformance with the provision of Section 4.8.3 in the amount of the progress payment. Progress payments for which a letter of credit shall be required are as follows: Milestone set forth in Item 1(a) in Appendix J (authorization of shipment) for each Vehicle.

(b) In lieu of a letter of credit to secure progress payments, Contractor may elect to increase its performance bond required under Section 4.8.1 of this Agreement by the amount of progress payments for the above milestone and any other items for which Contractor elects to submit security instead of transferring title. Such increase in the amount of the performance bond shall be included in the amount of the performance bond submitted at the time of Contract Award. This increase in the amount of the performance bond shall constitute security for all progress payments for which the bond is issued should Contractor default with respect to any provision of this Agreement. In lieu of an increase in the Performance Bond, an Advance Payment Bond, in a form acceptable to the City's Risk Manager, or other security acceptable to the City's Risk Manager, will also be accepted.

3.3.3 Retention. As described in Appendix J, the City will withhold 2% of the Vehicle amount as retention until Final Acceptance and conclusion of the Agreement. The City will not make price adjustments to this Contract to protect Contractor from economic inflation; however, the City will negotiate with Contractor adjustments to the price of the Coaches resulting from legislation or regulations that become effective after the date of this Contract that affects the price of the Buses.

3.3.4 Payment Limited to Satisfactory Services and Delivery of Goods. Contractor is not entitled to any payments from City until the SFMTA approves the Goods and Services delivered pursuant to this Agreement. Payments to Contractor by City shall not excuse Contractor from its obligation to replace unsatisfactory Goods and/or cure Services provided in an unsatisfactory manner, even if the unsatisfactory character may have been apparent or detected at the time such payment was made. Goods and Services delivered pursuant to this Agreement that do not conform to the requirements of this Agreement may be rejected by City and in such case must be replaced by Contractor without delay at no cost to the City.

3.3.5 Withhold Payments. If Contractor fails to provide Goods and Services in accordance with Contractor's obligations under this Agreement, the City may withhold any and all payments due Contractor until such failure to perform is cured. Contractor shall not stop providing Goods and Services as a result of City's withholding of payments, as provided herein.

3.3.6 Invoice Format. Invoices furnished by Contractor under this Agreement must be in a form acceptable to the City's Controller and the SFMTA, and include a unique invoice number and a specific invoice date. Payment shall be made by City as specified in Section 3.3.8, or in such alternate manner as the Parties have mutually agreed upon in writing.

All invoices must show:

- Relevant milestones;
- Purchase order number;
- Contract order number;
- Contract payment terms and contract price;
- Unit price;
- Quantity of items;
- Complete description of Goods delivered or Services performed;
- Total invoice amount;
- Supporting documentation and/or documentation referencing submittal or delivery;
- PeopleSoft Purchase Order ID Number;
- PeopleSoft Supplier Name and ID;
- Sales/use tax (if applicable).

Invoices that do not include all required information or contain inaccurate information may not be processed for payment.

3.3.7 Reserved. (SBE/DBE Payment and Utilization Tracking System)

3.3.8 Getting paid by the City for Goods and Services

(a) The City and County of San Francisco utilizes the Paymode-X® service offered by Bank of America Merrill Lynch to pay City contractors. Contractor must sign up to receive electronic payments to be paid under this Agreement. To sign up for electronic payments, visit http://portal.paymode.com/city_countyofsanfrancisco.

(b) At the option of the City, Contractor may be required to submit invoices directly in the City's financial and procurement system (PeopleSoft) via eSettlement. Refer to https://sfcitypartner.sfgov.org/pages/training.aspx for more information on eSettlement. For access to PeopleSoft eSettlement, submit a request through sfemployeeportalsupport@sfgov.org.

3.3.9 Grant Funded Contracts

(a) Disallowance. If Contractor requests or receives payment from City for Goods and Services, reimbursement for which is later disallowed by the State of

California or United States Government, Contractor shall promptly refund the disallowed amount to City upon City's request. At its option, City may offset the amount disallowed from any payment due or to become due to Contractor under this Agreement or any other agreement between Contractor and City.

(b) Grant Terms. The funding for this Agreement is provided in full or in part by a Federal or State Grant to the City. As part of the terms of receiving the funds, the City is required to incorporate some of the terms into this Agreement. The incorporated terms may be found in Appendix F, "Grant Terms." To the extent that any Grant Term is inconsistent with any other provisions of this Agreement such that Contractor is unable to comply with both the Grant Term and the other provision(s), the Grant Term shall apply.

(c) Subcontractors. Contractor shall insert each Grant Term into each lower tier subcontract. Contractor is responsible for compliance with the Grant Terms by any subcontractor, lower-tier subcontractor or service provider.

3.3.10 Payment Terms Grant Funded Contracts

(a) Payment Due Date: Unless the SFMTA notifies the Contractor that a dispute exists, Payment shall be made within 30 Days, measured from (1) the delivery and acceptance of Goods and/or the rendering of Services or (2) the date of receipt of the invoice, whichever is later. Payment is deemed to be made on the date on which City has issued a check to Contractor or, if Contractor has agreed to electronic payment, the date on which City has posted electronic payment to Contractor.

(b) Reserved (Payment Discount Terms)

3.4 Audit and Inspection of Records. Contractor agrees to maintain and make available to the City, during regular business hours, accurate books and accounting records relating to the Goods and Services. Contractor will permit City to audit, examine, copy, and make excerpts and transcripts from such books and records, and to make audits of all invoices, materials, payrolls, records or personnel and other data related to all other matters covered by this Agreement, whether funded in whole or in part under this Agreement. Contractor shall maintain such data and records in an accessible location and condition for a period of not less than five years, unless required for a longer duration due to Federal, State, or local requirements of which the City will notify Contractor in writing, after final payment under this Agreement or until after final audit has been resolved, whichever is later. The State of California or any Federal agency having an interest in the subject matter of this Agreement shall have the same rights as conferred upon City by this Section. Contractor shall include the same audit and inspection rights and record retention requirements in all subcontracts.

3.5 Submitting False Claims. The full text of San Francisco Administrative Code Chapter 21, Section 21.35, including the enforcement and penalty provisions, is incorporated into this Agreement. Pursuant to San Francisco Administrative Code §21.35, any contractor or subcontractor who submits a false claim shall be liable to the City for the statutory penalties set

forth in that section. A contractor or subcontractor will be deemed to have submitted a false claim to the City if the contractor or subcontractor: (a) knowingly presents or causes to be presented to an officer or employee of the City a false claim or request for payment or approval; (b) knowingly makes, uses, or causes to be made or used a false record or statement to get a false claim paid or approved by the City; (c) conspires to defraud the City by getting a false claim allowed or paid by the City; (d) knowingly makes, uses, or causes to be made or used a false record or statement to conceal, avoid, or decrease an obligation to pay or transmit money or property to the City; or (e) is a beneficiary of an inadvertent submission of a false claim to the City, subsequently discovers the falsity of the claim, and fails to disclose the false claim to the City within a reasonable time after discovery of the false claim.

3.6 Reserved. (Payment of Prevailing Wages)

3.7 Reserved. (Displaced Worker Protection Act)

Article 4 Goods and Services

4.1 Reserved. (Primary and Secondary Contractors)

4.2 Reserved. (Term Agreement – Indefinite Quantities)

4.3 Personnel

4.3.1 Qualified Personnel. Contractor shall utilize only competent personnel under the supervision of, and in the employment of, Contractor (or Contractor's authorized subcontractors) to perform the Services. Contractor will comply with City's reasonable requests regarding assignment and/or removal of personnel, but all personnel, including those assigned at City's request, must be supervised by Contractor. Contractor shall commit adequate resources to allow timely completion within the project schedule specified in this Agreement.

4.4 Goods. The Goods to be provided under this contract are described in the pricing sheets in Appendix B, and are further defined in Washington State Cooperative Purchasing Schedule Master Contract No. 06719-01, which is incorporated into this Agreement through Appendix A, SFMTA's Technical Specifications in Appendix G, and the New Flyer Proposal & Options Accepted by the SFMTA in Appendix H. This Agreement is subject to the terms and conditions of Washington State Master Contract No. 06719-01, and is intended to supplement, but not change or otherwise modify the terms and conditions set forth in Appendix A. All Goods provided by the Contractor shall conform with the Technical Specifications in Appendix A as supplemented by Appendices G and H, and shall be delivered according to the Project Delivery Schedule (Appendix I). Officers and employees of the City are not authorized to request, and the City is not required to reimburse the Contractor for, Goods beyond the Goods described in Appendix B and the Technical Specifications unless the Contract is modified as provided in Section 11.5 (Modification of this Agreement).

4.4.1 Spare Parts. The total Contract amount includes an allowance of $3,000,000 for spare parts, as per Schedule 1 of Appendix B. The City may choose to purchase

spare parts from the Contractor at its sole discretion from the list of spare parts included in Schedule 1A of Appendix B. The City reserves the right to purchase spare parts that are not included in Schedule 1A from the Contractor at prices negotiated based on costs. The prices for spare parts listed in Schedule 1A shall be valid for at least two years from the Effective Date. Spare parts shall be delivered within 120 Days after the SFMTA provides written notice of intent to acquire the specified parts.

4.4.2 Special Tools. The total Contract amount includes an allowance of $1,000,000 for special tools, as per Schedule 1 of Appendix B. The City may choose to purchase special tools from the Contractor at its sole discretion from the list of special tools included in Schedule 1B of Appendix B. The City reserves the right to purchase special tools that are not included in Schedule 1B from the Contractor at prices negotiated based on costs. The prices for special tools listed in Schedule 1B shall be valid for at least two years from the Effective Date.

4.4.3 Place of Manufacture. No article furnished hereunder shall have been made in prison or by convict labor, except Goods purchased for use by City's detention facilities. The SFMTA may require Contractor to provide within 7 business days from the date they are requested to do so, information and documentation requested by Purchaser, including but not limited to: sources of supply, distribution, dealership or agency agreements and authorizations from manufacturer(s) they claim to represent, lines of credit with financial institutions for manufacturer(s) they claim to represent, lines of credit with financial institutions and suppliers, numbers of employees, trade references and any other information to determine the Contractor's fitness to supply the Agreement requirements.

4.4.4 Electrical Products. Goods must comply with all applicable laws, ordinances and other legal requirements, including (among others) the Cal-OSHA regulations in Title 8 of the Code of Regulations and, for electrical products, Sections 110.2 and 110.3 (B) of the S.F. Electrical Code.

4.4.5 Condition of Goods. Goods offered and furnished must be new and previously unused, and of manufacturer's latest model, unless otherwise specified herein. Contractor shall establish quality control measures, as applicable to department's operations, and promptly provide documented reports to City of any product defects or premature failures.

4.4.6 Inspection. All Goods supplied shall be subject to inspection and acceptance or rejection by any department official responsible for inspection. Non-conforming or rejected Goods may be subject to reasonable storage fees.

4.4.7 F.O.B. Goods shall be shipped Freight on Board, to any destination named in a Purchase Order issued by City against this Agreement. *The cost of shipment must be incorporated into the offered unit costs.*

4.4.8 Failure to Deliver. If Contractor fails to deliver Goods of the quality, in the manner or within the time called for by this Agreement, such Goods may be bought from any **source** by the SFMTA. If City is required to pay a price that exceeds the price agreed upon by

this Agreement, the excess price will be charged to and collected from Contractor (or sureties on its bond, if bond has been required); or, the City may terminate the Agreement for default; or, the City may return deliveries already made and receive a refund.

4.4.9 Safety Data Sheets. Where required by law or by City, Contractor will include Safety Data Sheets (SDSs) with delivery for applicable items. Failure to include the SDSs for such items will constitute a material breach of contract and may result in refusal to accept delivery.

4.4.10 Awarded Goods. If during the term of the Agreement, a contract item is determined to be unacceptable for a particular use, and such is documented by the SFMTA, it is understood and agreed that the item will be canceled and removed from the Agreement without penalty to the City. The City's sole obligation to the supplier is payment of deliveries made prior to the cancellation date. City shall give the supplier ten Days' notice prior to any cancellation. The City will purchase the required replacement item from any source and in the manner as determined by the SFMTA. If a contracted item has been discontinued by the manufacturer or is deemed temporarily unavailable, it will be the responsibility of the Contractor to search the marketplace and find an acceptable equal substitute in the time required for delivery and at the Agreement price. Contractor must notify the SFMTA in writing, which can include email, certified mail, registered mail, or other trackable mail, of any changes in the description of article, brand, product code or packaging. Any changes made without the approval of City will constitute a Default.

4.4.11 Warranty. Contractor warrants to City that the manufacturer's warranty and service will be passed on to the City at the time of delivery.

4.5 Services

4.5.1 Services Contractor Agrees to Perform. Contractor agrees to perform the Services stated in Appendix A. Officers and employees of the City are not authorized to request, and the City is not required to reimburse the Contractor for, Services beyond the Services listed in Appendix A, unless Appendix A is modified as provided in Section 11.5, "Modification of this Agreement."

4.5.2 Subcontracting. Contractor may subcontract portions of the Services only upon prior written approval of City. Contractor is responsible for its subcontractors throughout the course of the work required to perform the Services. All Subcontracts must incorporate the terms of Article 10 "Additional Requirements Incorporated by Reference" of this Agreement, unless inapplicable. Neither Party shall, on the basis of this Agreement, contract on behalf of, or in the name of, the other Party. Any agreement made in violation of this provision shall be null and void.

4.5.3 Awarded Services. If, during the term of the Agreement, a contract service is determined to be unacceptable for a particular department, and such is documented by the SFMTA, it is understood and agreed that the service will be canceled and removed from the

Agreement without penalty to City. City's sole obligation to Contractor is payment for Services performed prior to the cancellation date. City shall give Contractor ten days' notice prior to any cancellation. City will contract for the required service from any source and in the manner as determined by the SFMTA. Contractor must notify the SFMTA in writing, which can include email, certified mail, registered mail, or other trackable mail, 30 days in advance of any changes in the Services required in the Agreement. Any changes made without the approval of the SFMTA will constitute a Default.

4.5.4 Independent Contractor; Payment of Employment Taxes and Other Expenses

(a) Independent Contractor. For the purposes of this Section 4.5, "Contractor" shall be deemed to include not only Contractor, but also any agent or employee of Contractor. Contractor acknowledges and agrees that at all times, Contractor or any agent or employee of Contractor shall be deemed at all times to be an independent contractor and is wholly responsible for the manner in which it delivers the Goods and Services required by this Agreement and work requested by City under this Agreement. Contractor, its agents, and employees will not represent or hold themselves out to be employees of the City at any time. Contractor or any agent or employee of Contractor shall not have employee status with City, nor be entitled to participate in any plans, arrangements, or distributions by City pertaining to or in connection with any retirement, health or other benefits that City may offer its employees. Contractor or any agent or employee of Contractor is liable for the acts and omissions of itself, its employees and its agents. Contractor shall be responsible for all obligations and payments, whether imposed by federal, state or local law, including, but not limited to, FICA, income tax withholdings, unemployment compensation, insurance, and other similar responsibilities related to Contractor's performing any of the obligations pursuant to this Agreement, or any agent or employee of Contractor providing same. Nothing in this Agreement shall be construed as creating an employment or agency relationship between City and Contractor or any agent or employee of Contractor. Any terms in this Agreement referring to direction from City shall be construed as providing for direction as to policy and the result of Contractor's work only, and not as to the means by which such a result is obtained. City does not retain the right to control the means or the method by which Contractor performs work under this Agreement. Contractor agrees to maintain and make available to City, upon request and during regular business hours, accurate books and accounting records demonstrating Contractor's compliance with this section. Should City determine that Contractor, or any agent or employee of Contractor, is not performing in accordance with the requirements of this Agreement, City shall provide Contractor with written notice of such failure. Within five (5) business days of Contractor's receipt of such notice, and in accordance with Contractor policy and procedure, Contractor shall remedy the deficiency. Notwithstanding, if City believes that an action of Contractor, or any agent or employee of Contractor, warrants immediate remedial action by Contractor, City shall contact Contractor and provide Contractor in writing with the reason for requesting such immediate action.

(b) Payment of Employment Taxes and Other Expenses. Should City, in its discretion, or a relevant taxing authority such as the Internal Revenue Service or the State Employment Development Division, or both, determine that Contractor is an employee for purposes of collection of any employment taxes, the amounts payable under this Agreement shall be reduced by amounts equal to both the employee and employer portions of the tax due (and offsetting any credits for amounts already paid by Contractor which can be applied against this liability). City shall then forward those amounts to the relevant taxing authority. Should a relevant taxing authority determine a liability for past Services performed by Contractor for City, upon notification of such fact by City, Contractor shall promptly remit such amount due or arrange with City to have the amount due withheld from future payments to Contractor under this Agreement (again, offsetting any amounts already paid by Contractor which can be applied as a credit against such liability). A determination of employment status pursuant to this Section 4.5 shall be solely limited to the purposes of the particular tax in question, and for all other purposes of this Agreement, Contractor shall not be considered an employee of City. Notwithstanding the foregoing, Contractor agrees to indemnify and hold harmless City and its officers, agents and employees from, and, if requested, shall defend them against any and all claims, losses, costs, damages, and expenses, including attorneys' fees, arising from this section.

4.6 Assignment. The Services to be performed by Contractor are personal in character. Neither this Agreement, nor any duties or obligations hereunder, may be directly or indirectly assigned, novated, hypothecated, transferred, or delegated by Contractor, or, where the Contractor is a joint venture, a joint venture partner (collectively referred to as an Assignment), unless first approved by City by written instrument executed and approved in the same manner as this Agreement in accordance with the Administrative Code. The City's approval of any such Assignment is subject to the Contractor demonstrating to City's reasonable satisfaction that the proposed transferee is: (a) reputable and capable, financially and otherwise, of performing each of Contractor's obligations under this Agreement and any other documents to be assigned, (b) not forbidden by applicable law from transacting business or entering into contracts with City; and (c) subject to the jurisdiction of the courts of the State of California. A change of ownership or control of Contractor or a sale or transfer of substantially all of the assets of Contractor shall be deemed an Assignment for purposes of this Agreement. Contractor shall immediately notify City about any Assignment. Any purported Assignment made in violation of this provision shall be null and void.

4.7 Liquidated Damages. By entering into this Agreement, Contractor agrees that in the event the delivery of the Goods are delayed beyond the delivery schedule stated in Appendix I of this Agreement, City will suffer actual damages that will be impractical or extremely difficult to determine. City may deduct a sum representing the liquidated damages from any money due to Contractor under this Agreement or any other contract between City and Contractor. Such deductions shall not be considered a penalty, but rather agreed upon monetary damages sustained by City because of Contractor's failure to furnish deliverables to City within the time fixed or such extensions of time permitted in writing by City. By entering into this

Agreement, the Contractor agrees that in the event deliveries are not completed within the number of days indicated in Appendix I, and in the Technical Specifications or if Contractor fails to correct fleet defects in accordance with Technical Specifications as may be revised by Contract Modifications, City will suffer damages that will be impracticable or extremely difficult to determine; further, Contractor agrees that the amounts listed below for each day of delay beyond scheduled milestones and timelines are not a penalty, but are a reasonable estimate of the loss that City will incur based on the delay, established in light of the circumstances existing at the time this contract was awarded. Except where the delay is the result of an Unavoidable Delay, City may deduct a sum representing the liquidated damages from any money due to Contractor. Such deductions shall not be considered a penalty, but rather agreed monetary damages sustained by City because of Contractor's failure to deliver to City within the time fixed or such extensions of time permitted in writing by the SFMTA. Liquidated damages imposed under this Agreement shall be in addition to any other damages that are recoverable by the City specified elsewhere in the Contract.

Item No.	Milestone	Amount Per Day
1.	Delivery of Pilot Coach	$400
2.	Submittal of Training Lesson Plans	$200
3.	Submittal of Draft Operation, Maintenance, and Parts Manual	$200
4.	Delivery of 1st Production Coach	$400
5.	Delivery of Last Production Coach	$400
6.	Spare Parts Delivery	$400
7.	Delivery of Special Tools	$400
8.	Submittal of Final Operation, Maintenance, and Parts Manuals	$200
9.	Contractor-Supplied Parts	2%*

* 2% per day of Contractor's list price for every Day a part is past the 72-hour delivery time (see Technical Specifications, Section 10.2.2.2).

4.8 Performance and Payment Security. The following provisions set forth financial guarantees that must be met by Contractor. Contractor may choose to meet the requirements of this Section by obtaining either the required bonds or an irrevocable letter of credit (Letter of Credit) in an equivalent amount.

4.8.1 Bonds.

(a) Within 20 days following the receipt of a notice of tentative award of contract, and until completion of all Contract obligations and Acceptance by City of the final Vehicle, the Contractor shall furnish to City a performance and a labor and materials bond each in an amount not less than 6 Million dollars ($6,000.000.00) to guarantee Contractor's faithful performance of all obligations of the Contract, including warranty obligations in existence until the last Vehicle is Accepted, and to guarantee Contractor 's payment to all suppliers of labor and materials under this Contract, excluding the period covered by the warranty bond described in Subsection (c) below.

(b) Once after the City fully accepts the last Vehicle, the City will issue a letter releasing the obligations of the surety under the performance and labor and materials bonds, provided that all Deliverables have been performed and Accepted and a warranty bond or letter of credit meeting the requirements of Section 4.8.3 is in place. The original bond document(s) shall be retained by the City.

(c) Contractor shall provide a two-year warranty or guaranty bond in the amount of 3 Million dollars ($3,000,000.00) covering all of Contractor's warranty obligations under the Contract, which bond shall become effective upon release of the Performance Bond under subsection b. above. At City's election, and subject to approval of the surety issuing the bond, Contractor shall provide for up to two one-year extensions or renewals of the warranty or guaranty bond at an amount approved by the SFMTA and the City's Risk Manager. If the original surety declines to extend or renew the initial bond, Contractor shall in good faith try to obtain the required additional coverage from another surety and shall document to the City its efforts in this regard. At the expiration of the warranty bond, the City will release it in the same manner as it releases the performance and labor and materials bonds (see Subsection (b) above).

4.8.2 Requirements for Bonds.

(a) Bonding entities on the above bonds must be legally authorized to engage in the business of furnishing performance bonds in the State of California. All bonding entities must be satisfactory to the SFMTA and to the Controller and Risk Manager of the City.

(b) During the period covered by the Agreement, if any of the sureties upon the bond shall have an AM Best rating that falls below A-, VIII, or become insolvent and unable to pay promptly the amount of such bond to the extent to which the surety might be liable, Contractor, within 30 days after notice given by the SFMTA to Contractor, shall by supplemental bond or otherwise, substitute another and sufficient surety approved by SFMTA in place of the surety becoming insolvent or unable to pay. If Contractor fails within such 30-day period to substitute another and sufficient surety, Contractor, if the SFMTA so elects, shall be deemed to be in default in the performance of its obligations hereunder and upon the said bond. The City, in addition to any and all other remedies, may terminate the Agreement or bring any

proper suit or proceeding against moneys then due or which thereafter may become due Contractor under the Agreement. The amount for which the surety shall have justified on the bond and the moneys so deducted shall be held by City as collateral for the performance of the conditions of the bond.

4.8.3 Requirements for Letter of Credit.

(a) General Requirements. Any Letter of Credit submitted as required security under this Agreement shall be a confirmed, clean, irrevocable Letter of Credit in favor of the City and County of San Francisco, a municipal corporation. It must have an original term of one year, with automatic renewals of the full amount (subject to modification to reflect the adjustments set forth above in Section 4.8.1) throughout the term of the Agreement and throughout the performance of Contractor's obligations under the Agreement. If Contractor fails to deliver the Letter of Credit as required, City will be entitled to cancel this Agreement. The Letter of Credit must provide that payment of its entire face amount, or any portion thereof, will be made to City upon presentation of a written demand to the bank signed by the Director of Transportation on behalf of the City.

(b) Financial Institution. The Letter of Credit must be issued on a form and issued by a financial institution acceptable to the City in its sole discretion, which financial institution must (i) be a bank or trust company doing business and having an office in the City and County of San Francisco, (ii) have a combined capital and surplus of at least $25,000,000, and (iii) be subject to supervision or examination by federal or state authority and with at least a Moody's A rating. Should the financial institution fail to maintain such rating, Contractor shall replace the Letter of Credit within 30 days with a Letter of Credit from a financial institution with such a rating.

(c) Demand on Letter of Credit. The Letter of Credit will constitute a security deposit guaranteeing faithful performance by Contractor of all terms, covenants, and conditions of this Agreement, including all monetary obligations set forth herein. If Contractor defaults with respect to any provision of this Agreement, the SFMTA may make a demand under the Letter of Credit for all or any portion thereof to compensate City for any loss or damage that they may have incurred by reason of Contractor's default, negligence, breach or dishonesty. Such loss or damage may include without limitation any damage to or restoration of City property or property that is required to be constructed, maintained or repaired pursuant to this Agreement, payments to City, and claims for liquidated damages; provided, however, that City will present its written demand to said bank for payment under said Letter of Credit only after City first has made its demand for payment directly to Contractor, and five full Working Days have elapsed without Contractor having made payment to City. Should the City terminate this Agreement due to a breach by Contractor, the City shall have the right to draw from the Letter of Credit those amounts necessary to pay any fees or other financial obligations under the Agreement and perform the Goods and deliver the Services described in this Agreement until such time as the City procures another contractor and the agreement between the City and that contractor

becomes effective. City need not terminate this Agreement in order to receive compensation for its damages. If any portion of the Letter of Credit is so used or applied by City, Contractor, within 10 Working Days after written demand by City, shall reinstate the Letter of Credit to its original amount; Contractor's failure to do so will be a material breach of this Agreement.

(d) Expiration or Termination. The Letter of Credit must provide for 60 days notice to City in the event of non-extension of the Letter of Credit; in that event, Contractor shall replace the Letter of Credit at least 10 Working Days prior to its expiration. In the event the City receives notice from the issuer of the Letter of Credit that the Letter of Credit will be terminated, not renewed or will otherwise be allowed to expire for any reason during the period from the commencement of the term of this Agreement to 90 Days after the expiration or termination of this Agreement, or the conclusion of all of Contractor's obligations under the Agreement, whichever occurs last, and Contractor fails to provide the City with a replacement Letter of Credit (in a form and issued by a financial institution acceptable to the City) within 10 Working Days following the City's receipt of such notice, such occurrence shall be an event of default, and, in addition to any other remedies the City may have due to such default (including the right to terminate this Agreement), the City shall be entitled to draw down the entire amount of the Letter of Credit (or any portion thereof) and hold such funds in an account with the City Treasurer in the form of cash guarantying Contractor's obligations under this Agreement. In such event, the cash shall accrue interest to the Contractor at a rate equal to the average yield of Treasury Notes with one-year maturity, as determined by the Treasurer. In the event the Letter of Credit is converted into cash pursuant to this paragraph, upon termination of this Agreement, Contractor shall be entitled to a full refund of the cash (less any demands made thereon by the City) within 90 Days of the termination date, including interest accrued through the termination date.

(e) Return of Letter of Credit. The Letter of Credit will be returned within 90 Days after the end of the term of this Agreement, provided that Contractor has faithfully performed throughout the life of the Agreement, Contractor has completed its obligations under the Agreement, there are no pending claims involving Contractor's performance under the Agreement and no outstanding disagreement about any material aspect of the provisions of this Agreement. In the event this Agreement is assigned, as provided for in Section 4.6, City will return or release the Letter of Credit not later than the effective date of the assignment, provided that the assignee has delivered to the City an equivalent Letter of Credit, as determined by City.

(f) Excessive Demand. If City receives any payments from the aforementioned bank under the Letter of Credit by reason of having made a wrongful or excessive demand for payment, City will return to Contractor the amount by which City's total receipts from Contractor and from the bank under the Letter of Credit exceeds the amount to which City is rightfully entitled, together with interest thereon at the legal rate of interest, but City will not otherwise be liable to Contractor for any damages or penalties.

4.9 Reserved. (Fidelity Bond)

4.10 Emergency - Priority 1 Service. In case of an emergency that affects any part of the San Francisco Bay Area, Contractor will give the City and County of San Francisco Priority 1 service with regard to the Goods and Services procured under this Agreement unless preempted by State and/or Federal laws. Contractor will make every good faith effort in attempting to deliver products using all modes of transportation available. Contractor shall provide a telephone number of a company representative who is able to receive and process orders for immediate delivery or will call in the event of an emergency. In addition, the Contractor shall charge fair and competitive prices for Goods and Services ordered during an emergency and not covered under the awarded Agreement.

4.11 Usage Reports by Contractor

4.11.1 Each year, no later than February 15, Contractor shall prepare and submit to the SFMTA an electronic report of the total Goods delivered and/or Services rendered under this Agreement during the preceding calendar year (January 1 – December 31). The report must list the following: (1) all Goods and Services ordered (Order) (2) all Goods and Services delivered; (3) the date on which each Order was placed; (4) the date on which each Order was delivered; and (5) total quantity and unit price of the Goods and/or Services contained within each Order.

4.11.2 City reserves the right to terminate this Agreement if information requested from and submitted by Contractor fails to satisfy City and/or Contractor is unable to provide the information and/or documentation within the period requested.

Article 5 Insurance and Indemnity

5.1 Insurance

5.1.1 Required Coverages. Without in any way limiting Contractor's liability pursuant to the "Indemnification" section of this Agreement, Contractor must maintain in force, during the full term of the Agreement, insurance in the following amounts and coverages:

(a) Commercial General Liability Insurance with limits not less than $5,000,000 each occurrence for Bodily Injury and Property Damage, including Contractual Liability, Personal Injury, Products and Completed Operations.

(b) Comprehensive or Business Automobile (Transit Coach, Truck, and other vehicles included) Liability Insurance with limits not less than $5,000,000 each occurrence, "Combined Single Limit" for Bodily Injury and Property Damage, including Owned, Non-Owned and Hired auto coverage, as applicable.

(c) Workers' Compensation, in statutory amounts, with Employers' Liability Limits not less than $1,000,000 each accident, injury, or illness.

(d) Reserved. (Professional Liability Insurance)

(e) Reserved. (Technology Errors and Omissions Liability Insurance)

(f) Reserved (Cyber and Privacy Coverage)

(g) Reserved. (Pollution Liability Insurance)

(h) During the course of this Agreement, should any Vehicles already Accepted by City, and in which title is vested in the City, be returned to Contractor for any reason, Contractor shall maintain, with respect to such vehicles, Garagekeepers' Legal Liability Insurance with limits not less than 100 percent of the value of City Vehicles and equipment in Contractor's care, custody, or control, including coverage's for fire, theft, riot and civil commotion, vandalism or malicious mischief, and collision; all-risk transportation insurance for the full value of all City-owned coaches in transit between Contractor and City premises; and any loss payable to the City as its interest may appear.

(i) During the course of this Agreement, as title to components or Coaches is transferred to City (refer to Section 3.3.2), Contractor shall provide property insurance on such components against all risks of loss or damage for 100% of their replacement value, including City as a named insured and loss payee, as its interests may appear, and any deductible not to exceed $25,000 each loss.

5.1.2 Additional Insured Endorsements

(a) The Commercial General Liability policy must be endorsed to name as Additional Insured the City and County of San Francisco, its Officers, Agents, and Employees.

(b) The Automobile Liability Insurance policy must be endorsed to name as Additional Insured the City and County of San Francisco, its Officers, Agents, and Employees.

(c) Reserved. (Pollution Auto Liability Insurance Additional Insured Endorsement)

5.1.3 Waiver of Subrogation Endorsements

(a) The Workers' Compensation policy(ies) shall be endorsed with a waiver of subrogation in favor of the City for all work performed by the Contractor, its employees, agents and subcontractors.

5.1.4 Primary Insurance Endorsements

(a) The Commercial General Liability policy shall provide that such policies are primary insurance to any other insurance available to the Additional Insureds, with respect to any claims arising out of this Agreement, and that the insurance applies separately to each insured against whom claim is made or suit is brought.

(b) The Automobile Liability Insurance policy shall provide that such policies are primary insurance to any other insurance available to the Additional Insureds, with

respect to any claims arising out of this Agreement, and that the insurance applies separately to each insured against whom claim is made or suit is brought.

(c) Reserved. (Pollution Liability Insurance Primary Insurance Endorsement)

5.1.5 Other Insurance Requirements

(a) Thirty Days' advance written notice shall be provided to the City of cancellation, intended non-renewal, or reduction in coverages, except for non-payment for which no less than 10 Days' notice shall be provided to City. Notices shall be sent to the City address set forth in Section 11.1 (Notices to the Parties). All notices, certificates and endorsements shall include the SFMTA contract number and title on the cover page.

(b) Should any of the required insurance be provided under a claims-made form, Contractor shall maintain such coverage continuously throughout the term of this Agreement and, without lapse, for a period of three years beyond the expiration of this Agreement, to the effect that, should occurrences during the Agreement term give rise to claims made after expiration of the Agreement, such claims shall be covered by such claims-made policies.

(c) Should any of the required insurance be provided under a form of coverage that includes a general annual aggregate limit or provides that claims investigation or legal defense costs be included in such general annual aggregate limit, such general annual aggregate limit shall be double the occurrence or claims limits specified above.

(d) Should any required insurance lapse during the term of this Agreement, requests for payments originating after such lapse shall not be processed until the City receives satisfactory evidence of reinstated coverage as required by this Agreement, effective as of the lapse date. If insurance is not reinstated, the City may, at its sole option, terminate this Agreement effective on the date of such lapse of insurance.

(e) Before delivering any Goods and/or commencing any Services, Contractor shall furnish to City certificates of insurance and additional insured policy endorsements with insurers with ratings comparable to A-, VIII or higher, that are authorized to do business in the State of California, and that are satisfactory to City, in form evidencing all coverages set forth above. Approval of the insurance by City shall not relieve or decrease Contractor's liability hereunder.

(f) If Contractor will use any subcontractor(s) to deliver Goods and/or provide Services, Contractor shall require the subcontractor(s) to provide all necessary insurance and to name the City and County of San Francisco, its officers, agents and employees and the Contractor as additional insureds.

5.2 Indemnification

5.2.1 Contractor shall indemnify and hold harmless City and its officers, agents and employees from, and, if requested, shall defend them from and against any and all claims, demands, losses, damages, costs, expenses, and liability (legal, contractual, or otherwise) arising from or in any way connected with any: (i) injury to or death of a person, including employees of City or Contractor; (ii) loss of or damage to property; (iii) violation of local, state, or federal common law, statute or regulation, including but not limited to privacy or personally identifiable information, health information, disability and labor laws or regulations; (iv) strict liability imposed by any law or regulation; or (v) losses arising from Contractor's execution of subcontracts not in accordance with the requirements of this Agreement applicable to subcontractors; so long as such injury, violation, loss, or strict liability (as set forth in subsections (i) – (v) above) arises directly or indirectly from Contractor's performance of this Agreement, including, but not limited to, Contractor's use of facilities or equipment provided by City or others, regardless of the negligence of, and regardless of whether liability without fault is imposed or sought to be imposed on City, except to the extent that such indemnity is void or otherwise unenforceable under applicable law, and except where such loss, damage, injury, liability or claim is the result of the active negligence or willful misconduct of City and is not contributed to by any act of, or by any omission to perform some duty imposed by law or agreement on Contractor, its subcontractors, or either's agent or employee. The foregoing indemnity shall include, without limitation, reasonable fees of attorneys, consultants and experts and related costs and City's costs of investigating any claims against the City.

5.2.2 In addition to Contractor's obligation to indemnify City, Contractor specifically acknowledges and agrees that it has an immediate and independent obligation to defend City from any claim which actually or potentially falls within this indemnification provision, even if the allegations are or may be groundless, false or fraudulent, which obligation arises at the time such claim is tendered to Contractor by City and continues at all times thereafter.

5.2.3 Contractor shall indemnify and hold City harmless from all loss and liability, including attorneys' fees, court costs and all other litigation expenses for any infringement of the patent rights, copyright, trade secret or any other proprietary right or trademark, and all other intellectual property claims of any person or persons arising directly or indirectly from the receipt by City, or any of its officers or agents, of Contractor's Services and/or delivery of Goods pursuant to this Agreement.

Article 6 Liability of the Parties

6.1 Liability of City. CITY'S PAYMENT OBLIGATIONS UNDER THIS AGREEMENT SHALL BE LIMITED TO THE PAYMENT OF THE COMPENSATION PROVIDED FOR IN SECTION 3.3, "COMPENSATION," OF THIS AGREEMENT. NOTWITHSTANDING ANY OTHER PROVISION OF THIS AGREEMENT, IN NO EVENT SHALL CITY BE LIABLE, REGARDLESS OF WHETHER ANY CLAIM IS BASED ON CONTRACT OR TORT, FOR ANY SPECIAL, CONSEQUENTIAL, INDIRECT OR

INCIDENTAL DAMAGES, INCLUDING, BUT NOT LIMITED TO, LOST PROFITS, ARISING OUT OF OR IN CONNECTION WITH THIS AGREEMENT OR GOODS DELIVERED OR THE SERVICES PERFORMED IN CONNECTION WITH THIS AGREEMENT

6.2 Liability for Use of Equipment. City shall not be liable for any damage to persons or property as a result of the use, misuse or failure of any equipment used by Contractor, or any of its subcontractors, or by any of their employees, even though such equipment is furnished, rented or loaned by City.

6.3 Liability for Incidental and Consequential Damages. Contractor shall be responsible for incidental and consequential damages resulting in whole or in part from Contractor's acts or omissions.

Article 7 Payment of Taxes

7.1 Contractor to Pay All Taxes. Except for any applicable California sales and use taxes charged by Contractor to City, Contractor shall pay all taxes, including possessory interest taxes levied upon or as a result of this Agreement, or the Goods and Services delivered pursuant hereto. Contractor shall remit to the State of California any sales or use taxes paid by City to Contractor under this Agreement. Contractor agrees to promptly provide information requested by the City to verify Contractor's compliance with any State requirements for reporting sales and use tax paid by City under this Agreement.

7.2 Possessory Interest Taxes. Contractor acknowledges that this Agreement may create a "possessory interest" for property tax purposes. Generally, such a possessory interest is not created unless the Agreement entitles the Contractor to possession, occupancy, or use of City property for private gain. If such a possessory interest is created, then the following shall apply:

7.2.1 Contractor, on behalf of itself and any permitted successors and assigns, recognizes and understands that Contractor, and any permitted successors and assigns, may be subject to real property tax assessments on the possessory interest.

7.2.2 Contractor, on behalf of itself and any permitted successors and assigns, recognizes and understands that the creation, extension, renewal, or assignment of this Agreement may result in a "change in ownership" for purposes of real property taxes, and therefore may result in a revaluation of any possessory interest created by this Agreement. Contractor accordingly agrees on behalf of itself and its permitted successors and assigns to report on behalf of the City to the County Assessor the information required by Revenue and Taxation Code Section 480.5, as amended from time to time, and any successor provision.

7.2.3 Contractor, on behalf of itself and any permitted successors and assigns, recognizes and understands that other events also may cause a change of ownership of the possessory interest and result in the revaluation of the possessory interest. (see, e.g., Rev. & Tax. Code Section 64, as amended from time to time). Contractor accordingly agrees on behalf of

itself and its permitted successors and assigns to report any change in ownership to the County Assessor, the State Board of Equalization or other public agency as required by law.

7.2.4 Contractor further agrees to provide such other information as may be requested by the City to enable the City to comply with any reporting requirements for possessory interests that are imposed by applicable law.

7.3 Withholding. Contractor agrees that it is obligated to pay all amounts due to the City under the San Francisco Business and Tax Regulations Code during the term of this Agreement. Pursuant to Section 6.10-2 of the San Francisco Business and Tax Regulations Code, Contractor further acknowledges and agrees that City may withhold any payments due to Contractor under this Agreement if Contractor is delinquent in the payment of any amount required to be paid to the City under the San Francisco Business and Tax Regulations Code. Any payments withheld under this paragraph shall be made to Contractor, without interest, upon Contractor coming back into compliance with its obligations.

Article 8 Termination and Default

8.1 Termination for Convenience

8.1.1 City shall have the option, in its sole discretion, to terminate this Agreement, at any time during the term hereof, for convenience and without cause. City shall exercise this option by giving Contractor written notice of termination. The notice shall specify the date on which termination shall become effective.

8.1.2 Upon receipt of the notice of termination, Contractor shall commence and perform, with diligence, all actions necessary on the part of Contractor to effect the termination of this Agreement on the date specified by City and to minimize the liability of Contractor and City to third parties as a result of termination. All such actions shall be subject to the prior approval of City. Such actions may include any or all of the following, without limitation:

(a) Halting the performance of all obligations under this Agreement on the date(s) and in the manner specified by the SFMTA.

(b) Terminating all existing orders and subcontracts, and not placing any further orders or subcontracts for Goods, materials, Services, equipment or other items.

(c) At the SFMTA's direction, assigning to City any or all of Contractor's right, title, and interest under the orders and subcontracts terminated. Upon such assignment, the SFMTA shall have the right, in its sole discretion, to settle or pay any or all claims arising out of the termination of such orders and subcontracts.

(d) Subject to the SFMTA's approval, settling all outstanding liabilities and all claims arising out of the termination of orders and subcontracts.

(e) Completing performance of any obligations that the SFMTA designates to be completed prior to the date of termination specified by the SFMTA.

(f) Taking such action as may be necessary, or as the SFMTA may direct, for the protection and preservation of any property related to this Agreement which is in the possession of Contractor and in which the SFMTA has or may acquire an interest.

8.1.3 Within 30 Days after the specified termination date, Contractor shall submit to the SFMTA an invoice, which shall set forth each of the following as a separate line item:

(a) The reasonable cost to Contractor, without profit, for all Services provided and all Goods ordered prior to the Termination Date, for which City has not already made payment. Reasonable costs may include a reasonable allowance for actual overhead, not to exceed a total of ten percent (10%) of Contractor's direct costs for Services. Any overhead allowance shall be separately itemized. Contractor may also recover the reasonable cost of preparing the invoice.

(b) A reasonable allowance for profit on the cost of the Services described in the immediately preceding subsection (a), provided that Contractor can establish, to the satisfaction of City, that Contractor would have made a profit had all Services under this Agreement been completed, and provided further, that the profit allowed shall in no event exceed five percent (5%) of such cost.

(c) The reasonable cost to Contractor of handling and returning material or equipment delivered to City or otherwise disposed of as directed by City.

(d) A deduction for the cost of materials to be retained by Contractor, amounts realized from the sale of such materials and not otherwise recovered by or credited to City, and any other appropriate credits to City against the cost of the Services or other work.

8.1.4 In no event shall City be liable for costs incurred by Contractor or any of its subcontractors after the termination date specified by the SFMTA, except for those costs specifically listed in Section 8.1.2. Such non-recoverable costs include, but are not limited to, anticipated profits on the Goods delivered and/or Services rendered by Contractor under this Agreement, post-termination employee salaries, post-termination administrative expenses, post-termination overhead or unabsorbed overhead, attorneys' fees or other costs relating to the prosecution of a claim or lawsuit, prejudgment interest, or any other expense which is not reasonable or authorized under Section 8.1.2.

8.1.5 In arriving at the amount due to Contractor under this Section, the SFMTA may deduct: (i) all payments previously made by the SFMTA for the Goods delivered and/or Services rendered by Contractor's final invoice; (ii) any claim which the SFMTA may have against Contractor in connection with this Agreement; (iii) any invoiced costs or expenses excluded pursuant to the immediately preceding subsection 8.1.4; and (iv) in instances in which, in the opinion of the SFMTA, the cost of any Goods delivered and/or Services rendered by Contractor under this Agreement is excessively high due to costs incurred to remedy or replace defective or rejected Goods and Services, the difference between the invoiced amount and

SFMTA's estimate of the reasonable cost of delivering the invoiced Goods and/or performing the invoiced Services in compliance with the requirements of this Agreement.

8.1.6 Payment Obligation. City's payment obligation under this Section shall survive termination of this Agreement.

8.2 Termination for Default; Remedies

8.2.1 Each of the following shall constitute an immediate event of default (Event of Default) under this Agreement:

(a) Contractor fails or refuses to perform or observe any term, covenant or condition contained in any of the following Sections of this Agreement:

3.5	Submitting False Claims
4.6	Assignment
Article 5	Insurance and Indemnity
Article 7	Payment of Taxes
10.10	Alcohol and Drug-Free Workplace
11.10	Compliance with Laws
Article 14	Data and Security

(b) Contractor fails or refuses to perform or observe any other term, covenant or condition contained in this Agreement, including any obligation imposed by ordinance or statute and incorporated by reference herein, and such default is not cured within 10 Days after written notice thereof from the SFMTA to Contractor. If Contractor defaults a second time in the same manner as a prior default cured by Contractor, the SFMTA may in its sole discretion immediately terminate the Agreement for default or grant an additional period not to exceed five Days for Contractor to cure the default.

(c) Contractor (i) is generally not paying its debts as they become due; (ii) files, or consents by answer or otherwise to the filing against it of a petition for relief or reorganization or arrangement or any other petition in bankruptcy or for liquidation or to take advantage of any bankruptcy, insolvency or other debtors' relief law of any jurisdiction; (iii) makes an assignment for the benefit of its creditors; (iv) consents to the appointment of a custodian, receiver, trustee or other officer with similar powers of Contractor or of any substantial part of Contractor's property; or (v) takes action for the purpose of any of the foregoing.

(d) A court or government authority enters an order (i) appointing a custodian, receiver, trustee or other officer with similar powers with respect to Contractor or with respect to any substantial part of Contractor's property, (ii) constituting an order for relief or approving a petition for relief or reorganization or arrangement or any other petition in bankruptcy or for liquidation or to take advantage of any bankruptcy, insolvency or other debtors' relief law of any jurisdiction or (iii) ordering the dissolution, winding-up or liquidation of Contractor.

8.2.2 On and after any Event of Default, City shall have the right to exercise its legal and equitable remedies, including, without limitation, the right to terminate this Agreement or to seek specific performance of all or any part of this Agreement. In addition, where applicable, City shall have the right (but no obligation) to cure (or cause to be cured) on behalf of Contractor any Event of Default; Contractor shall pay to City on demand all costs and expenses incurred by City in effecting such cure, with interest thereon from the date of incurrence at the maximum rate then permitted by law. City shall have the right to offset from any amounts due to Contractor under this Agreement or any other agreement between City and Contractor: (i) all damages, losses, costs or expenses incurred by City as a result of an Event of Default; and (ii) any liquidated damages levied upon Contractor pursuant to the terms of this Agreement; and (iii), any damages imposed by any ordinance or statute that is incorporated into this Agreement by reference, or into any other agreement with the City. This Section 8.2.2 shall survive termination of this Agreement.

8.2.3 All remedies provided for in this Agreement may be exercised individually or in combination with any other remedy available hereunder or under applicable laws, rules and regulations. The exercise of any remedy shall not preclude or in any way be deemed to waive any other remedy. Nothing in this Agreement shall constitute a waiver or limitation of any rights that City may have under applicable law.

8.2.4 Any notice of default must be sent to the address set forth in Article 11, in the manner prescribed in Article 11.

8.3 Non-Waiver of Rights. The omission by either Party at any time to enforce any default or right reserved to it, or to require performance of any of the terms, covenants, or provisions hereof by the other Party at the time designated, shall not be a waiver of any such default or right to which the Party is entitled, nor shall it in any way affect the right of the Party to enforce such provisions thereafter.

8.4 Rights and Duties upon Termination or Expiration.

8.4.1 This Section and the following Sections of this Agreement listed below, shall survive termination or expiration of this Agreement:

3.3.4	Payment Limited to Satisfactory Services and Delivery of Goods
3.3.9	Grant Funded Contracts
3.4	Audit and Inspection of Records
3.5	Submitting False Claims
Article 5	Insurance and Indemnity
6.1	Liability of City
6.3	Liability for Incidental and Consequential Damages
Article 7	Payment of Taxes
8.1.6	Payment Obligation
9.1	Ownership of Results

9.2	Works for Hire
11.6	Dispute Resolution Procedure
11.7	Agreement Made in California; Venue
11.8	Construction
11.9	Entire Agreement
11.10	Compliance with Laws
11.11	Severability
Article 13	SFMTA Specific Terms
Article 14	Data and Security

8.4.2 Subject to the survival of the Sections identified in Section 8.4.1, above, if this Agreement is terminated prior to expiration of the term specified in Article 2, this Agreement shall be of no further force or effect. Contractor shall transfer title to City, and deliver in the manner, at the times, and to the extent, if any, directed by City, any work in progress, completed work, supplies, equipment, and other materials produced as a part of, or acquired in connection with the performance of this Agreement, and any completed or partially completed work which, if this Agreement had been completed, would have been required to be furnished to City.

Article 9 Rights In Deliverables

9.1 Ownership of Results. Any interest of Contractor or its subcontractors, in the Deliverables, including any drawings, plans, specifications, blueprints, studies, reports, memoranda, computation sheets, computer files and media or other documents prepared by Contractor or its subcontractors for the purposes of this Agreement, shall become the property of and will be transmitted to City. However, unless expressly prohibited elsewhere in this Agreement, Contractor may retain and use copies for reference and as documentation of its experience and capabilities.

9.2 Works for Hire. If, in connection with Services, Contractor or its subcontractors creates Deliverables including, without limitation, artwork, copy, posters, billboards, photographs, videotapes, audiotapes, systems designs, software, reports, diagrams, surveys, blueprints, source codes, or any other original works of authorship, whether in digital or any other format, such works of authorship shall be works for hire as defined under Title 17 of the United States Code, and all copyrights in such works shall be the property of the City. If any Deliverables created by Contractor or its subcontractor(s) under this Agreement are ever determined not to be works for hire under U.S. law, Contractor hereby assigns all Contractor's copyrights to such Deliverables to the City, agrees to provide any material and execute any documents necessary to effectuate such assignment, and agrees to include a clause in every subcontract imposing the same duties upon subcontractor(s). With City's prior written approval, Contractor and its subcontractor(s) may retain and use copies of such works for reference and as documentation of their respective experience and capabilities.

9.3 Licenses Granted

9.3.1 Computerized Software and Systems. To the extent that software, firmware, systems designs, computerized manuals, training modules, or other such Deliverables are not designed specifically for City's purposes in connection with the Agreement, Contractor grants City a perpetual, non-exclusive, non-transferable, license at all locations owned or controlled by City to use all such Deliverables, or portions thereof. City shall also be authorized to modify or prepare derivative works of the Deliverables and make copies of such Deliverables for internal use only. Any such modifications shall become the property of the City unless such modifications are not used exclusively for internal purposes. City agrees not to remove or destroy any proprietary markings or proprietary legends placed upon or contained within the Deliverable(s) or any related materials or documentation. Contractor warrants that it has title to and/or the authority to grant a license of such Deliverables to the City.

9.3.2 IP Transfer. In the event that Contractor is (a) unable or fails to meet its warranty or service obligations, excluding any such failure that results from Contractor's good faith dispute with City as to the validity of a warranty claim, or (b) Contractor (i) shall make an assignment for the benefit of creditors, or (ii) shall file in any court or agency of competent jurisdiction, a petition in bankruptcy or insolvency (each, an "IP Transfer Trigger Event"), Contractor shall deliver any software, firmware, systems designs, computerized manuals, training modules, or other such information necessary to enable City to perform the maintenance and operation of the Vehicles (collectively, the "Specified Contractor IP"). No later than 30 days after an IP Transfer Trigger Event, City shall have the right to receive from Contractor, and Contractor shall deliver to City, one copy of the Specified Contractor IP, and Contractor grants to City a non-exclusive, royalty-free right and license to use the Specified Contractor IP solely as necessary for City to perform the maintenance and operation of the Vehicles.

9.3.3 Bankruptcy. All rights and licenses granted in respect of the Specified Contractor IP are, and shall be deemed to be, for purposes of Section 365(n) of the Bankruptcy Code, 11 U.S.C. § 101 et seq., licenses of rights to "intellectual property" as defined under Section 101(35A) of the Bankruptcy Code; and the Specified Contractor IP is, and shall be deemed to be, "embodiment[s]" of "intellectual property" for purposes of same. City shall retain and may fully exercise all of its rights and elections under the Bankruptcy Code or equivalent legislation in any other jurisdiction. Without limiting the generality of the foregoing, Contractor acknowledges that the rights and license granted to City pursuant to this Section 9.3 shall not be affected by Contractor's rejection of this Agreement in bankruptcy and shall continue subject to the terms and conditions of this Agreement.

9.3.4 License for Data. Except as provided below, the City grants to Contractor a license to inspect, examine, 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 extend necessary to enable the Contractor to perform reliability maintenance analysis, corrective actions, and/or other engineering work for the Buses. This grant of license does not apply to any data or information obtained through or downloaded from the following systems:

(a) CAD/AVL System

(b) Automatic Passenger Counter System

(c) Video Surveillance System

9.3.5 Other Deliverables. Contractor grants City a perpetual, non-exclusive, non-transferable license to use, retain, and reproduce at all locations controlled by the SFMTA, for internal use only, all copies (whether in hard copy or electronic format) of drawings, plans, specifications, schematics, studies, reports, memoranda, computation sheets and all other documents that are (a) prepared by Contractor or its Subcontractors or Suppliers (but not exclusively for City); and (b) subject to any restrictions set forth herein, required to be provided to City in connection with this Agreement. Contractor warrants that it has title to and/or the authority to grant a license of such Deliverables to the City.

9.4 Proprietary Materials -- Contractor Information: To the extent that the Contractor considers any document or Deliverable to be a trade secret or otherwise proprietary, Contractor shall so mark them. SFMTA shall require individuals using such proprietary documents to maintain the confidentiality of the documents, and if necessary, sign a confidentiality agreement regarding use of highly sensitive documents. For purposes of this Agreement, the Specified Contractor IP (see Section 9.3.2) shall be considered a trade secret under this Section and subject to the provisions of this Section. Contractor shall hold the City harmless from and defend the City against all claims, suits or other proceedings instituted against the City for copyright infringement, misuse or misappropriation of a trade secret, or for access to the documents or Deliverables under the City's Sunshine Ordinance or the California Public Records Act. The SFMTA will give Contractor prompt notice if it receives a request for such records under the Sunshine Ordinance or the California Public Records Act to allow Contractor the opportunity to contest the request. Contractor will pay the costs and damages awarded in any such action or proceeding, or the cost of settling such action or proceeding, provided that Contractor shall have sole control of the defense of any such action and all negotiations or its settlement or compromise. If notified promptly in writing of any informal claim (other than a judicial action) brought against City based on an allegation that City's use of the buses, spare parts, documents or Deliverables constitutes infringement, Contractor will pay the costs associated with resolving such claim and will pay the settlement amount (if any), provided that Contractor shall have sole control of the resolution of any such claim and all negotiations for its settlement.

Article 10 Additional Requirements Incorporated by Reference

10.1 Laws Incorporated by Reference. The full text of the laws listed in this Article 10, including enforcement and penalty provisions, are incorporated by reference into this Agreement. The full text of the San Francisco Municipal Code provisions incorporated by reference in this Article and elsewhere in the Agreement (Mandatory City Requirements) are available at http://www.amlegal.com/codes/client/san-francisco_ca/.

10.2 Conflict of Interest. By executing this Agreement, Contractor certifies that it does not know of any fact which constitutes a violation of Section 15.103 of the City's Charter; Article III, Chapter 2 of City's Campaign and Governmental Conduct Code; Title 9, Chapter 7 of the California Government Code (Section 87100 *et seq.*), or Title 1, Division 4, Chapter 1, Article 4 of the California Government Code (Section 1090 *et seq.*), and further agrees promptly to notify the City if it becomes aware of any such fact during the term of this Agreement.

10.3 Prohibition on Use of Public Funds for Political Activity. In performing the Services or delivering the Goods, Contractor shall comply with San Francisco Administrative Code Chapter 12G, which prohibits funds appropriated by the City for this Agreement from being expended to participate in, support, or attempt to influence any political campaign for a candidate or for a ballot measure. Contractor is subject to the enforcement and penalty provisions in Chapter 12G.

10.4 Consideration of Salary History. Contractor shall comply with San Francisco Labor and Employment Code Article 141, the Consideration of Salary History Ordinance or "Pay Parity Act." Contractor is prohibited from considering current or past salary of an applicant in determining whether to hire the applicant or what salary to offer the applicant to the extent that such applicant is applying for employment to be performed on this Agreement or in furtherance of this Agreement, and whose application, in whole or part, will be solicited, received, processed or considered, whether or not through an interview, in the City or on City property. The ordinance also prohibits employers from (1) asking such applicants about their current or past salary or (2) disclosing a current or former employee's salary history without that employee's authorization unless the salary history is publicly available. Contractor is subject to the enforcement and penalty provisions in Article 141. Information about and the text of Article 141 is available on the web at https://sfgov.org/olse/consideration-salary-history. Contractor is required to comply with all of the applicable provisions of Article 141, irrespective of the listing of obligations in this Section.

10.5 Nondiscrimination Requirements

10.5.1 Nondiscrimination in Contracts. Contractor shall comply with the provisions of San Francisco Labor and Employment Code Articles 131 and 132. Contractor shall incorporate by reference in all subcontracts the provisions of Sections 131.2(a), 131.2(c)-(k), and 132.3 of the San Francisco Labor and Employment Code and shall require all subcontractors to

comply with such provisions. Contractor is subject to the enforcement and penalty provisions in Articles 131 and 132.

10.5.2 Nondiscrimination in the Provision of Employee Benefits. San Francisco Labor and Employment Code Article 131.2 applies to this Agreement. Contractor does not as of the date of this Agreement, and will not during the term of this Agreement, in any of its operations in San Francisco, on real property owned by San Francisco, or where work is being performed for the City elsewhere in the United States, discriminate in the provision of employee benefits between employees with domestic partners and employees with spouses and/or between the domestic partners and spouses of such employees, subject to the conditions set forth in San Francisco Labor and Employment Code Article 131.2.

10.6 Reserved. (Local Business Enterprise and Non-Discrimination in Contracting Ordinance)

10.7 Minimum Compensation Ordinance. If Labor and Employment Code Article 111 applies to this Agreement, Contractor shall pay covered employees no less than the minimum compensation required by San Francisco Labor and Employment Code Article 111, including a minimum hourly gross compensation, compensated time off, and uncompensated time off. Contractor is subject to the enforcement and penalty provisions in Article 111. Information about and the text of Article 111 is available on the web at http://sfgov.org/olse/mco. Contractor is required to comply with all of the applicable provisions of Article 111, irrespective of the listing of obligations in this Section. By signing and executing this Agreement, Contractor certifies that it complies with Article 111.

10.8 Reserved. (Health Care Accountability Ordinance)

10.9 First Source Hiring Program. Contractor must comply with all of the provisions of the First Source Hiring Program, Chapter 83 of the San Francisco Administrative Code, that apply to this Agreement, and Contractor is subject to the enforcement and penalty provisions in Chapter 83.

10.10 Alcohol and Drug-Free Workplace. City reserves the right to deny access to, or require Contractor to remove from, City facilities personnel of any Contractor or subcontractor who City has reasonable grounds to believe has engaged in alcohol abuse or illegal drug activity which in any way impairs City's ability to maintain safe work facilities or to protect the health and well-being of City employees and the general public. City shall have the right of final approval for the entry or re-entry of any such person previously denied access to, or removed from, City facilities. Illegal drug activity means possessing, furnishing, selling, offering, purchasing, using or being under the influence of illegal drugs or other controlled substances for which the individual lacks a valid prescription. Alcohol abuse means possessing, furnishing, selling, offering, or using alcoholic beverages, or being under the influence of alcohol.

Contractor agrees in the performance of this Agreement to maintain a drug-free workplace by notifying employees that unlawful drug use is prohibited and specifying what

actions will be taken against employees for violations; establishing an on-going drug-free awareness program that includes employee notification and, as appropriate, rehabilitation. Contractor can comply with this requirement by implementing a drug-free workplace program that complies with the Federal Drug-Free Workplace Act of 1988 (41 U.S.C. § 701) (or California Drug-Free Workplace Act of 1990 Cal. Gov. Code, § 8350 et seq., if state funds involved).

10.11 Limitations on Contributions. By executing this Agreement, Contractor acknowledges its obligations under Section 1.126 of the City's Campaign and Governmental Conduct Code, which prohibits any person who contracts with, or is seeking a contract with, any department of the City for the rendition of personal services, for the furnishing of any material, supplies or equipment, for the sale or lease of any land or building, for a grant, loan or loan guarantee, or for a development agreement, from making any campaign contribution to (i) a City elected official if the contract must be approved by that official, a board on which that official serves, or the board of a state agency on which an appointee of that official serves, (ii) a candidate for that City elective office, or (iii) a committee controlled by such elected official or a candidate for that office, at any time from the submission of a proposal for the contract until the later of either the termination of negotiations for such contract or twelve months after the date the City approves the contract. The prohibition on contributions applies to each prospective party to the contract; each member of Contractor's board of directors; Contractor's chairperson, chief executive officer, chief financial officer and chief operating officer; any person with an ownership interest of more than 10% in Contractor; any subcontractor listed in the bid, proposal or contract; and any committee that is sponsored or controlled by Contractor. Contractor certifies that it has informed each such person of the limitation on contributions imposed by Section 1.126 by the time it submitted a proposal for the contract, and has provided the names of the persons required to be informed to the City department with whom it is contracting.

10.12 Reserved. (Slavery Era Disclosure)

10.13 Reserved. (Working with Minors)

10.14 Consideration of Criminal History in Hiring and Employment Decisions

10.14.1 Contractor agrees to comply fully with and be bound by all of the provisions of Article 142, "City Contractor/Subcontractor Consideration of Criminal History in Hiring and Employment Decisions", of the San Francisco Labor and Employment Code ("Article 142"), including the remedies provided, and implementing regulations, as may be amended from time to time. The provisions of Article 142 are incorporated by reference and made a part of this Agreement as though fully set forth herein. The text of the Article 142 is available on the web at http://sfgov.org/olse/fco. Contractor is required to comply with all of the applicable provisions of Article 142, irrespective of the listing of obligations in this Section. Capitalized terms used in this Section and not defined in this Agreement shall have the meanings assigned to such terms in Article 142.

10.14.2 The requirements of Article 142 shall only apply to a Contractor's or Subcontractor's operations to the extent those operations are in furtherance of the performance of this Agreement, shall apply only to applicants and employees who would be or are performing work in furtherance of this Agreement, and shall apply when the physical location of the employment or prospective employment of an individual is wholly or substantially within the City of San Francisco. Article 142 shall not apply when the application in a particular context would conflict with federal or state law or with a requirement of a government agency implementing federal or state law.

10.15 Reserved. (Public Access to Nonprofit Records and Meetings)

10.16 Food Service Waste Reduction Requirements. Contractor shall comply with the Food Service Waste Reduction Ordinance, as set forth in San Francisco Environment Code Chapter 16, including but not limited to the remedies for noncompliance provided therein.

10.17 Reserved. (Distribution of Beverages and Water)

10.18 Tropical Hardwood and Virgin Redwood Ban. Pursuant to San Francisco Environment Code Section 804(b), the City urges Contractor not to import, purchase, obtain, or use for any purpose, any tropical hardwood, tropical hardwood wood product, virgin redwood or virgin redwood wood product.

10.19 Reserved. (Preservative Treated Wood Products)

10.20 Reserved. (Sweat Free Procurement)

10.21 Reserved. (Environment Code Chapter 5, Resource Conservation Ordinance)

10.22 Reserved. (Prop J Approval)

10.23 Use of City Opinion. Contractor shall not quote, paraphrase, or otherwise refer to or use any opinion of City, its officers or agents, regarding Contractor or Contractor's performance under this Agreement without prior written permission of the SFMTA.

Article 11 General Provisions

11.1 Notices to the Parties. Unless otherwise indicated in this Agreement, all written communications sent by the Parties may be by U.S. mail or e-mail, and shall be addressed as follows:

To City: San Francisco Municipal Transportation Agency
Transit Division Fleet Engineering
700 Pennsylvania Avenue Building B 2/F, San Francisco, CA 94107
Attention: Gary Chang, Project Manager
Gary.Chang@sfmta.com

To Contractor: New Flyer of America, Inc
6200 Glenn Carlson Drive, St. Cloud, MN 56301
Attention: Jeff Langelier, Business Segment Director
mailto:Jeff_Langelier@newflyer.com

Any notice of default must be sent overnight mail delivery service or courier, with a signature obtained at delivery. Either Party may change the address to which notice is to be sent by giving written notice thereof to the other Party. If email notification is used, the sender must specify a receipt notice.

11.2 Compliance with Americans with Disabilities Act. Contractor shall provide the Services and/or Goods in a manner that complies with the Americans with Disabilities Act (ADA), including but not limited to Title II's program access requirements, and all other applicable federal, state and local disability rights legislation.

11.3 Incorporation of Recitals. The matters recited above are hereby incorporated into and made part of this Agreement.

11.4 Sunshine Ordinance. Contractor acknowledges that this Agreement and all records related to its formation, Contractor's performance of Services or delivery of the Goods, and City's payment are subject to the California Public Records Act, (California Government Code §6250 et. seq.), and the San Francisco Sunshine Ordinance, (San Francisco Administrative Code Chapter 67). Such records are subject to public inspection and copying unless exempt from disclosure under federal, state or local law.

11.5 Modification of this Agreement. This Agreement may not be modified, nor may compliance with any of its terms be waived, except as noted in Section 11.1 "Notices to Parties", regarding change in personnel or place, and except by written instrument executed and approved as required under City law and under the policy of the SFMTA Board of Directors. Contractor shall cooperate with the SFMTA to submit to the CCO any amendment, modification, supplement or change order that would result in a cumulative increase of the original amount of this Agreement by more than 25% (CMD Contract Modification Form).

11.6 Dispute Resolution Procedure

11.6.1 Negotiation; Alternative Dispute Resolution. The Parties will attempt in good faith to resolve any dispute or controversy arising out of or relating to the performance of Services or delivery of the Goods under this Agreement. If the Parties are unable to resolve the dispute, then, pursuant to San Francisco Administrative Code Section 21.36, Contractor may submit to the Contract Administrator a written request for administrative review and documentation of the Contractor's claim(s). Upon such request, the Contract Administrator shall promptly issue an administrative decision in writing, stating the reasons for the action taken and informing the Contractor of its right to judicial review. If agreed by both Parties in writing, disputes may be resolved by a mutually agreed-upon alternative dispute resolution process. If the Parties do not mutually agree to an alternative dispute resolution process or such efforts do not

resolve the dispute, then either Party may pursue any remedy available under California law. The status of any dispute or controversy notwithstanding, Contractor shall proceed diligently with the performance of its obligations under this Agreement in accordance with the Agreement and the written directions of the City. Neither Party will be entitled to legal fees or costs for matters resolved under this Section.

11.6.2 Government Code Claim Requirement. No suit for money or damages may be brought against the City until a written claim therefor has been presented to and rejected by the City in conformity with the provisions of San Francisco Administrative Code Chapter 10 and California Government Code Section 900, et seq. Nothing set forth in this Agreement shall operate to toll, waive or excuse Contractor's compliance with the California Government Code Claim requirements set forth in San Francisco Administrative Code Chapter 10 and California Government Code Section 900, et seq.

11.6.3 Reserved. (Health and Human Service Contract Dispute Resolution Procedure)

11.6.4 No Cessation of Work. Pending final resolution of a dispute hereunder, the Contractor shall proceed diligently with the performance of its obligations under this Agreement in accordance with the written directions of the Project Manager

11.7 Agreement Made in California; Venue. The formation, interpretation and performance of this Agreement shall be governed by the laws of the State of California. Venue for all litigation relative to the formation, interpretation and performance of this Agreement shall be in San Francisco.

11.8 Construction. All paragraph captions are for reference only and shall not be considered in construing this Agreement.

11.9 Entire Agreement. This Contract sets forth the entire agreement between the Parties, and supersedes all other oral or written provisions. This Agreement may be modified only as provided in Section 11.5 "Modification of this Agreement".

11.10 Compliance with Laws. Contractor shall keep itself fully informed of the City's Charter, codes, ordinances and duly adopted rules and regulations of the City and of all state, and federal laws in any manner affecting the performance of this Agreement, and must at all times comply with such local codes, ordinances, and regulations and all applicable laws as they may be amended from time to time.

11.11 Severability. Should the application of any provision of this Agreement to any particular facts or circumstances be found by a court of competent jurisdiction to be invalid or unenforceable, then (i) the validity of other provisions of this Agreement shall not be affected or impaired thereby, and (ii) such provision shall be enforced to the maximum extent possible so as to effect the intent of the Parties and shall be reformed without further action by the Parties to the extent necessary to make such provision valid and enforceable.

11.12 Cooperative Drafting. This Agreement has been drafted through a cooperative effort of City and Contractor, and both Parties have had an opportunity to have the Agreement reviewed and revised by legal counsel. No Party shall be considered the drafter of this Agreement, and no presumption or rule that an ambiguity shall be construed against the Party drafting the clause shall apply to the interpretation or enforcement of this Agreement.

11.13 Order of Precedence. Contractor agrees to furnish the Goods or perform the Services described herein in accordance with the terms and conditions of this Agreement. Contractor agrees, except for technical specifications, that in the event of discrepancy, inconsistency, gap, ambiguity, or conflicting language between the City's terms and Contractor's printed terms attached, the City's terms shall take precedence, followed by the procurement issued by the State of Washington, and Contractor's bid and/or proposal respectively. For technical specifications, Tab 14a of Contractor's proposal (Appendix H) takes precedence over the City's technical specifications (Appendix G).

11.14 Time of Essence. Time is of the essence in this Agreement.

11.15 Notification of Legal Requests. Contractor shall immediately notify the SFMTA upon receipt of any subpoenas, service of process, litigation holds, discovery requests and other legal requests (Legal Requests) related to all City Data given to Contractor by the City in the performance of this Agreement, or which in any way might reasonably require access to City Data, and in no event later than 24 hours after it receives the request. Contractor shall not respond to Legal Requests related to City without first notifying City other than to notify the requestor that the information sought is potentially covered under a non-disclosure agreement. Contractor shall retain and preserve City Data in accordance with the City's instruction and requests, including, without limitation, any retention schedules and/or litigation hold orders provided by the City to Contractor, independent of where the City Data is stored.

11.16 Cooperative Agreement. Contractor agrees that during the term of this Agreement and any authorized extension, the Director of Transportation may allow other public agencies or non-profits made up of multiple public agencies to utilize this Agreement to obtain some or all of the Goods and/or Services to be provided by Contractor under the same terms and conditions as the SFMTA.

Article 12 Deliveries and Acceptance

The delivery and acceptance requirements in this Article supplement the requirements contained in Appendix A, Washington State Contract No. 06719-01.

12.1 Deliveries.

12.1.1 Pre-delivery Tests and Inspections. Pre-delivery tests and inspections shall be performed prior to shipment to the SFMTA. Such tests and inspections shall be performed in accordance with the procedures defined in Test Requirements Appendix G Section 12.2 of the Technical Specifications, and they may be witnessed by the SFMTA Resident

Inspector. When a Coach passes these tests and inspections, the Resident Inspector shall authorize release of the Coach for shipment. Such authorization does not imply Acceptance of the Vehicle by the SFMTA.

12.1.2 Delivery Procedure. Delivery shall be determined by signed receipt of the SFMTA Acceptance division at the point of delivery and may be preceded by a cursory inspection of the Vehicle. The point of delivery shall be:

40-Ft Hybrid Electric Coaches
Bus Acceptance 1399 Marin Street San Francisco, CA 94124

Contractor shall deliver Coaches during weekday working hours at a time mutually agreeable to the SFMTA and Contractor, or as otherwise specified in writing by the SFMTA. Contractor shall provide at least five Working Days notice to the SFMTA prior to delivery. Delivery of the Coaches shall be F.O.B. point of delivery, freight pre-paid and allowed. Contractor shall ensure that all Coaches are fully operable when they are delivered. Contractor shall deliver a maximum of three Coaches per week.

12.1.3 Condition of Coaches. Drivers shall keep a complete and accurate maintenance log enroute, which shall be delivered to the SFMTA Project Manager / Representative with the Coach. The log shall show the driver's compliance with the tire manufacturer's highway **operating** procedures. If the Coaches are towed, the rear axle shafts shall be removed during the towing and re-coupled by the Contractor after arrival at the point of delivery. Contractor shall deliver each Coach with a full tank of fuel and fully cleaned (exterior, interior, underside, and topside) prior to presentation for inspection. Also, if the Coaches are towed from the Contractor’s facility to the SFMTA, highway-type tires shall be installed. Upon arrival at an SFMTA maintenance facility or within the City/County of San Francisco, Contractor, at its expense, shall install city-type tires.

12.1.4 Spare Parts Delivery Procedure. Composition of spare parts is subject to SFMTA **approval**. Contractor shall provide the SFMTA with one-week advance notice before shipment of spare parts. Such notice shall include a packing list clearly identifying all parts and their quantity in the shipment.

Delivery of spare parts shall be acknowledged by signed receipt of the SFMTA representative at the point of delivery and may be preceded by a cursory inspection of the parts. Within 20 Days of delivery, the SFMTA will issue a notification of Acceptance, non-Acceptance, or Conditional Acceptance of the spare parts. The point of delivery shall be the location for the applicable Coach provided in Section 12.1.2.

Delivery of spare parts shall be F.O.B. point of delivery, freight pre-paid and allowed.

12.2 Acceptance of Vehicles

12.2.1 Procedure.

(a) Contractor shall ensure that the Coach's underside is washed and cleaned prior to being presented to SFMTA for Acceptance.

(b) After arrival at the designated point of delivery, each Coach shall undergo pre-Acceptance and Acceptance tests by the SFMTA as defined in the Quality Assurance Section of the Technical Specifications. The SFMTA shall make a good faith effort to begin the Acceptance process within 20 Days after delivery of each Coach. If the Contractor is not notified by the SFMTA of non-acceptance within 20 calendar days after delivery of each Coach, acceptance of the Coach by the SFMTA shall be deemed to have occurred on the 20th day after delivery. When a Coach passes all tests, SFMTA will provide written Acceptance of the Coach to the Contractor. Contractor shall transfer title to the Coach to the City on the day of Acceptance, or Conditional Acceptance, if the Coach is not fully Accepted. Acceptance of one Coach does not imply Acceptance of any other delivered Coaches.

(c) If a Coach fails the Acceptance tests, the Coach shall not be Accepted until the repair procedures defined in Section 12.3, of this Agreement have been carried out and the Coach has been retested and passes all applicable tests. All deliveries of Coaches shall be halted whenever five or more Coaches have failed or have not been Accepted or Conditionally Accepted and are awaiting repairs or Corrections.

(d) After completion of post-delivery testing, the SFMTA will issue a notification of Acceptance, non-Acceptance or Conditional Acceptance.

12.2.2 Conditional Acceptance. If a Coach does not meet all requirements for Acceptance, the SFMTA may, at its exclusive option, "conditionally accept" the Coach and place it into revenue service, pending receipt of Contractor-furnished materials and/or labor necessary to effectuate corrective action for Acceptance. For any Conditionally Accepted Vehicle, payments shall be made as provided in Section 3.3.1 above.

12.2.3 Assumption of Risk of Loss. Prior to delivery as described in Section 12.1 of this Agreement, and regardless whether title has passed to the City, the Contractor shall bear risk of loss of the Coach, including any damage sustained during transportation to the delivery site. Risk of loss will pass to the SFMTA upon delivery of each Coach except that loss or damage to the Coach resulting from acts or omissions of the Contractor shall be the responsibility of the Contractor until Acceptance of the Vehicle.

12.2.4 Title. At the time of coach entering into production, Contractor shall provide the SFMTA Project Manager with adequate documents for securing the title for the Coach in the State of California. Unless full unencumbered title transfers earlier under Section 3.3.2, upon Acceptance of each Coach, title to each Coach shall pass to the City, which title

Contractor warrants shall be free and clear of all liens, mortgages and encumbrances, financing statements, security agreements, claims, and demands of any character.

12.3 Repairs Prior To Acceptance. The SFMTA Project Manager may require the Contractor, or its designated representative, to perform repairs after non-Acceptance or Conditional Acceptance, or the Contractor may request that the repairs be done by SFMTA personnel with reimbursement by the Contractor. Contractor shall inform the SFMTA in advance of any modifications made to the Coach during the Acceptance period.

12.3.1 Repairs by Contractor. If the SFMTA Project Manager requires the Contractor to perform repairs after non-Acceptance or Conditional Acceptance of the Vehicle, the Contractor's representative must begin the repair within five Days after receiving notification from the SFMTA Project Manager of failure of Acceptance tests.

The Contractor shall provide, at its own expense, all spare parts, tools, and labor required to complete the repairs. At the SFMTA Project Manager's option, the Contractor may be required to remove the Coach from SFMTA property while repairs are being effected. The Contractor shall then provide a space to complete the repairs, shall diligently pursue the repairs, and shall assume risk of loss while the Coach is under its control.

12.3.2 Repairs by SFMTA.

(a) If the SFMTA Project Manager agrees to a request by the Contractor for SFMTA to perform repairs on a Contractor-owned Coach prior to SFMTA Acceptance, the SFMTA shall correct or repair the Defect using parts supplied by the Contractor specifically for this repair. Monthly, or at a period to be mutually agreed upon, reports of all repairs covered by this procedure shall be submitted by the SFMTA Project Manager to the Contractor for actual cost reimbursement of parts. The Contractor shall provide forms for these reports.

(b) If the Contractor supplies parts for repairs being performed by the SFMTA before Acceptance of the Coach, Contractor shall deliver these parts prepaid to the SFMTA within 10 Working Days after receipt of the request for the parts. The Contractor may request that Defective components covered by this provision be returned to the manufacturing plant. Contractor shall bear all expenses for supplying such parts and for any associated costs.

(c) Contractor shall reimburse the SFMTA for all costs of labor and materials (including taxes) for repairs made or caused to be made by the SFMTA. If the SFMTA performs the repairs itself, the amount shall be determined by multiplying the number of person-hours actually required to Correct the Defect by the current technician's hourly overtime wage rate, which includes fringe benefits and overhead, plus the cost of towing the Coach if such action was necessary. If the SFMTA requires the service of an outside repair facility, Contractor shall reimburse the SFMTA for all such repair invoices. Contractor shall also reimburse the SFMTA for administrative costs incurred in performing the repairs. The use of SFMTA labor

will not relieve the Contractor from the responsibility to ensure that repairs are carried out in accordance with proper procedures.

(d) SFMTA may deduct the cost of repairs from any monies due or that may become due to the Contractor under the Agreement, or if such monies are insufficient, the Contractor or its surety shall pay to the SFMTA any deficiency.

12.4 Unavoidable Delays

12.4.1 Definition. An Unavoidable Delay is an interruption of the work beyond the control of the Contractor, which the Contractor could not have avoided by the exercise of care, prudence, foresight, and diligence. Such delays include, and are limited to, acts of God; floods; windstorms; tornadoes; wars; riots; insurrections; epidemics; quarantine restrictions; strikes and lockouts; freight embargoes; acts of a governmental agency; priorities or privileges established for the manufacture, assembly, or allotment of materials by order, decree, or otherwise of the United States or by any department, bureau, commission, committee, agent, or administrator of any legally constituted public authority; changes in the Goods or Services ordered by the City insofar as they necessarily require additional time in which to complete the entire work; the prevention by the City of the Contractor's commencing or prosecuting the work. The duration of said Unavoidable Delays shall be limited to the extent that the commencement, prosecution, and completion of the Goods or Services are delayed thereby, as determined by the City.

12.4.2 Notification of Delay. The Contractor shall notify the SFMTA as soon as the Contractor has, or should have, knowledge that an event has occurred that will delay deliveries. Within five Days, the Contractor shall confirm such notice in writing, furnishing as much detail as is available.

12.4.3 Request for Extension. The Contractor agrees to supply, as soon as such data are available, any reasonable proof that is required by the SFMTA to make a decision on any request for extension. The SFMTA shall examine the request and any documents supplied by the Contractor and shall determine if the Contractor is entitled to an extension, and if so, the duration of such extension. The SFMTA shall notify the Contractor of its decision in writing.

The granting of an extension of time because of Unavoidable Delays shall in no way operate as a waiver on the part of the City of the right to collect liquidated damages for other delays or of any other rights to which the City is entitled.

Article 13 SFMTA Specific Terms

13.1 Third Party Beneficiaries. No third parties are intended by the Parties hereto to be third party beneficiaries under this Agreement, and no action to enforce the terms of this Agreement may be brought against either Party by any person who is not a party hereto.

13.2 Exclusion Lists and Employee Verification

13.2.1 Contractor acknowledges that some or all of the Commodities or Services that Contractor furnishes to City under this Agreement may be included, directly or indirectly, in whole or in part, in claims submitted by City to Federal or State programs. By executing this Agreement Contractor certifies that it is not currently, and shall not during the term of this Agreement become, excluded, directed to be excluded, suspended, ineligible or otherwise sanctioned from participation in any Federal or State assistance programs. Contractor shall notify City, as provided in Section 11.1 (Notices to the Parties), within thirty (30) Days of any such exclusion, suspension, ineligibility, or other sanction. This is a material term of this Agreement. Contractor agrees to indemnify and hold harmless City and City's officers, directors, employees, agents, successors and permitted assigns from and against any and all (including but not limited to Federal, State, or third party) civil monetary penalties, assessments, repayment obligations, losses, damages, settlement agreements and expenses (including reasonable attorneys' fees) arising from the exclusion, suspension, ineligibility, or other sanction of Contractor and/or Contractor's workforce (including those who oversee Contractor's workforce, supervisors and governing body members) from participation in any Federal or State assistance program.

13.3 Large Vehicle Driver Safety Training Requirements

13.3.1 Contractor agrees that before any of its employees and subcontractors drive large vehicles within the City and County of San Francisco, those employees and subcontractors shall successfully complete either (a) the SFMTA's Large Vehicle Urban Driving Safety training program or (b) a training program that meets the SFMTA's approved standards for large vehicle urban driving safety. The SFMTA's approved standards for large vehicle urban driving safety is available for download at www.SFMTA.com/largevehicletrainingstandards. This requirement does not apply to drivers providing delivery services who are not employees or subcontractors of the Contractor. For purposes of this section, "large vehicle" means any single vehicle or combination of vehicle and trailer with an unladen weight of 10,000 pounds or more, or a van designed to carry 10 or more people.

13.3.2 By entering into this Agreement, Contractor agrees that in the event the Contractor fails to comply with the Large Vehicle Driver Safety Training Requirements, the City will suffer actual damages that will be impractical or extremely difficult to determine; further, Contractor agrees that the sum of up to One Thousand Dollars ($1,000) per employee or subcontractor who is permitted to drive a large vehicle in violation of these requirements is not a penalty, but is a reasonable estimate of the loss that City will incur based on the Contractor's failure to comply with this requirement, established in light of the circumstances existing at the time this Contract was awarded. City may deduct a sum representing the liquidated damages from any money due to Contractor. Such deductions shall not be considered a penalty, but rather agreed monetary damages sustained by City because of Contractor's failure to comply.

Article 14 Data and Security

14.1 Nondisclosure of Private, Proprietary or Confidential Information

14.1.1 Protection of Private Information. If this Agreement requires City to disclose "Private Information" to Contractor within the meaning of San Francisco Administrative Code Chapter 12M, Contractor and subcontractor shall use such information only in accordance with the restrictions stated in Chapter 12M and in this Agreement and only as necessary in delivery of the Goods or performing the Services under this Agreement. Contractor is subject to the enforcement and penalty provisions in Chapter 12M.

14.1.2 Confidential Information. In the delivery of the Goods or performance of Services pursuant to this Agreement, Contractor may have access to City's proprietary or Confidential Information, the disclosure of which to third parties may damage City. If City discloses proprietary or Confidential Information to Contractor, or Contractor collects such information on City's behalf, such information must be held by Contractor in confidence and used only in performing the Agreement. Contractor shall exercise the same standard of care to protect such information as a reasonably prudent contractor would use to protect its own proprietary or Confidential Information.

14.2 Reserved. (Payment Card Industry (PCI) Requirements)

14.3 Business Associate Agreement

The Parties acknowledge that City is a Covered Entity as defined in the Healthcare Insurance Portability and Accountability Act of 1996 (HIPAA) and is required to comply with the HIPAA Privacy Rule governing the access, use, disclosure, transmission, and storage of protected health information (PHI) and the Security Rule under the Health Information Technology for Economic and Clinical Health Act, Public Law 111-005 (the HITECH Act).

The Parties acknowledge that Contractor will:

1. ☐ Do **at least one** or more of the following:
A. Create, receive, maintain, or transmit PHI for or on behalf of City (including storage of PHI, digital or hard copy, even if Contractor does not view the PHI or only does so on a random or infrequent basis); or

B. Receive PHI, or access to PHI, from City or another Business Associate of City, as part of providing Goods and Services to or for City including legal, actuarial, accounting, consulting, data aggregation, management, administrative, accreditation, or financial; or

C. Transmit PHI data for City and require access on a regular basis to such PHI. (Such as health information exchanges (HIEs), e-prescribing gateways, or electronic health record vendors)

For purposes of this Agreement, Contractor is a Business Associate of the City, as defined under HIPAA. Contractor must comply with and complete the Business Associate Agreement and attestations attached to this Agreement.

2. ☒ **NOT do any of the activities listed above in subsection 1;**

Contractor is not a Business Associate of the City. A Business Associate Agreement and Attestations are not required for the purposes of this Agreement.

14.4 Protected Health Information. Where applicable, Contractor, all subcontractors, all agents and employees of Contractor and any subcontractor shall comply with all federal and state laws regarding the transmission, storage and protection of all private health information, if any, disclosed to Contractor by City in the performance of this Agreement. Contractor agrees that any failure of Contractor to comply with the requirements of federal and/or state and/or local privacy laws shall be a material breach of the Agreement. In the event that City pays a regulatory fine, and/or is assessed civil penalties or damages through private rights of action, based on an impermissible use or disclosure of protected health information given to Contractor or its subcontractors or agents by City, Contractor shall indemnify City for the amount of such fine or penalties or damages, including costs of notification. In such an event, in addition to any other remedies available to it under equity or law, the City may terminate the Agreement.

14.5 Management of City Data and Confidential Information

14.5.1 Use of City Data and Confidential Information. Contractor agrees to hold City Data received from, or collected on behalf, of the City, in strictest confidence. Contractor shall not use or disclose City Data except as permitted or required by the Agreement or as otherwise authorized in writing by the City. Any work using, or sharing or storage of, City Data outside the United States is subject to prior written authorization by the City, which will not be unreasonably withheld. Access to City Data must be strictly controlled and limited to Contractor's staff assigned to this project on a need-to-know basis only. Contractor is provided a limited non-exclusive license to use the City Data solely for performing its obligations under the Agreement and not for Contractor's own purposes or later use. Nothing herein shall be construed to confer any license or right to the City Data or Confidential Information, by implication, estoppel or otherwise, under copyright or other intellectual property rights, to any third-party. Unauthorized use of City Data by Contractor, subcontractors, or other third parties is prohibited. For purpose of this requirement, the phrase "unauthorized use" means the data mining or processing of data, stored or transmitted by the service, for commercial purposes, advertising or advertising-related purposes, or for any purpose other than security or service delivery analysis that is not explicitly authorized.

14.5.2 Disposition of Confidential Information. Upon request of City or termination or expiration of this Agreement, and pursuant to any document retention period

required by this Agreement, Contractor shall promptly, but in no event later than 30 Days, return all Data given to or collected by Contractor on City's behalf, which includes all original media. Once Contractor has received written confirmation from City that City Data has been successfully transferred to City, Contractor shall within 10 business days clear or purge all City Data from its servers, any hosted environment Contractor has used in performance of this Agreement, including its subcontractors' environment(s), work stations that were used to process the Data or for production of the Data, and any other work files stored by Contractor in whatever medium. Contractor shall provide City with written certification that such purge occurred within five business days of the purge. Secure disposal shall be accomplished by "clearing," "purging" or "physical destruction," in accordance with National Institute of Standards and Technology (NIST) Special Publication 800-88 or most current industry standard.

14.6 Ownership of City Data. The Parties agree that as between them, all rights, including all intellectual property rights, in and to the City Data and any derivative works of the City Data is the exclusive property of the City.

Article 15 MacBride And Signature

15.1 MacBride Principles - Northern Ireland

The provisions of San Francisco Administrative Code §12F are incorporated herein by this reference and made part of this Agreement. By signing this Agreement, Contractor confirms that Contractor has read and understood that the City urges companies doing business in Northern Ireland to resolve employment inequities and to abide by the MacBride Principles, and urges San Francisco companies to do business with corporations that abide by the MacBride Principles.

IN WITNESS WHEREOF, the Parties hereto have executed this Agreement on the day first mentioned above.

CITY	CONTRACTOR
San Francisco **Municipal Transportation Agency** _____ **Jeffery P. Tumlin** Director of Transportation Authorized By: Municipal Transportation Agency Board of Directors Resolution No: _____ Adopted: _____ Attest: _____ Christine Silva, Secretary **Board of Supervisors** Resolution No: _____ Adopted: _____ Attest: _____ Clerk of the Board Approved as to Form: David Chiu City Attorney By: _____ David F. Innis Deputy City Attorney	**New Flyer of America, Inc.** Jennifer McNeill **Jennifer McNeill** Vice President, Sales and Marketing 6200 Glenn Carlson Drive St. Cloud, MN 56301 Acknowledgement of Large Vehicle Driver Safety Training Requirements: By signing this Agreement, Contractor acknowledges that it has read and understands Section 13.3: Large Vehicle Driver Safety Training Requirements. City Supplier Number: 0000030698

Appendices:

A: Washington State Cooperative Purchasing Schedule Master Contract No. 06719-01 Transit Buses: Heavy Duty, 35 Ft Diesel, 40 Ft Diesel, 60 Ft Diesel, 35 Ft Hybrid, 40 Ft Hybrid, 60 Ft Hybrid, 35 Ft CNG, 40 Ft CNG, 60 Ft CNG, 35 Ft Electric, 40 Ft Electric, 60 Ft Electric, 40 Ft Hydrogen, 60 Ft Hydrogen Categories For Use by Washington State Transit Bus Cooperative Participants By and Between State of Washington Department of Enterprise Services and New Flyer of America Inc.

- Exhibit B-1 – State of Washington Technical Specification
- Price Sheet
- Amendment #1
- Amendment #2
- Amendment #3
- Amendment #4

B: Calculation of Charges

- Schedule 1 – Schedule of Prices
- Schedule 1A – Spare Parts List
- Schedule 1B – Special Tools List

C: Regulatory and Compliance Requirements

D: Reserved (HIPAA Business Associate Agreement)

E: Reserved (Form P-12U-C and 12-UI)

F: Grant Terms: FTA Requirements for Procurement Contracts

G: SFMTA's Technical Specifications

H: New Flyer Proposal & Options accepted by the SFMTA

I: Project Delivery Schedule

J: Payment Milestones

Appendix A

Incorporates the attached documents:

- Washington State Cooperative Purchasing Schedule Master Contract No. 06719-01 Transit Buses: Heavy Duty, 35 Ft Diesel, 40 Ft Diesel, 60 Ft Diesel, 35 Ft Hybrid, 40 Ft Hybrid, 60 Ft Hybrid, 35 Ft CNG, 40 Ft CNG, 60 Ft CNG, 35 Ft Electric, 40 Ft Electric, 60 Ft Electric, 40 Ft Hydrogen, 60 Ft Hydrogen Categories For Use by Washington State Transit Bus Cooperative Participants By and Between State of Washington Department of Enterprise Services and New Flyer of America Inc.
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- Amendment #3
- Amendment #4

SFMTA-2024-03-FTA

Agreement

Appendix A, Item A1

Washington State Cooperative Purchasing Schedule Master Contract

No. 06719-01

Transit Buses: Heavy Duty, 35 Ft Diesel, 40 Ft Diesel, 60 Ft Diesel, 35 Ft Hybrid, 40 Ft Hybrid, 60 Ft Hybrid, 35 Ft CNG, 40 Ft CNG, 60 Ft CNG, 35 Ft Electric, 40 Ft Electric, 60 Ft Electric, 40 Ft Hydrogen, 60 Ft Hydrogen Categories For Use by Washington State Transit Bus Cooperative Participants By and Between State of Washington Department of Enterprise Services and New Flyer of America Inc.

WASHINGTON STATE TRANSIT BUS COOPERATIVE

STATE COOPERATIVE PURCHASING SCHEDULE

MASTER CONTRACT

NO. 06719-01

TRANSIT BUSES: HEAVY DUTY

35 FT DIESEL, 40 FT DIESEL, 60 FT DIESEL, 35 FT HYBRID, 40 FT HYBRID, 60 FT HYBRID, 35 FT CNG, 40 FT CNG, 60 FT CNG, 35 FT ELECTRIC, 40 FT ELECTRIC, 60 FT ELECTRIC, 40 FT HYDROGEN, 60 FT HYDROGEN CATEGORIES

For Use by Washington State Transit Bus Cooperative Participants

By and Between

STATE OF WASHINGTON

DEPARTMENT OF ENTERPRISE SERVICES

and

NEW FLYER OF AMERICA, INC.

Dated April 1, 2021

WASHINGTON STATE TRANSIT BUS COOPERATIVE

STATE COOPERATIVE PURCHASING SCHEDULE

MASTER CONTRACT

NO. 06719

TRANSIT BUS – HEAVY DUTY

35 FT DIESEL, 40 FT DIESEL, 60 FT DIESEL, 35 FT HYBRID, 40 FT HYBRID, 60 FT HYBRID, 35 FT CNG, 40 FT CNG, 60 FT CNG, 35 FT ELECTRIC, 40 FT ELECTRIC, 60 FT ELECTRIC, 40 FT HYDROGEN, 60 FT HYDROGEN CATEGORIES

This Master Contract ("Master Contract") is made and entered into by and between the State of Washington acting by and through the Department of Enterprise Services, a Washington State governmental agency ("Enterprise Services") and New Flyer of America Inc., a North Dakota corporation ("Contractor") and is dated and effective as of April 1, 2021.

RECITALS

A. Whereas, pursuant to Legislative direction codified in RCW chapter 39.26, Enterprise Services, on behalf of the State of Washington, is authorized to develop, solicit, and establish master contracts for goods and/or services for general use by Washington state agencies and certain other entities (eligible Participants).

B. Whereas, pursuant to RCW 39.26.060, Enterprise Services may develop, solicit, and establish cooperative purchasing agreements for procurement of any goods or services with one or more states, state agencies, local governments, local government agencies, federal agencies, or tribes located in the state, in accordance with an agreement entered into between the participants.

C. Whereas, pursuant to Section 3019 of the FAST Act, the State of Washington acting by and through Enterprise Services, may enter into a cooperative procurement contract with one or more vendors if the vendors agree to provide an option to purchase rolling stock and related equipment to such State government and any other participant and such State government acts throughout the term of the contract as the lead procurement agency.

D. The State of Washington, acting by and through Enterprise Services is a member of and the lead procurement for the Washington State Transit Bus Cooperative. The Washington State Transit Bus Cooperative is a cooperative purchasing agreement for eligible participants to procure transit buses through a competitively solicited and awarded Cooperative Master Contract.

E. Whereas, on behalf of the State of Washington, Enterprise Services, as part of a competitive governmental procurement, issued a Competitive Solicitation No. 06719-01 dated March 4, 2020 regarding Heavy Duty Transit Buses**.**

F. Whereas, Enterprise Services evaluated all responses to the Competitive Solicitation and identified Contractor as an apparent successful bidder.

G. Whereas, Enterprise Services has determined that entering into this Master Contract will meet the identified needs and be in the best interest of the State of Washington and the Washington State Transit Bus Cooperative.

H. Whereas, the purpose of this Master Contract is to enable eligible Participants to purchase Transit Buses as set forth herein.

AGREEMENT

NOW THEREFORE, in consideration of the mutual promises, covenants, and conditions set forth herein, the parties hereto hereby agree as follows:

1. TERM.

The term of this Master Contract is twenty-four (24) months, commencing April 1, 2021 and ending March 31, 2023; Provided, however, that Enterprise Services at is sole discretion may extend the term for three (3) subsequent twelve (12) month extensions if Contractor is not in default; and provided further, that in no event shall such term be extended if Contractor cannot meet the required certifications of this Contract. The maximum contract term is sixty (60) months, ending March 31, 2026.

2. ELIGIBLE PARTICIPANTS. This Master Contract may be utilized by any of the following types of entities ("Participants"):

2.1. WASHINGTON STATE AGENCIES. All Washington state agencies, departments, offices, divisions, boards, and commissions.

2.2. WASHINGTON STATE INSTITUTIONS OF HIGHER EDUCATION (COLLEGES). Any the following institutions of higher education in Washington:

- State universities – i.e., University of Washington & Washington State University;
- Regional universities – i.e., Central Washington University, Eastern Washington University, & Western Washington University
- Evergreen State College;
- Community colleges; and
- Technical colleges.

2.3. MCUA PARTIES. Any of the following types of entities that have executed a Master Contract Usage Agreement with Enterprise Services:

- Political subdivisions (e.g., counties, cities, school districts, public utility districts) in the State of Washington;
- Federal governmental agencies or entities;
- Public-benefit nonprofit corporations (i.e., § 501(c)(3) nonprofit corporations that receive federal, state, or local funding); and
- Federally-recognized Indian Tribes located in the State of Washington.

2.4. TRANSIT BUS COOPERATIVE PARTIES. Any authorized entity that has executed a Washington State Transit Bus Cooperative Purchasing Agreement with Enterprise Services. The following types of

entities are anticipated to execute a Washington State Transit Bus Cooperative Purchasing Agreement:

- State agencies, local governments, local government agencies, or political subdivisions (e.g., counties, cities, school districts, public utility districts, ports) of any state or territory of the United States;
- Federal governmental agencies or entities located in any state or territory of the United States; and
- Federally-recognized Indian Tribes located in any state or territory of the United States

3. SCOPE – INCLUDED GOODS AND PRICE.

3.1. CONTRACT SCOPE. Pursuant to this Master Contract, Contractor is authorized to sell only those Transit Buses within the scope of their authorized goods meeting the requirements set forth in *Exhibit A – Included Transit Buses* for the prices set forth in *Exhibit B – Prices*. Contractor shall not represent to any Participant under this Master Contract that Contractor has contractual authority to sell any Transit Buses beyond those meeting the requirements set forth in *Exhibit A – Included Transit Buses*.

3.2. STATE'S ABILITY TO MODIFY SCOPE OF MASTER CONTRACT. Subject to mutual agreement between the parties, Enterprise Services reserves the right to modify the goods included in this Master Contract; *Provided*, however, that any such modification shall be effective only upon thirty (30) days advance written notice; and *Provided further*, that any such modification must be within the scope of this Master Contract. Enterprise Services may, at any time, without notice to Contractor by written order designated or indicated to be a change order, make changes within the general scope of the contract to adjust the quantities of Transit Buses purchased under this Master Contract.

3.3. PARTICIPANT CHANGE ORDERS.

(a) Participants may, at any time, by written order designated or indicated to be a change order, make changes in their Purchase Order within the general scope of this Master Contract, including changes: (1) In the specifications; (2) In the method or manner of performance of the work; (3) In the price sheet to include additional options within the scope of the contract; (4) In the delivery performance of the work; or (5) In additional requirements for compliance with state or federal law.

(b) Any other written or oral order (which includes direction, instruction, interpretation, or determination) from the Participant that causes a change shall be treated as a change order under this clause; provided, that Contractor gives the Participant written notice stating (1) the date, circumstances, and source of the order and (2) that Contractor regards the order as a change order.

(c) Except as provided in this clause, no order, statement, or conduct of the Participant shall be treated as a change under this clause or entitle Contractor to an equitable adjustment.

(d) If any change under this clause causes an increase or decrease in Contractor's cost of, or the time required for, the performance of any part of the work under this Master Contract, whether or not changed by any such order, the Participant will make an equitable adjustment and modify the Purchase Order in writing. However, except for an adjustment based on defective specifications, no adjustment for any change under this clause shall be made for any costs incurred more than twenty (20) days before Contractor

gives written notice as required. In the case of defective specifications for which the Participant is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with the defective specifications.

(e) Contractor will assist Participant in obtaining all of the requested cost details as may be required for FTA assisted purchases. Failure to respond or provide needed details may be grounds for the Participant to cancel the purchase without penalty.

(f) The Contractor must assert its right to an adjustment under this clause within 30 days after

1. receipt of a written change order under paragraph (a) of this clause or

2. the furnishing of a written notice under paragraph (b) of this clause, by submitting to the Contracting Officer a written statement describing the general nature and amount of proposal, unless this period is extended by the Participant. The statement of proposal for adjustment may be included in the notice under paragraph (b) above.

(g) No proposal by the Contractor for an equitable adjustment shall be allowed if asserted after final payment under this Master Contract.

(h) This clause does not supersede FTA Circular C 4220.1F.

3.4. ECONOMIC ADJUSTMENT. Beginning twelve (12) months after the effective date of this Master Contract and for every annual anniversary thereafter, the prices set forth in *Exhibit B* shall be adjusted, based upon the percent changes (whether up or down) in the United States Department of Labor, Bureau of Labor and Statistics (BLS) indices described below, for the most recent year. The Index is the Producer Price Index for Truck and Bus Bodies, Series No. WPU 1413, published by the United States Department of Labor, Bureau of Labor Statistics, or if such Index is no longer in use, then such replacement that is most comparable to the Index as may be designated by the Bureau of Labor Statistics, or as agreed by the parties. Economic adjustment will lag one (1) calendar quarter past the Master Contract commencement date to allow for publication of BLS data. All calculations for the index shall be based upon the latest version of data published as of April 1st each year. Prices shall be adjusted on June 1st. If an index is recoded, that is the replacement is a direct substitute according to the BLS, this Master Contract will instead use the recode. If an index becomes unavailable, Enterprise Services shall substitute a proxy index. If there is not a direct substitute, the next higher aggregate index available will be used. The economic adjustment shall be calculated as follows:

New Price = Old Price x (Current Period Index/Base Period Index).

For certainty, notwithstanding anything else to the contrary contained herein, in the event that a price adjustment is required in respect of changes that are mandatory as a result of legislation or regulations that become effective after the date of the tender submission, such price adjustment shall be negotiated in good faith by the Participants and the Contractor.

3.5. PRICE CEILING. Although Contractor may offer lower prices to Participants, during the term of this Master Contract, Contractor guarantees to provide the Heavy Duty Transit Buses at no greater than the prices set forth in *Exhibit B – Prices for Heavy Duty Transit Buses* (subject to economic adjustment as set forth herein).

3.6. GOODS AND SERVICES ADDITION. Contractor may offer new goods and services within the scope of the authorized goods set forth in *Exhibit A – Included Transit Buses* to Participants to implement new technology solutions or meet specific Participant requirements. Goods and services added to purchase orders under the Master Contract must be commercially available at the time they are added and fall within the original scope of the Master Contract.

3.7. PRICING OF GOODS AND SERVICE ADDITIONS. Prices for additional Transit Bus goods and services performed under this Master Contract follow cost reimbursement rules under 4220.1F Ch VI, 2.c(1). Cost-reimbursement provides for payment of Contractor's allowable incurred costs, to the extent agreed to in the Contractor's agreement with the Participant. Participants are required to include FAR Part 31 cost principles in their cost reimbursement contracts for the purpose of determining allowable costs under the contract. Contract shall comply with Participants' requests in determining reasonable prices, including but not limited to providing a breakdown of relevant incurred costs or individual component pricing to Participant upon request. A dispute on the reimbursement costs will follow the dispute procedures of this Master Contract.

3.8. MASTER CONTRACT INFORMATION. Enterprise Services shall maintain and provide information regarding this Master Contract, including scope and pricing, to eligible Participants.

4. CONTRACTOR REPRESENTATIONS AND WARRANTIES. Contractor makes each of the following representations and warranties as of the effective date of this Master Contract and at the time any order is placed pursuant to this Master Contract. If, at the time of any such order, Contractor cannot make such representations and warranties, Contractor shall not process any orders and shall, within three (3) business days notify Enterprise Services, in writing, of such breach.

4.1. QUALIFIED TO DO BUSINESS. Contractor represents and warrants that it is in good standing and qualified to do business in the State of Washington, that it is registered with the Washington State Department of Revenue and the Washington Secretary of State, that it possesses and shall keep current all required licenses and/or approvals, and that it is current, in full compliance, and has paid all applicable taxes owed to the State of Washington. Contractor represents and warrants that it is or will be qualified to do business in other applicable states for purchases under this Master Contract with each of the Washington State Transit Bus Cooperative member states, including but not limited to Alaska, Idaho, Oregon, Colorado, Montana, and Nevada.

4.2. SUSPENSION & DEBARMENT. Contractor represents and warrants that neither it nor its principals or affiliates presently are debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in any governmental contract by any governmental department or agency within the United States.

4.3. QUALITY OF GOODS OR SERVICES. Contractor represents and warrants that any Transit Bus sold pursuant to this Master Contract shall be merchantable, shall conform to this Master Contract and Participant's Purchase Order, shall be fit and safe for the intended purposes, shall be free from defects in materials and workmanship, and shall be produced and delivered in full compliance with applicable law. Contractor further represents and warrants it has clear title to the goods and that the same shall be delivered free of liens and encumbrances and that the same do not infringe any third party patent. The rights and remedies of the parties under this warranty are in addition to any other rights and remedies of the parties provided by law or equity, including, without limitation, actual damages, and, as applicable and awarded under the law, to a prevailing party, reasonable attorneys' fees and costs. Whenever under the Master Contract or Purchase Order it is provided that Contractor shall furnish materials or manufactured components or shall do work for which no detailed specifications are set forth, the work

performed shall be in full conformity and harmony with the intent to secure the best standards of manufacture in the work as a whole or in part. No advantage shall be taken by Contractor in the omission of any part or detail which goes to make the Transit Buses complete and ready for service, even though such part or detail is not mentioned in the specifications or in Contractor's approved design.

4.4. EXECUTIVE ORDER 18-03 – WORKERS' RIGHTS (MANDATORY INDIVIDUAL ARBITRATION). Contractor represents and warrants, as previously certified in Contractor's bid submission, that Contractor does NOT require its employees, as a condition of employment, to sign or agree to mandatory individual arbitration clauses or class or collective action waivers. Contractor further represents and warrants that, during the term of this Contract, Contractor shall not, as a condition of employment, require its employees to sign or agree to mandatory individual arbitration clauses or class or collective action waivers.

4.5. OREGON REVISED STATUTE 279A.112. Contractor represents and warrants, as previously certified in Contractor's bid submission, that their firm has a written policy and practice preventing sexual harassment, sexual assault and discrimination against employees who are members of a protected class.

4.6. EMISSIONS INFORMATION. Contractor represents and warrants, as previously certified in Contractor's bid submission, that their firm has a written policy and practice to assess and provide accurate emission information on products to Participants.

4.7. SUSTAINABILITY POLICY. Contractor represents and warrants, as previously certified in Contractor's bid submission, that their firm has a written policy and practice, detailing own sustainability policies and programs in place and to provide services in line with the principles established therein.

4.8. PROCUREMENT ETHICS & PROHIBITION ON GIFTS. Contractor represents and warrants that it complies fully with all applicable procurement ethics restrictions including, but not limited to, restrictions against Contractor providing gifts or anything of economic value, directly or indirectly, to Participants' employees.

4.9. WASHINGTON'S ELECTRONIC BUSINESS SOLUTION (WEBS). Contractor represents and warrants that it is registered in Washington's Electronic Business Solution (WEBS), Washington's contract registration system and that, all of its information therein is current and accurate and that throughout the term of this Master Contract, Contractor shall maintain an accurate profile in WEBS.

4.10. STATEWIDE PAYEE DESK. Contractor represents and warrants that it is registered with the Statewide Payee Desk, which registration is a condition to payment.

4.11. COOPERATIVE MASTER CONTRACT PROMOTION; ADVERTISING AND ENDORSEMENT. Contractor represents and warrants that it shall use commercially reasonable efforts both to promote and market the use of this Master Contract with eligible Participants and to ensure that those entities that utilize this Master Contract are eligible Participants. Contractor understands and acknowledges that neither Enterprise Services nor Participants are endorsing Contractor's goods and/or services or suggesting that such goods and/or services are the best or only solution to their needs. Accordingly, Contractor represents and warrants that it shall make no reference to Enterprise Services, any Participant, or the State of Washington in any promotional material without the prior written consent of Enterprise Services.

4.12. MASTER CONTRACT TRANSITION. Contractor represents and warrants that, in the event this Master Contract or a similar contract resulting from the Cooperative, is transitioned to another contractor (e.g., Master Contract expiration or termination), Contractor shall use commercially reasonable efforts to assist Enterprise Services for a period of sixty (60) days to effectuate a smooth transition to another contractor to minimize disruption of service and/or costs to the State of Washington.

4.13. VEHICLE TITLE & REGISTRATION. Contractor represents and warrants that upon payment in full, Contractor shall convey to Participant all necessary paperwork, including a "manufacturer's statement of origin" (MSO) and applicable state title application to register the Transit Bus with the Participant's applicable state licensing authority at the time of acceptance. Title to the bus shall pass to the Participant upon acceptance of the bus by the Participant.

4.14. WAGE VIOLATIONS. Contractor represents and warrants that, during the term of this Master Contract and the three (3) year period immediately preceding the award of the Master Contract, it is not determined, by a final and binding citation and notice of assessment issued by the Washington Department of Labor and Industries or through a civil judgment entered by a court of limited or general jurisdiction, to be in willful violation of any provision of Washington state wage laws set forth in RCW chapters 49.46, 49.48, or 49.52.

4.15. PAY EQUITY. Contractor represents and warrants that, among its workers, similarly employed individuals are compensated as equals. For purposes of this provision, employees are similarly employed if the individuals work for the same employer, the performance of the job requires comparable skill, effort, and responsibility, and the jobs are performed under similar working conditions. Job titles alone are not determinative of whether employees are similarly employed. Contractor may allow differentials in compensation for its workers based in good faith on any of the following: a seniority system; a merit system; a system that measures earnings by quantity or quality of production; a bona fide job-related factor or factors; or a bona fide regional difference in compensation levels. A bona fide job-related factor or factors may include, but not be limited to, education, training, or experience that is: consistent with business necessity; not based on or derived from a gender-based differential; and accounts for the entire differential. A bona fide regional difference in compensation level must be consistent with business necessity; not based on or derived from a gender-based differential; and account for the entire differential. Notwithstanding any provision to the contrary, upon breach of warranty and Contractor's failure to provide satisfactory evidence of compliance within thirty (30) days, Enterprise Services may suspend or terminate this Master Contract and any Participant hereunder similarly may suspend or terminate its use of the Master Contract and/or any agreement entered into pursuant to this Master Contract.

4.16. SUBJECT DATA. All "subject data", including specifications, technical data, records and reports, engineering drawings (including shop drawings and working drawings), manuals and instruction materials and computer or microprocessor software that is delivered or specified to be delivered under this contract shall remain the property of the Contractor; provided however, the Participants shall have a royalty-free, non-exclusive, non-transferable and irrevocable license to use such subject data only for the purposes of operating and maintaining the Transit Buses. The Participants grant the Contractor the right to inspect, examine, download, and otherwise obtain any information or data available from components provided by the Contractor, including, but not limited to, any electronic control modules or other data-collection devices, to the extent necessary to enable the Contractor to perform reliability maintenance analysis, corrective action and/or other engineering-type work for the Transit Buses.

5. USING THE MASTER CONTRACT – PURCHASES.

5.1. ORDERING REQUIREMENTS. Participants shall order Transit Buses from this Master Contract, consistent with the terms hereof and by using any ordering mechanism agreeable both to Contractor and Participant but, at a minimum, including the use of a purchase order. When practicable, Contractor and Participant also shall use telephone orders, email orders, web-based orders, and similar procurement methods (collectively "Purchase Order"). All order documents must reference the Master Contract number. Consistent with Participant's procurement authority, Participant may propose and negotiate additional terms with the applicable Contractor to meet Participant's needs, subject to agreement with the applicable Contractor. Under no circumstances will Participant's agreements change or modify the contract obligations of this Master Contract. The terms of this Master Contract shall apply to any Purchase Order and, in the event of any conflict, the terms of this Master Contract shall prevail. Notwithstanding any provision to the contrary, in no event shall any 'click-agreement,' software or web-based application terms and conditions, or other agreement modify the terms and conditions of this Master Contract.

5.2. APPROVAL OF PURCHASES. Enterprise Services and, if the Participant is using FTA funds, the Participant's respective authorization authority for use of those FTA funds shall approve the Participant's initial Purchase Order. Enterprise Services shall review the Purchase Order and approve that the purchase is within the Scope of the Master Contract. The Participant's respective authorization authority for use of those FTA funds will approve the purchase according to their own policies and procedures. Participant and Contractor shall provide timely information as requested by Enterprise Services for the approval process.

5.3. CONTRACTOR COOPERATIVE USE APPROVAL. Pursuant to RCW 39.26.060, the intent of this Contract is to allow for cooperative procurement to the maximum extent possible. Accordingly, any authorized entity that has executed a Washington State Transit Bus Cooperative Purchasing Agreement with Enterprise Services may place orders under this Master Contract. Participation in the cooperative is voluntary. If agreed to by Contractor, this Contract may be used by any participant in the cooperative to procure the Transit Buses. Contractor has the right to refuse initial orders by cooperative participants on a capacity basis, if the Contractor cannot fulfill the complete order based on delivery deadlines. Orders under this Contract will be fulfilled on a first come, first serve basis of the initial order date. If Contractor rejects an order for capacity, Enterprise Services may request additional information from the Contract regarding Contractor's capacity to fulfill orders.

5.4. FTA PRE-AWARD AND POST-DELIVERY CERTIFICATIONS. Contractor shall take all reasonable steps assist Participants in completing all required pre-award and post-delivery certifications required by federal or state law or policy for purchases under this Master Contract. Contractor shall provide all requested information to complete the certifications in a reasonable time to ensure certifications are completed in a timely manner.

5.5. DELIVERY REQUIREMENTS. Contractor must ensure that delivery of Transit Buses will be made as required by this Master Contract, the Purchase Order used by Participants, or as otherwise mutually agreed in writing between the Participant and Contractor. The following apply to all deliveries:

(a) Contractor shall make all deliveries to the applicable delivery location specified in the Purchase Order by the delivery date. The delivery date must be within 18 months of the initial order date, as stated in the Purchaser Order or agreement between Participant and

Contractor; provided however that the Participant and Contractor may amend the delivery date by mutual agreement. Deliveries shall occur during Participant's normal work hours and within the time period mutually agreed in writing between Participant and Contractor at the time of order placement.

(b) Contractor shall deliver all buses with a full tank of fuel and clean inside and out. For any bus not meeting this requirement, Contractor will be assessed $300. When Transit Buses are delivered, certificates or releases signed by Participant simply acknowledge receipt of the Transit Buses and do not constitute acceptance by the Participant of the condition of the Transit Buses, or its conformance with the terms of the Master Contract or Participant's Purchase Order. Acceptance by Participant occurs subsequent to final inspection when Participant provides Contractor with a written Notice of Acceptance.

(c) Contractor shall ship or deliver all goods and/or services purchased pursuant to this Master Contract, freight charges prepaid by Contractor, FOB Participant's specified destination with all transportation and handling charges included. Contractor shall bear all risk of loss, damage, or destruction of the goods and/or services ordered hereunder that occurs prior to delivery, except loss or damage attributable to Participant's negligence. Contractor shall use a qualified and experienced common or contract carrier who is properly licensed and insured. Contractor shall make all arrangements for shipment.

(d) All packing lists, packages, instruction manuals, correspondence, shipping notices, shipping containers, and other written materials associated with this Master Contract shall be identified by the Master Contract number set forth on the cover of this Master Contract and the applicable Participant's Purchase Order number. Packing lists shall be included with each shipment and clearly identify all contents and any backorders.

5.6. PROTOTYPE BUSES. If requested by Participant, Contractor shall produce one prototype bus for each type of bus with respect to the Purchase Order for inspection and testing at the Participant's facilities. The prototype bus will demonstrate that the bus fully meets all requirements of the Purchase Order. Contractor shall produce and deliver the prototype bus to Participant for inspection and testing a minimum of one-hundred twenty (120) days prior to initiation of any production activities for the remaining buses unless otherwise authorized in writing by Participant. The cost of transporting the prototype bus to and from the Participant's facilities shall be at the expense of Contractor. Contractor shall schedule the prototype review with the Participant when a vehicle has been completed with all equipment and furnishings installed, but early enough so design changes resulting from the review will not delay production or cause scrapping of production material.

In the event of nonconformity Participant shall, to the extent practicable, notify Contractor of said nonconformity. No later than seven (7) days after the end of the fourteen (14) day test, Participant 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. Any failure by Participant to detect any defects or omissions in this testing period will in no way relieve Contractor from fully complying with the specifications of the Master Contract and Participant Order. All prototype buses shall be brought up to the final production bus configuration in all respects at no additional cost to Participant, except as may be agreed by change orders.

5.7. NOTIFICATION OF DELAY. Contractor shall provide prompt notice to Participant and Enterprise Services for any delay in the manufacturing process that will affect the expected delivery date. Contractor will provide notice of the delay within fourteen (14) days of discovery of the potential delay. This notice of delay must include a reasonable expectation of when the delay will be resolved, the reason for the delay, whether the delay will cause the delivery to exceed the delivery date, and any other applicable information regarding the delay.

- Participant shall provide Contractor with notice of acceptance of the reasonable delay or notice that the delay is determined to be non-excusable within seven (7) days of receipt of the notice of delay.
- If there is a dispute between Contractor and Participant as to whether the delay is reasonable, Contractor may appeal Participant's decision to Enterprise Services within seven (7) days of receipt of the notice that the delay is non-excusable. Enterprise Services will review the provided information and make a final determination as to whether the delay is reasonable or non-excusable. If a dispute remains after this procedure, parties shall follow the dispute resolution process of Section 16.
- Contractor shall promptly comply with any request from Enterprise Services or Participant for additional information in making the delay determination. A request for more information from Enterprise Services or Participant tolls the time for required response until the time that Contractor responds to the request for more information.
- Reasonable delay is a delay for which the Contractor is not responsible. A reasonable delay must arise from unforeseeable causes, be beyond the control of Contractor, and be without the fault of the Contractor. A reasonable delay will extend the delivery date by the agreed upon length of the delay. For certainty, the reasons for such reasonable delay shall include but not be limited to, the neglect or failure of the Participant or by delay or failure of the Contractor caused by an event beyond its control, including, but not limited to, natural disasters, floods, fires, acts of war or terrorism, labor shortages, strikes or lock-outs or shortages or loss of transportation, then the time for completion of the work and/or the delivery dates shall be extended by the Participant by a reasonable period of time after such event of delay has ended in order that the Contractor may complete the work or deliver the buses.
- Non-excusable delay is a delay for which Contractor is wholly or partially responsible. A non-excusable delay is a delay that arises from a foreseeable cause, is within the control of Contractor, or is due to the fault of Contractor. A non-excusable delay will not extend the agreed upon delivery date.

5.8. DELAY DAMAGES. Participant will be damaged by any failure on the part of Contractor to deliver the buses within the time specified in delivery date. The amount of damages for delay of beyond the delivery date is difficult if not impossible to ascertain. The amount of such damages Contractor shall pay to Participant is fixed at the amount of $250.00 per day for each bus not delivered in substantially good condition as inspected by the Participant. Participant may elect to deduct the amount of the damages from the amount due to Contractor under the Purchase Order or may notify Contractor of the amount due based on the delay. If Participant requires Contractor to pay the delay damages, Contractor shall pay the entire amount within thirty (30) days after receipt of a written demand by Participant. The payment of damages will be in lieu of any damages for any loss of profit, loss of revenue, loss of use, or for any other direct, indirect, special or consequential losses or damages of any kind that may be suffered by Participant arising at any time from the failure of Contractor to fulfill the delivery obligations in a timely manner.

5.9. INSPECTION AND ACCEPTANCE OF TRANSIT BUSES. Transit Buses purchased under this Master Contract are subject to Participant's reasonable inspection, testing, and approval at Participant's destination for a period of fourteen (14) days from the date that the Transit Buses are received at the place of delivery. Participant reserves the right to reject and refuse acceptance of Transit Buses that are not in accordance with this Master Contract and the Participant's Purchase Order during this inspection period. Representatives of Contractor may witness acceptance inspections and testing if so requested by Contractor. Participant retains the right to complete as thorough an inspection as it deems necessary to determine if each bus is in conformance with Master Contract and Purchase Orders requirements for configuration and performance parameters. Contractor shall coordinate and manage Contractor's post-delivery inspection process and notify the Participant of scheduling and availability of buses ready for pre-acceptance inspection. Acceptance by the Participant occurs when Participant provides Contractor with a written Notice of Acceptance, which will be subsequent to final inspection by responsible assigned employees of the Participant. All acceptances are subject to the warranty requirements of this Master Contract. For certainty, if the Transit Buses pass these tests or if the Participants do not notify the Contractor of non-acceptance within 14 calendar days after delivery of the Transit Buses, acceptance of the Transit Buses by the Participants shall be deemed to have occurred on the 14th day after delivery. Acceptance shall occur earlier if the Participants notify the Contractor of early acceptance or places the Transit Buses into revenue service.

5.10. INSPECTION DEFECTS. If there are any apparent defects in the goods and/or services within the inspection period, Participant will promptly notify Contractor. At Participant's option, and without limiting any other rights, Participant may:

- Require Contractor to repair or replace, at Contractor's expense, any or all of the damaged goods; or
- Require Contractor to refund the price of any or all of the damaged goods; or
- Participant may note any damage to the goods on the receiving report, decline acceptance, and deduct the cost of rejected goods from final payment.

Payment for any goods under such Purchase Order shall not be deemed acceptance of the goods. If Participant discovers defects during the inspection process, the requirement for timely delivery under 6.2(a) will continue to run until Contractor resolves the defects and provides Participant with the applicable goods free of defects. The period for the delivery date for the goods will be tolled for the length of time Participant was in the inspection period until the time that Participant provided notice of defect to Contractor.

5.11. POST-INSPECTION REPAIR BY CONTRACTOR. In the event of non-acceptance of the bus, Contractor must begin Work within five (5) working days after receiving notification from Participant of failure of acceptance tests. Participant shall make the bus available to complete repairs timely with the Contractor repair schedule. If Contractor fails or refuses to begin the repairs within five (5) days, then the repair work may be done by Participant's personnel with reimbursement by Contractor. Contractor shall provide, at its own expense, all spare parts, tools and space required to complete the repairs. At Participant's option, Contractor may be required to remove the bus from Participant's property while repairs are being made. If the bus is removed from Participant's property, then repair procedures must be diligently pursued by Contractor's representatives, and Contractor shall assume risk of loss while the bus is under its control. Upon completion of repairs, the forteen (14) calendar day acceptance period shall re-commence as per section 5.9.

5.12. CONTRACTOR SERVICE AND PARTS SUPPORT. For each Participant Order, Contractor shall supply Participant with a completed *Exhibit D - Contractor Service and Parts Support Data* with contact information on the representatives responsible for assisting Participant, 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. Contractor shall also submit its policy on transportation charges for parts other than those covered by warranty.

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

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

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

5.14. TERMINATION FOR WITHDRAWAL OF FUNDING. If any Participant's expected or actual funding for purchases under this Master Contract are withdrawn, reduced, or limited in any way prior to the payment for the last bus accepted, Participant may, upon written notice to Contractor, terminate their Purchase Order for Transit Buses not yet accepted. If the Purchase Order is terminated as provided in this subsection: (1) Participant will be liable only for payment in accordance with the terms of this Contract for work performed satisfactorily up to the date of termination and materials on order that cannot be canceled; and (2) Contractor shall be released from any obligation to provide additional buses as are affected by the termination. The Contractor shall be paid its costs, including contract close-out costs, and profit on work performed up to the time of termination

5.15. FACILITY INSPECTIONS. Contractor shall provide right of access to its facilities to Enterprise Services, any Enterprise Services agents, Participant, any of Participants agents, or to any other authorized agent or official of the state of Washington or the federal government, at all reasonable times, in order to monitor and evaluate performance, compliance, and/or quality assurance under this Contract.

5.16. ON SITE REQUIREMENTS. While on Participant's premises, Contractor, its agents, employees, or subcontractors shall comply, in all respects, with Participant's physical, fire, access, safety, or other security requirements.

6. INVOICING & PAYMENT.

6.1. CONTRACTOR INVOICE. Contractor shall submit to Participant's designated invoicing contact properly itemized invoices. Such invoices shall itemize the following:

(a) Master Contract No. 06719

(b) Contractor name, address, telephone number, and email address for billing issues (i.e., Contractor Customer Service Representative)

(c) Contractor's Federal Tax Identification Number

(d) Date(s) of delivery

(e) Invoice amount; and

(f) Payment terms, including any available prompt payment discounts.

Contractor's invoices for payment shall reflect accurate Master Contract prices. Invoices will not be processed for payment until receipt of a complete invoice as specified herein.

6.2. PAYMENT. Payment is the sole responsibility of, and will be made by, the Participant. Payment is due within thirty (30) days of invoice. If Participant fails to make timely payment(s), Contractor may invoice Participant in the amount of one percent (1%) per month on the amount overdue or a minimum of $1. Payment will not be considered late if a check or warrant is mailed within the time specified. Contractor provides a prompt payment discount of 0.2192% for payments within 10 days of receipt of the invoice. This discount will only be provided for Participant payments within the stated time.

6.3. MILESTONE PAYMENTS. Participant and Contractor may condition payment on the achievement of various agreed upon milestones for the Transit Buses. Milestone payments will be mutually agreed upon by Participant and Contractor in regard to timing of milestone, acceptance of milestone, and amounts for milestone payments. Payment for milestones will follow the procedure for invoice payment.

6.4. OVERPAYMENTS. Contractor promptly shall refund to Participant the full amount of any erroneous payment or overpayment. Such refunds shall occur within thirty (30) days of written notice to Contractor; *Provided*, however, that Participant shall have the right to elect to have either direct payments or written credit memos issued. If Contractor fails to make timely payment(s) or issuance of such credit memos, Participant may impose a one percent (1%) per month on the amount overdue thirty (30) days after notice to the Contractor.

6.5. NO ADVANCE PAYMENT. No advance payments shall be made for any goods or services furnished by Contractor pursuant to this Master Contract.

6.6. NO ADDITIONAL CHARGES. Unless otherwise specified herein, Contractor shall not include or impose any additional charges including, but not limited to, charges for shipping, handling, or payment processing.

6.7. TAXES/FEES. Contractor promptly shall pay all applicable taxes on its operations and activities pertaining to this Master Contract. Failure to do so shall constitute breach of this Master Contract. Unless otherwise agreed, Participant shall pay applicable sales tax imposed by the tax jurisdictions in which delivery occurs on purchased goods and/or services. Contractor, however, shall not make any charge for federal excise taxes and Participant agrees to furnish Contractor with an exemption certificate where appropriate.

7. CONTRACT MANAGEMENT.

7.1. CONTRACT ADMINISTRATION & NOTICES. Except for legal notices, the parties hereby designate the following contract administrators as the respective single points of contact for purposes of this Master Contract. Enterprise Services' contract administrator shall provide Master Contract oversight. Contractor's contract administrator shall be Contractor's principal contact for business activities under this Master Contract. The parties may change contractor administrators by written notice as set forth below.

Any notices required or desired shall be in writing and sent by U.S. mail, postage prepaid, or sent via email, and shall be sent to the respective addressee at the respective address or email address set forth below or to such other address or email address as the parties may specify in writing:

Enterprise Services	**Contractor**
Attn: David Mgebroff	Attn:
Washington Dept. of Enterprise Services	
PO Box 41411	
Olympia, WA 98504-1411	
Tel: (360) 407-8049	Tel:
Email: david.mgebroff@des.wa.gov	Email:

Notices shall be deemed effective upon the earlier of receipt, if mailed, or, if emailed, upon transmission to the designated email address of said addressee.

7.2. CONTRACTOR CUSTOMER SERVICE REPRESENTATIVE. Contractor shall designate a customer service representative (and inform Enterprise Services of the same) who shall be responsible for addressing Participant issues pertaining to this Master Contract.

7.3. LEGAL NOTICES. Any legal notices required or desired shall be in writing and delivered by U.S. certified mail, return receipt requested, postage prepaid, or sent via email, and shall be sent to the respective addressee at the respective address or email address set forth below or to such other address or email address as the parties may specify in writing:

Enterprise Services	**Contractor**
Attn: Legal Services Manager	Attn:
Washington Dept. of Enterprise Services	
PO Box 41411	
Olympia, WA 98504-1411	
Email: greg.tolbert@des.wa.gov	Email:

Notices shall be deemed effective upon the earlier of receipt when delivered, or, if mailed, upon return receipt, or, if emailed, upon transmission to the designated email address of said addressee.

8. CONTRACTOR SALES REPORTING; VENDOR MANAGEMENT FEE; & CONTRACTOR REPORTS.

8.1. MASTER CONTRACT SALES REPORTING. Contractor shall report total Master Contract sales quarterly to Enterprise Services, as set forth below.

(a) Master Contract Sales Reporting System. Contractor shall report quarterly Master Contract sales in Enterprise Services' Master Contract Sales Reporting System. Enterprise Services will provide Contractor with a login password and a vendor

number. The password and vendor number will be provided to the Sales Reporting Representative(s) listed on Contractor's Bidder Profile.

(b) Data. Each sales report must identify every authorized Participant by name as it is known to Enterprise Services and its total combined sales amount invoiced during the reporting period (i.e., sales of an entire agency or political subdivision, not its individual subsections). The "Miscellaneous" option may be used only with prior approval by Enterprise Services. Upon request, Contractor shall provide contact information for all authorized Participants specified herein during the term of the Master Contract. If there are no Master Contract sales during the reporting period, Contractor must report zero sales.

(c) Due dates for Master Contract Sales Reporting. Quarterly Master Contract Sales Reports must be submitted electronically by the following deadlines for all sales invoiced during the applicable calendar quarter:

FOR CALENDAR QUARTER ENDING	MASTER CONTRACT SALES REPORT DUE
March 31:	April 30
June 30:	July 31
September 30:	October 31
December 31:	January 31

8.2. VENDOR MANAGEMENT FEE. Contractor shall pay to Enterprise Services a vendor management fee ("VMF") of 0.15 percent on the purchase price for all Master Contract sales (the purchase price is the total invoice price less applicable sales tax).

(a) The sum owed by Contractor to Enterprise Services as a result of the VMF is calculated as follows:

> Amount owed to Enterprise Services = Total Master Contract sales invoiced (not including sales tax) x .00150.

(b) The VMF must be rolled into Contractor's current pricing. The VMF must not be shown as a separate line item on any invoice unless specifically requested and approved by Enterprise Services.

(c) Enterprise Services will invoice Contractor quarterly based on Master Contract sales reported by Contractor. Contractors are not to remit payment until they receive an invoice from Enterprise Services. Contractor's VMF payment to Enterprise Services must reference this Master Contract number, work request number (if applicable), the year and quarter for which the VMF is being remitted, and the Contractor's name as set forth in this Master Contract, if not already included on the face of the check.

(d) Failure to accurately report total net sales, to submit a timely usage report, or remit timely payment of the VMF, may be cause for Master Contract suspension or termination or the exercise of other remedies provided by law. Without limiting any other available remedies, the Parties agree that Contractor's failure to remit to Enterprise Services timely payment of the VMF shall obligate Contractor to pay to Enterprise Services, to offset the administrative and transaction costs incurred by the

State to identify, process, and collect such sum, the sum of $200.00 or twenty-five percent (25%) of the outstanding amount, whichever is greater, or the maximum allowed by law, if less.

(e) Enterprise Services reserves the right, upon thirty (30) days advance written notice, to increase, reduce, or eliminate the VMF for subsequent purchases, and reserves the right to renegotiate Master Contract pricing with Contractor when any subsequent adjustment of the VMF might justify a change in pricing.

8.3. ANNUAL MASTER CONTRACT SALES REPORT. Contractor shall provide to Enterprise Services a detailed annual Master Contract sales report. Such report shall include, at a minimum: Product description, part number or other Product identifier, per unit quantities sold, and Master Contract price. This report must be provided in an electronic format that can be read by MS Excel.

9. RECORDS RETENTION & AUDITS.

9.1. RECORDS RETENTION. Contractor shall maintain books, records, documents, and other evidence pertaining to this Master Contract and orders placed by Participants under it to the extent and in such detail as shall adequately reflect performance and administration of payments and fees. Contractor shall retain such records for a period of six (6) years following expiration or termination of this Master Contract or final payment for any order placed by a Participant against this Master Contract, whichever is later; *Provided*, however, that if any litigation, claim, or audit is commenced prior to the expiration of this period, such period shall extend until all such litigation, claims, or audits have been resolved.

9.2. AUDIT. Enterprise Services reserves the right to audit, or have a designated third party audit, applicable records to ensure that Contractor has properly invoiced Participants and that Contractor has paid all applicable contract management fees. Accordingly, Contractor shall permit Enterprise Services, any Participant, and any other duly authorized agent of a governmental agency, to audit, inspect, examine, copy and/or transcribe Contractor's books, documents, papers and records directly pertinent to this Master Contract or orders placed by a Participant under it for the purpose of making audits, examinations, excerpts, and transcriptions. This right shall survive for a period of six (6) years following expiration or termination of this Master Contract or final payment for any order placed by a Participant against this Master Contract, whichever is later; *Provided*, however, that if any litigation, claim, or audit is commenced prior to the expiration of this period, such period shall extend until all such litigation, claims, or audits have been resolved. The Participants and their representatives and agents agree to enter into a confidentiality agreement with the Contractor prior to commencing an audit, review or analysis in order to protect and maintain the confidentiality of the Contractor's information.

9.3. OVERPAYMENT OF PURCHASES OR UNDERPAYMENT OF FEES. Without limiting any other remedy available to any Participant, Contractor shall (a) reimburse Participants for any overpayments inconsistent with the terms of this Master Contract or orders, at a rate of 125% of such overpayments, found as a result of the examination of the Contractor's records; and (b) reimburse Enterprise Services for any underpayment of fees, at a rate of 125% of such fees found as a result of the examination of the Contractor's records (e.g., if Contractor underpays the Vendor Management Fee by $500, Contractor would be required to pay to Enterprise Services $500 x 1.25 = $625).

10. INSURANCE.

10.1. REQUIRED INSURANCE. During the Term of this Master Contract, Contractor, at its expense, shall maintain in full force and effect the insurance coverages set forth in *Exhibit C – Insurance Requirements*. All costs for insurance, including any payments of deductible amounts, shall be considered incidental to and included in the prices for goods/services and no additional payment shall be made.

10.2. WORKERS COMPENSATION. Contractor shall comply with applicable workers compensation statutes and regulations (e.g., RCW Title 51, Industrial Insurance). If Contractor fails to provide industrial insurance coverage or fails to pay premiums or penalties on behalf of its employees as may be required by law, Enterprise Services may terminate this Master Contract. This provision does not waive any of the Washington State Department of Labor and Industries (L&I) rights to collect from Contractor. In addition, Contractor waives its immunity under RCW Title 51 to the extent it is required to indemnify, defend, and hold harmless the State of Washington and its agencies, officials, agents, or employees.

11. WARRANTY.

11.1. CONTRACTOR WARRANTY. Warranties in this document are in addition to any statutory remedies or warranties imposed on Contractor. Consistent with this requirement, Contractor warrants and guarantees to Participant each complete Transit Bus and specific subsystems and components as follows.

Contractor warrants the Transit Buses are of good material and workmanship and agrees to promptly replace any part or parts, at no cost to the Participant, which by reason of defective materials or workmanship fail under normal use, free of negligence or accident during the applicable warranty period. Contractor warranties include the replacement of parts and services associated with the replacement and repair, including but not limited to any diagnostic, refurbishment, shipping, or travel costs.

Performance requirements based on design criteria will not be deemed a warranty item. Contractor shall insure in its procurement arrangements that the warranty requirements of this Master Contract are enforceable through and against the Contractor's suppliers, vendors, material men, and subcontractors. Any inconsistency or difference between the warranties extended to Participants by Contractor and those extended to Contractor by its suppliers, vendors, material men, and subcontractors, are at the risk and expense of Contractor. Such inconsistency or difference will not excuse Contractor's full compliance with its obligations under this Contract.

11.2. WARRANTY INFORMATION. Upon Participant’s request, Contractor promptly shall provide complete copies of all written warranties or guarantees and documentation of any other arrangement relating to such warranties or guarantees extended by Contractor's suppliers, sub-suppliers, vendors, material men, and subcontractors covering parts, components, and systems utilized in the bus. Contractor shall ensure that such suppliers, sub-suppliers, vendors, material men, and subcontractors satisfactorily perform warranty related work when requested to do so by Participant.

11.3. SYSTEM WARRANTIES. The following systems are warranted to be free from defects and related defects for the years and mileage listed in the table below, whichever comes first. Each warranty is based on regular operation of the bus under the operating conditions prevailing in Participant’s locale.

Warranty	Description	Years/Mileage
Complete Bus	Complete bus, propulsion system, components, major subsystems, and body and chassis structure	2 years, 100,000 miles; Class 1 or 2 Failures: 12 years, 500,000 miles
Body And Chassis Structure	Body, body structure, structural elements of the suspension and engine cradle	3 years, 150,000 miles
Body and Chassis Corrosion Failure or Fatigue Failure	Primary load-carrying members of the bus structure, including structural elements of the suspension	Class 1 or 2 Failures: 12 years, 500,000 miles
Propulsion System (Diesel, CNG, Hybrid)	engine, transmission or drive motors, and generators (for hybrid technology) and drive and non-drive axles	2 years, 100,000 miles
Propulsion System (Electric)	traction motors, traction motor controllers, transmission, drive motors, drive and non-drive axles, and any other propulsion system-related replacement component	5 years, 300,000 miles
Energy Storage System	traction battery, Battery Management System, and any other ESS-related replacement component	2 years, unlimited miles
Emission Control System	complete exhaust system, including catalytic converter (if required), after treatment device, components identified as emission control devices	5 years, 100,000 miles

The ESS is warranted to remain within warrantable end of life during the warranty period. The ESS original specified energy storage capacity and warrantable end of life, as a percentage of the original specified energy capacity, must be clearly defined by the Contractor. Acceptable methods for measuring or obtaining ESS storage capacity with respect to its original specified capacity must be clearly identified by the manufacturer. The manufacturer will propose the test method, and certify the results are true and accurate. The test will be performed according to a documented test procedure. Participant may engage third-parties for capacity testing.

11.4. SUBSYSTEMS WARRANTY. The Contractor warrants the following subsystems to be free from defects and related defects for at least two years or 100,000 miles, whichever comes first.

- Brake system: Foundation brake components, including advancing mechanisms, as supplied with the axles, excluding friction surfaces.
- Destination signs: All destination sign equipment for the front, side and rear signs, power modules and operator control.
- Heating, ventilating: Roof and/or rear main unit only, excluding floor heaters and front defroster.
- AC unit and compressor: Roof and/or rear main unit only, excluding floor heaters and front defroster.
- Door systems: Door operating actuators and linkages.
- Air compressor.
- Air dryer.
- Wheelchair lift and ramp system: Lift and/or ramp parts and mechanical only.

- Starter.
- Alternator: Alternator only. Does not include the drive system.
- Charge air cooler: Charge air cooler including core, tanks and including related surrounding framework and fittings.
- Fire suppression: Fire suppression system including tank and extinguishing agent dispensing system.
- Hydraulic systems: Including radiator fan drive and power steering as applicable.
- Propulsion cooling systems: Radiator including core, tanks and related framework, including surge tank. Transmission cooler.
- Power electronics: DC/DC converters, inverters, if supplied
- Passenger seating excluding upholstery.
- Fuel storage and delivery system.
- Surveillance system including cameras and video recorders.

Contractor warrants the following subsystems to be free from defects and related defects for at least 2 years or 100,000 miles, whichever comes first:

- Low voltage and high voltage electrical wiring and harnesses

11.5. SERIAL NUMBERS. Prior to final delivery of each bus, Contractor shall provide a complete electronic list of serialized units installed on each bus to facilitate warranty tracking. The list will include, but is not limited to the following:

- Engine
- Transmission or Traction Motor
- Alternator
- Starter
- Destination/Luminator (Major components)
- Drive axle and non-drive axle(s)
- DVR unit, supporting electronics (Monitors)
- Driver's seat
- Battery equalizer
- Radiator package
- Exhaust emission components
- A/C compressor and condenser/evaporator unit
- Power steering unit
- Fuel cylinders (if applicable)
- Air compressor
- Wheelchair ramp (if applicable)

Contractor shall provide updated serial numbers resulting from warranty campaigns. The format of the list will be approved by Participant prior to delivery of the first production bus.

11.6. 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.

11.7. VOIDING OF WARRANTY. The warranty will not apply to the failure of any part or component of the bus that directly results from misuse, negligence, accident, or repairs not conducted in accordance with the Contractor-provided maintenance manuals and with workmanship performed by adequately trained personnel in accordance with recognized standards of the industry. The warranty will be void if Participant 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. Participant should maintain documentation, auditable by Contractor, verifying service activities in conformance with the Contractor's maintenance manuals.

11.8. EXCEPTIONS AND ADDITIONS TO WARRANTY. Warranties will not apply to the following items:

- scheduled maintenance items
- normal wear-out items, such as brake linings, filters, belts, and wiper blades
- items furnished by Participant

Should Participant require the use of a specific product and has rejected Contractor's request for an alternate product, then the standard supplier warranty for that product will be the only warranty provided to Participant. This product will not be eligible under "Fleet Defects," below.

11.9. PASS-THROUGH/SUPERIOR WARRANTY. If any vendor to the Contractor offers, at no additional cost, a warranty on a component that is longer or more comprehensive than the required warranties on this Contract, Contractor shall inform Participant of the additional warranty and pass it through to Participant at no additional cost.

Contractor shall state in writing that Participant's warranty reimbursements will not be impacted. Contractor also shall state in writing any exceptions and reimbursement including all costs incurred in transport of vehicles and/or components. At any time during the warranty period, Contractor may request approval from Participant to assign its warranty obligations to others, but only on a case-by-case basis approved in writing by Participant. Otherwise, Contractor shall be solely responsible for the administration of the warranty as specified. Warranty administration by others does not eliminate the warranty liability and responsibility of Contractor.

11.10. FLEET DEFECTS. "Fleet Defect" means cumulative failures of twenty (20%) percent of the same components in the same or similar application in a minimum fleet size of twelve (12) or more buses where such items are covered by warranty. A Fleet Defect applies only to the base warranty period in for Complete Bus, Propulsion System, and Subsystems Warranty. When a Fleet Defect is declared, the remaining warranty period on that item/component is suspended. The warranty period does not resume until the Fleet Defect is corrected.

For the purpose of Fleet Defects, each order shall be treated as a separate bus fleet. In addition, if there is a change in a major component within the order, the buses containing the new major component will become a separate bus fleet for the purposes of determining Fleet Defects.

Contractor shall correct a Fleet Defect under the warranty provisions defined in Section 13 Repair Procedure. After correcting the Fleet Defect, Participant and Contractor shall mutually agree to and Contractor shall promptly undertake and complete a work program reasonably designed to prevent the occurrence of the same Fleet Defect in all other buses and spare parts purchased under the order. Where the specific Fleet Defect is solely attributed to particular identifiable parts, the work program will include redesign and/or replacement of only the defectively designed and/or manufactured parts. In all other cases, the work program will include inspection and/or correction of all the buses in the fleet via a mutually agreed-to arrangement. Contractor shall update, as necessary, technical support information (parts, service and operator's manuals) due to changes resulting from warranty repairs. Participant may immediately declare a defect in design resulting in a safety hazard to be a Fleet Defect. Contractor shall be responsible to furnish, install and replace all defective units.

The Fleet Defect warranty provisions do not apply to Participant-supplied items, such as radios, fare collection equipment, communication systems, and tires. In addition, Fleet Defects do not apply to interior and exterior finishes, hoses, fittings, and fabric.

12. REPAIR PROCEDURE.

12.1. REPAIR PERFORMANCE. Contractor is responsible for all warranty-covered repair work, including diagnostics of warranty covered parts. To the extent practicable, Participant will allow Contractor or its designated representative to perform repair work. At its discretion, Participant may perform such repair work if it determines it needs to do so based on transit service or other requirements. Contractor shall reimburse Participant for any warranty-covered repair work it performs. Minor/Major Warranty-covered repairs may be carried out by the Purchaser and reimbursed through New Flyer's on-line warranty system. New Flyer is available to assist in completing these warranty-covered repairs if needed. Whenever feasible and mutually beneficial, the Purchser may provide a work space for New Flyer to accomplish the repair onsite as needed. This allows us to work with the Purchaser to return the bus to revenue service as quickly as possible. If shop space is unavailable, New Flyer will utilize one of its three subcontractors (Top Tempo, Tri-State, Coach Retrofit) with their own service facilities within the State of Washington area to perform the repairs and get the buses back into revenue service as soon as possible. In addition, Contractor can utilize its service centers for repairs within the State of Washington as needed. Major Component Warranty repairs should be carried out by the equipment suppliers (Engine, Transmission, Propulsion System, High Voltage Batteries, HVAC and Destination Sign Suppliers) in order to adhere to their mandate that all warranty repairs be performed by an authorized dealer unless the Purchaser is an authorized warranty center. If the Purchaser elects to perform these repairs, without the written permission of the original equipment manufacturer, the remaining warranty coverage may be voided

12.2. REPAIRS BY THE CONTRACTOR. Participant shall notify Contractor's designated representative within thirty (30) days if Participant detects a defect within the warranty periods defined in this Master Contract or the applicable Participant Order. Contractor or its designated representative shall, if requested, begin repair work on warranty-covered repairs within five (5) calendar days after receiving notification of a defect from Participant. Participant will make the bus available to complete repairs timely with the Contractor's repair schedule.

Contractor shall provide at its own expense all spare parts, tools, and space required to complete repairs. At Participant's option, Contractor may be required to remove the bus from Participant's property while repairs are made. If the bus is removed from Participant's property, then repair procedures must be diligently pursued by Contractor's representative.

12.3. REPAIRS BY PARTICIPANT. If Participant performs the warranty-covered repairs, then it must correct or repair the defect and any related defects utilizing parts supplied by Contractor specifically for this repair. At its discretion, Participant may use Contractor-specified parts available from its own stock if deemed in its best interests. Parts supplied by Contractor may be remanufactured but must have the same form, fit and function, and warranty. The parts will be shipped prepaid to Participant from any source selected by Contractor within fourteen (14) days of receipt of the request for said parts and shall not be subject to a handling charge.

12.4. DEFECTIVE COMPONENT RETURN. Contractor may request that parts covered by the warranty be returned to the manufacturing plant. Contractor will pay the freight costs for this action.

12.5. FAILURE ANALYSIS. Upon specific request of Participant, Contractor will provide a failure analysis of Fleet Defect or safety-related parts, or major components, removed from buses under the terms of the warranty that could affect fleet operation. Such reports will be delivered within 60 days of the receipt of failed parts.

12.6. REIMBURSEMENT FOR LABOR AND OTHER RELATED COSTS. Contractor shall reimburse Participant for repair labor. The amount is determined by Participant for a qualified mechanic at a straight time wage rate per hour, which includes fringe benefits and overhead adjusted for Participant's most recently published rate in effect at the time the repair work is performed, plus the cost of towing the bus if such action was necessary and if the bus was in the normal service area. These wage and fringe benefit rates shall not exceed the rates in effect in Participant's service garage at the time the defect correction is made.

12.7. REIMBURSEMENT FOR PARTS. Contractor shall reimburse Participant for defective parts and for parts that must be replaced to correct the defect. The reimbursement will be at the current price at the time of repair and include taxes where applicable, plus fifteen (15) percent handling costs. Handling costs will not be paid if parts are supplied by Contractor and shipped to Participant.

12.8. REIMBURSEMENT REQUIREMENTS. Contractor shall respond to parts warranty claims with an accept/reject decision including necessary failure analysis no later than sixty (60) days after Participant 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. Participant may dispute rejected claims or claims for which Contractor did not reimburse the full amount. Contractor and Participant will review disputed warranty claims during the following quarter to reach an equitable decision to permit the disputed claim to be resolved and closed. Contractor and Participant will review all claims at least once per quarter throughout the entire warranty period to ensure that open claims are being tracked and properly dispositioned.

12.9. WARRANTY AFTER REPLACEMENT/REPAIRS. If any component, unit, or subsystem is repaired, rebuilt, or replaced by Contractor or by Participant with the concurrence of Contractor, then the component, unit, or subsystem will have the unexpired warranty period of the original. Repairs will not be warranted if Contractor-provided or authorized parts are not used for the repair, unless Contractor has failed to respond within five days, in accordance with Section 13.2 Repairs by the Contractor.

If an item is declared to be a Fleet Defect, then the warranty stops with the declaration of the Fleet Defect. Once the Fleet Defect is corrected, the items shall have three (3) months or the remaining time and/or miles of the original warranty, whichever is greater. This remaining warranty period will begin on the repair/replacement date for corrected items on each bus if the repairs are completed by Contractor or on the date Contractor provides all parts to Participant if repairs are completed by Participant.

12.10. WARRANTY PROCESSING PROCEDURES. The following list represents information required by Contractor from the Participant for processing warranty claims. One failure per bus per claim is allowed.

- bus number and VIN
- total vehicle life mileage at time of repair
- date of failure/repair
- acceptance/in-service date
- Contractor part number and description
- component serial number
- description of failure
- all costs associated with each failure/repair (invoices may be required for third-party costs):
    - towing

- road calls
- labor
- materials
- parts
- handling
- troubleshooting time

The Participant's forms will be accepted by Contractor if all of the above information is included. Electronic submittal may be used if available between Contractor and Participant.

12.11. RETURN OF PARTS. When returning defective parts to Contractor, Participant will tag each part with the following:

- bus number and VIN
- claim number
- part number
- serial number (if available)

12.12. 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.

13. QUALITY ASSURANCE

13.1. QUALITY ASSURANCE ORGANIZATION ESTABLISHMENT. Contractor shall establish and maintain an effective in-plant quality assurance organization.

13.2. QUALITY CONTROL. The quality assurance organization shall exercise quality control over all phases of production, from initiation of design through manufacture and preparation for delivery. The organization shall also control the quality of supplied articles.

13.3. 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.

13.4. MINIMUM FUNCTIONS. The quality assurance organization shall include the following minimum functions:

- Work instructions: The quality assurance organization shall verify inspection operation instructions to ascertain that the manufactured product meets all prescribed requirements.

- Records maintenance: The quality assurance organization shall maintain and use records and data essential to the effective operation of its program. These records and data shall be available for review by the resident inspectors. Inspection and test records for this procurement shall be available for a minimum of one year after inspections and tests are completed.

- Corrective action: The quality assurance organization shall detect and promptly ensure correction of any conditions that may result in the production of defective transit buses. These conditions may occur in designs, purchases, manufacture, tests or operations that culminate in defective supplies, services, facilities, technical data or standards.

13.5. BASIC STANDARDS AND FACILITIES. The following standards and facilities shall be basic in the quality assurance process:

- Configuration control: Contractor shall maintain drawings, assembly procedures and other documentation that completely describe a qualified bus that meets all of the options and special requirements of each Purchase Order. The quality assurance organization shall verify that each transit bus is manufactured in accordance with these controlled drawings, procedures and documentation.

- Measuring and testing facilities: Contractor shall provide and maintain the necessary gauges and other measuring and testing devices for use by the quality assurance organization to verify that the buses conform to all specification requirements. These devices shall be calibrated at established periods against certified measurement standards that have known, valid relationships to national standards.

- Production tooling as media of inspection: When production jigs, fixtures, tooling masters, templates, patterns and other devices are used as media of inspection, they shall be proved for accuracy at formally established intervals and adjusted, replaced or repaired as required to maintain quality.

- Equipment use by resident inspectors: Contractor's gauges and other measuring and testing devices shall be made available for use by the resident inspectors to verify that the buses conform to all specification requirements. If necessary, the Contractor's personnel shall be made available to operate the devices and to verify their condition and accuracy.

13.6. MAINTENANCE OF CONTROL. Contractor shall maintain quality control of purchases:

- Supplier control: Contractor shall require each supplier to maintain a quality control program for the services and supplies that it provides. Contractor's quality assurance organization shall inspect and test materials provided by suppliers for conformance to specification requirements. Materials that have been inspected, tested and approved shall be identified as acceptable to the point of use in the manufacturing or assembly processes. Controls shall be established to prevent inadvertent use of nonconforming materials.

- Purchasing data: Contractor shall verify that all applicable specification requirements are properly included or referenced in purchase orders of articles to be used on transit buses.

13.7. MANUFACTURING CONTROL. Contractor shall maintain quality control of production:

- Controlled conditions: Contractor shall ensure that all basic production operations, as well as all other processing and fabricating, are performed under controlled conditions. Establishment of these controlled conditions shall be based on the documented work instructions, adequate production equipment and special working environments if necessary.

- Completed items: A system for final inspection and test of completed transit buses shall be provided by the quality assurance organization. It shall measure the overall quality of each completed bus.

- Nonconforming materials: The quality assurance organization shall monitor the Contractor's system for controlling nonconforming materials. The system shall include procedures for identification, segregation and disposition.

- Statistical techniques: Statistical analysis, tests and other quality control procedures may be used when appropriate in the quality assurance processes.

- Inspection status: A system shall be maintained by the quality assurance organization for identifying the inspection status of components and completed transit buses. Identification may include cards, tags or other normal quality control devices.

13.8. Inspection System. The quality assurance organization shall establish, maintain and periodically audit a fully documented inspection system. The system shall prescribe inspection and test of materials, Work in process and completed articles. At 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.

14. CLAIMS.

14.1. ASSUMPTION OF RISKS; CLAIMS BETWEEN THE PARTIES. Contractor assumes sole responsibility and all risks of personal injury or property damage to itself and its employees, and agents in connection with its operations under this Master Contract. For certainty, the Participants shall assume risk of loss of the bus on delivery. Prior to delivery, the Contractor shall have risk of loss of the bus. Neither Enterprise Services nor any Participant has made any representations regarding any factor affecting Contractor's risks. Contractor shall pay for all damage to any Participant's property resulting directly or indirectly from its acts or omissions under this Master Contract.

14.2. THIRD-PARTY CLAIMS; INDEMNITY. To the fullest extent permitted by law, Contractor shall defend, indemnify, and hold harmless Enterprise Services and any Participant and their employees and agents from and against all claims, demands, judgments, assessments, damages, penalties, fines, costs, liabilities or losses including, without limitation, sums paid in settlement of claims, attorneys' fees, consultant fees, and expert fees (collectively "claims") arising from any act or omission of Contractor or its successors, agents, and subcontractors under this Master Contract, except claims caused solely by Enterprise Services or any Participants' negligence. Contractor

shall take all steps needed to keep Participant's property free of liens arising from Contractor's activities, and promptly obtain or bond the release of any such liens that may be filed.

15. DISPUTE RESOLUTION.

15.1. DISPUTE PROCEDURE. The parties shall cooperate to resolve any dispute pertaining to this Master Contract efficiently, as timely as practicable, and at the lowest possible level with authority to resolve such dispute. If, however, a dispute persists and cannot be resolved, it may be escalated within each organization. In such situation, upon notice by either party, each party, within five (5) business days shall reduce its description of the dispute to writing and deliver it to the other party. The receiving party then shall have three (3) business days to review and respond in writing. In the event that the parties cannot then agree on a resolution of the dispute, the parties shall schedule a conference between the respective senior manager of each organization to attempt to resolve the dispute. In the event the parties cannot agree, either party may resort to court to resolve the dispute.

15.2. PERFORMANCE DURING DISPUTE. Unless otherwise directed by Enterprise Services, Contractor shall continue performance under this Master Contract while matters in dispute are being resolved.

16. SUSPENSION & TERMINATION.

16.1. SUSPENSION & TERMINATION FOR DEFAULT. Enterprise Services may suspend Contractor's operations under this Master Contract immediately by written cure notice of any default. In such case, the notice of suspension will state the time period in which cure is permitted and other appropriate conditions. Suspension shall continue until the default is remedied to Enterprise Services' reasonable satisfaction; *Provided*, however, that, if after thirty (30) days from such a suspension notice, Contractor remains in default, Enterprise Services may terminate Contractor's rights under this Master Contract. All of Contractor's obligations to Enterprise Services and Participants survive termination of Contractor's rights under this Master Contract, until such obligations have been fulfilled.

16.2. DEFAULT. Each of the following events shall constitute default of this Master Contract by Contractor:

(a) Contractor fails to perform or comply with any of the terms or conditions of this Master Contract including, but not limited to, Contractor's obligation to pay vendor management fees when due;

(b) Contractor breaches any representation or warranty provided herein; or

(c) Contractor enters into proceedings relating to bankruptcy, whether voluntary or involuntary.

16.3. REMEDIES FOR DEFAULT.

(a) Enterprise Services' rights to suspend and terminate Contractor's rights under this Master Contract are in addition to all other available remedies.

(b) In the event of termination for default, Enterprise Services may exercise any remedy provided by law including, without limitation, the right to procure for all Participants replacement goods and/or services. In such event, Contractor shall be liable to Enterprise Services for damages as authorized by law including, but not limited to, any price difference between the Master Contract price and the replacement or cover price.

16.4. LIMITATION ON DAMAGES. Notwithstanding any provision to the contrary, the parties agree that in no event shall any party or Participant be liable to the other for exemplary or punitive damages.

16.5. GOVERNMENTAL TERMINATION.

(a) Termination for Withdrawal of Authority. Enterprise Services may suspend or terminate this Master Contract if, during the term hereof, Enterprise Services' procurement authority is withdrawn, reduced, or limited such that Enterprise Services, in its judgment, would lack authority to enter into this Master Contract; *Provided*, however, that such suspension or termination for withdrawal of authority shall only be effective upon twenty (20) days prior written notice; and *Provided further*, that such suspension or termination for withdrawal of authority shall not relieve any Participant from payment for goods and/or services already ordered as of the effective date of such notice. Except as stated in this provision, in the event of such suspension or termination for withdrawal of authority, neither Enterprise Services nor any Participant shall have any obligation or liability to Contractor.

(b) TERMINATION FOR CHANGE OF AUTHORITY. Enterprise Services may suspend or terminate this Master Contract if, during the term hereof, federal procurement authority is withdrawn, reduced, or limited such that Enterprise Services, in its judgment, would lack authority to enter into this Master Contract as a State Cooperative Purchasing Schedule under applicable federal law; Provided, however, that such suspension or termination for withdrawal of authority shall only be effective upon twenty (20) days prior written notice; and Provided further, that such suspension or termination for withdrawal of authority shall not relieve any Participant from payment for goods and/or services already ordered as of the effective date of such notice. Except as stated in this provision, in the event of such suspension or termination for withdrawal of authority, neither Enterprise Services nor any Participant shall have any obligation or liability to Contractor.

(c) TERMINATION FOR PUBLIC CONVENIENCE. Enterprise Services, for public convenience, may terminate this Master Contract; *Provided*, however, that such termination for public convenience must, in Enterprise Services' judgment, be in the best interest of the State of Washington; and *Provided further*, that such termination for public convenience shall only be effective upon sixty (60) days prior written notice; and *Provided further*, that such termination for public convenience shall not relieve any Participant from payment for goods and/or services already ordered as of the effective date of such notice. Except as stated in this provision, in the event of such termination for public convenience, neither Enterprise Services nor any Participant shall have any obligation or liability to Contractor.

(d) PAYMENT UPON TERMINATION. In the event of termination for any reason under this Section 16, the Contractor shall be paid its costs, including contract close-out costs, and profit on work performed up to the time of termination.

16.6. TERMINATION PROCEDURE. Regardless of basis, in the event of suspension or termination (in full or in part), the parties shall cooperate to ensure an orderly and efficient suspension or termination. Accordingly, Contractor shall deliver to Participants all goods and/or services that are complete (or with approval from Enterprise Services, substantially complete) and Participants shall inspect, accept, and pay for the same in accordance with this Master Contract and the applicable

Purchase Order. Unless directed by Enterprise Services to the contrary, Contractor shall not process any orders after notice of suspension or termination inconsistent therewith.

17. FTA ROLE IN DISPUTES, BREACHES, DEFAULTS, OR OTHER LITIGATION.

17.1. FTA INTEREST. The U.S. Federal Transit Administration ("FTA") has a vested interest in the settlement of any violation of federal law, regulation, or requirement, or any disagreement involving the award, this Master Contract, and any amendments thereto including, but not limited to, a default, breach, major dispute, or litigation. Accordingly, FTA shall have the right to concur in such any settlement or compromise.

17.2. NOTIFICATION TO FTA. If a current or prospective legal matter that may affect the Federal Government emerges, Enterprise Services and Participant promptly shall notify the FTA Chief Counsel, or FTA Regional Counsel for the Region in which Enterprise Services and Participant are located.

1. The types of legal matters that require notification include, but are not limited to, a major dispute, breach, default, litigation, or naming the Federal Government as a party to litigation or a legal disagreement in any forum for any reason.

2. Matters that may affect the Federal Government include, but are not limited to, the Federal Government's interests in the award, this Master Contract, and any amendments thereto, or the Federal Government's administration or enforcement of federal laws, regulations, and requirements.

3. If Enterprise Services or Participant have credible evidence that a Principal, Official, Employee, Agent, or Third Party Participant of Enterprise Services or Participant, or other person has submitted a false claim under the False Claims Act, 31 U.S.C. § 3729 et seq., or has committed a criminal or civil violation of law pertaining to such matters as fraud, conflict of interest, bribery, gratuity, or similar misconduct involving federal assistance, Enterprise Services and Participant promptly shall notify the U.S. DOT Inspector General, in addition to the FTA Chief Counsel or Regional Counsel for the Region in which the Enterprise Services and Participant are located.

17.3. FEDERAL INTEREST IN RECOVERY. The Federal Government retains the right to a proportionate share of any proceeds recovered from any third party, based on the percentage of the federal share for this Master Contract.

18. GENERAL PROVISIONS.

18.1. TIME IS OF THE ESSENCE. Time is of the essence for each and every provision of this Master Contract.

18.2. COMPLIANCE WITH LAW. Contractor shall comply with all applicable law.

18.3. INTEGRATED AGREEMENT. This Master Contract constitutes the entire agreement and understanding of the parties with respect to the subject matter and supersedes all prior negotiations, representations, and understandings between them. There are no representations or understandings of any kind not set forth herein.

18.4. AMENDMENT OR MODIFICATION. Except as set forth herein, this Master Contract may not be amended or modified except in writing and signed by a duly authorized representative of each party.

18.5. AUTHORITY. Each party to this Master Contract, and each individual signing on behalf of each party, hereby represents and warrants to the other that it has full power and authority to enter

into this Master Contract and that its execution, delivery, and performance of this Master Contract has been fully authorized and approved, and that no further approvals or consents are required to bind such party.

18.6. NO AGENCY. The parties agree that no agency, partnership, or joint venture of any kind shall be or is intended to be created by or under this Master Contract. Neither party is an agent of the other party nor authorized to obligate it.

18.7. ASSIGNMENT. Contractor may not assign its rights under this Master Contract without Enterprise Services' prior written consent and Enterprise Services may consider any attempted assignment without such consent to be void; *Provided*, however, that, if Contractor provides written notice to Enterprise Services within thirty (30) days, Contractor may assign its rights under this Master Contract in full to any parent, subsidiary, or affiliate of Contractor that controls or is controlled by or under common control with Contractor, is merged or consolidated with Contractor, or purchases a majority or controlling interest in the ownership or assets of Contractor. Unless otherwise agreed, Contractor guarantees prompt performance of all obligations under this Master Contract notwithstanding any prior assignment of its rights.

18.8. BINDING EFFECT; SUCCESSORS & ASSIGNS. This Master Contract shall be binding upon and shall inure to the benefit of the parties hereto and their respective successors and assigns.

18.9. PUBLIC INFORMATION. This Master Contract and all related documents are subject to public disclosure as required by Washington's Public Records Act, RCW chapter 42.56. The Purchase Order and all related documents are subject to the public disclosure requirements of the Participant's jurisdiction.

18.10. ASSIGNMENT OF ANTITRUST RIGHTS REGARDING PURCHASED GOODS/SERVICES. Contractor irrevocably assigns to Enterprise Services, on behalf of the State of Washington, or any applicable Participant any claim for relief or cause of action which the Contractor now has or which may accrue to the Contractor in the future by reason of any violation of state or federal antitrust laws in connection with any Transit Buses provided in Washington for the purpose of carrying out the Contractor's obligations under this Master Contract, including, at Enterprise Services' option, the right to control any such litigation on such claim for relief or cause of action.

18.11. FEDERAL FUNDS. To the extent that any Participant uses federal funds to purchase goods and/or services pursuant to this Master Contract, such Participant shall specify, with its order, any applicable requirement or certification that must be satisfied by Contractor at the time the order is placed or upon delivery.

18.12. SEVERABILITY. If any provision of this Master Contract is held to be invalid or unenforceable, such provision shall not affect or invalidate the remainder of this Master Contract, and to this end the provisions of this Master Contract are declared to be severable. If such invalidity becomes known or apparent to the parties, the parties agree to negotiate promptly in good faith in an attempt to amend such provision as nearly as possible to be consistent with the intent of this Master Contract.

18.13. WAIVER. Failure of either party to insist upon the strict performance of any of the terms and conditions hereof, or failure to exercise any rights or remedies provided herein or by law, or to notify the other party in the event of breach, shall not release the other party of any of its obligations under this Master Contract, nor shall any purported oral modification or rescission of this Master Contract by either party operate as a waiver of any of the terms hereof. No waiver by either party of any breach, default, or violation of any term, warranty, representation,

contract, covenant, right, condition, or provision hereof shall constitute waiver of any subsequent breach, default, or violation of the same or other term, warranty, representation, contract, covenant, right, condition, or provision.

18.14. SURVIVAL. All representations, warranties, covenants, agreements, and indemnities set forth in or otherwise made pursuant to this Master Contract shall survive and remain in effect following the expiration or termination of this Master Contract, *Provided*, however, that nothing herein is intended to extend the survival beyond any applicable statute of limitations periods.

18.15. GOVERNING LAW. The validity, construction, performance, and enforcement of this Master Contract shall be governed by and construed in accordance with the laws of the State of Washington, without regard to its choice of law rules. The validity, construction, performance, and enforcement of Purchase Orders shall be governed by and construed in accordance with the laws of the Participant's jurisdiction.

18.16. JURISDICTION & VENUE. In the event that any action is brought to enforce any provision of this Master Contract, the parties agree to exclusive jurisdiction in Thurston County Superior Court for the State of Washington and agree that in any such action venue shall lie exclusively at Olympia, Washington. In the event that any action is brought to enforce any provision of a Purchase Order, the parties agree to submit to exclusive jurisdiction and venue in the Participant's jurisdiction.

18.17. ATTORNEYS' FEES. Should any legal action or proceeding be commenced by either party in order to enforce this Master Contract or any provision hereof, or in connection with any alleged dispute, breach, default, or misrepresentation in connection with any provision herein contained, the prevailing party shall be entitled to recover reasonable attorneys' fees and costs incurred in connection with such action or proceeding, including costs of pursuing or defending any legal action, including, without limitation, any appeal, discovery, or negotiation and preparation of settlement arrangements, in addition to such other relief as may be granted.

18.18. FAIR CONSTRUCTION & INTERPRETATION. The provisions of this Master Contract shall be construed as a whole according to their common meaning and not strictly for or against any party and consistent with the provisions contained herein in order to achieve the objectives and purposes of this Master Contract. Each party hereto and its counsel has reviewed and revised this Master Contract and agrees that the normal rules of construction to the effect that any ambiguities are to be resolved against the drafting party shall not be construed in the interpretation of this Master Contract. Each term and provision of this Master Contract to be performed by either party shall be construed to be both a covenant and a condition.

18.19. FURTHER ASSURANCES. In addition to the actions specifically mentioned in this Master Contract, the parties and any applicable Participant shall each do whatever may reasonably be necessary to accomplish the transactions contemplated in this Master Contract including, without limitation, executing any additional documents reasonably necessary to effectuate the provisions and purposes of this Master Contract.

18.20. EXHIBITS. All exhibits referred to herein are deemed to be incorporated in this Master Contract in their entirety.

18.21. CAPTIONS & HEADINGS. The captions and headings in this Master Contract are for convenience only and are not intended to, and shall not be construed to, limit, enlarge, or affect the scope or intent of this Master Contract nor the meaning of any provisions hereof.

18.22. ELECTRONIC SIGNATURES. A signed copy of this Master Contract or any other ancillary agreement transmitted by facsimile, email, or other means of electronic transmission shall be deemed to have the same legal effect as delivery of an original executed copy of this Master Contract or such other ancillary agreement for all purposes.

18.23. COUNTERPARTS. This Master Contract may be executed in any number of counterparts, each of which shall be deemed an original and all of which counterparts together shall constitute the same instrument which may be sufficiently evidenced by one counterpart. Execution of this Master Contract at different times and places by the parties shall not affect the validity thereof so long as all the parties hereto execute a counterpart of this Master Contract.

EXECUTED as of the date and year first above written.

STATE OF WASHINGTON
Department of Enterprise Services

By: Elena McGrew
Elena McGrew
Its: Enterprise Procurement Manager

NEW FLYER OF AMERICA INC.,
a North Dakota corporation

By: Jennifer McNeill
Jennifer McNeill
Its: Vice President, Sales and Marketing

NEW FLYER OF AMERICA INC.,
a North Dakota corporation

By: Chris Stoddart
Chris Stoddart
Its: President, New Flyer

Included Transit Buses

Contractor is authorized to sell Heavy Duty Transit Buses in the categories awarded, including applicable accessories, components, subsystems, and replacement parts necessary for operation of the transit buses for its operational life. Transit buses offered under this Master Contract will comply with the specifications listed in the attached specification document.

[attached as a separate document]

Exhibit B

Prices for Heavy Duty Transit Buses

Prices for Heavy Duty Transit Buses as listed in the attached Heavy Duty Price Sheet.

[attached as a separate document]

Exhibit C

Insurance Requirements

1. **INSURANCE OBLIGATION**. During the Term of this Master Contract, Contractor shall possess and maintain in full force and effect, at Contractor's sole expense, the following insurance coverages:

    a. COMMERCIAL GENERAL LIABILITY INSURANCE. Commercial general liability insurance (and, if necessary, commercial umbrella liability insurance) covering bodily injury and property damage, personal injury, and advertising injury liability on an 'occurrence form' that shall be no less comprehensive and no more restrictive than the coverage provided by Insurance Services Office (ISO) under the most recent version of form CG 00 01 in the amount of not less than $2,000,000 per occurrence and $4,000,000 general aggregate. This coverage shall include blanket contractual liability coverage. This coverage shall include a cross-liability clause or separation of insured condition.

    b. WORKERS' COMPENSATION INSURANCE & EMPLOYER'S LIABILITY (STOP GAP). Contractor shall comply with applicable Workers' Compensation or Industrial Accident insurance providing benefits to statutory limits, including Employer's or Stop-Gap Liability with a minimum limit of $1,000,000 per accident/bodily injury by disease; $1,000,000 policy limit/Bodily injury by disease; and $1,000,000 each employee.

    c. PRODUCTS-COMPLETED OPERATIONS LIABILITY INSURANCE. Products-completed operations liability insurance in the amount of not less than $2,000,000 combined single limit per occurrence, $4,000,000 general annual aggregate for a period of five (5) years after acceptance of the last bus delivered under this Contract. Products Liability coverage may be effected through one or more excess liability policies.

    d. COMMERCIAL AUTOMOBILE LIABILITY INSURANCE. 'Symbol 1' Commercial Automobile Liability coverage (and, if necessary, commercial umbrella liability insurance) including coverage for all owned, hired, and non-owned vehicles. The combined single limit per accident shall not be less than $2,000,000.

    e. PROFESSIONAL LIABILITY (ERRORS & OMISSIONS) INSURANCE. Professional liability insurance in the amount of not less than $2,000,000 combined single limit per occurrence, $4,000,000 general annual aggregate.

    f. UMBRELLA INSURANCE. Umbrella coverage in the sum of $_____ shall be provided and shall apply over all liability policies, without exception, including but not limited to Commercial General Liability, Employers' Liability, Products-Completed Operations Liability, Automobile Liability, and Professional Liability.

    Claims Made Policies (applicable only to professional liability). If any of the required policies provide claims-made coverage:

    1. The Retroactive Date must be shown, and must be before the date of the contract or the beginning of contract work

    2. Insurance must be maintained and evidence of insurance must be provided for at least five (5) years after completion of the contract work.

3. If coverage is canceled or non-renewed, and not replaced with another claims-made policy form with a Retroactive Date prior to the contract effective date, the Contractor must purchase "extended reporting" coverage for a minimum of five (5) years after completion of work.

The insurance coverage limits set forth herein are the minimum. Contractor's insurance coverage shall be no less than the minimum amounts specified. Coverage in the amounts of these minimum limits, however, shall not be construed to relieve Contractor from liability in excess of such limits. Contractor waives all rights against the State of Washington for the recovery of damages to the extent such damages are covered by any insurance required herein.

2. **INSURANCE CARRIER RATING**. Coverages provided by the Contractor must be underwritten by an insurance company deemed acceptable to the State of Washington's Office of Risk Management. Insurance coverage shall be provided by companies authorized to do business within the State of Washington and rated A- Class VII or better in the most recently published edition of Best's Insurance Rating. Enterprise Services reserves the right to reject all or any insurance carrier(s) with an unacceptable financial rating.

3. **ADDITIONAL INSURED**. Except for Workers' Compensation, Commercial Automobile Liability, and Professional Liability (Errors and Omissions), all required insurance shall include the State of Washington (and its agents, officers, and employees) and the applicable Participant as an Additional Insureds evidenced by copy of the Additional Insured Endorsement attached to the Certificate of Insurance on such insurance policies.

4. **CERTIFICATE OF INSURANCE**. Prior to execution of the Master Contract, Contractor shall furnish to Enterprise Services, as evidence of the insurance coverage required by this Master Contract, a certificate of insurance satisfactory to Enterprise Services that insurance, in the above-stated kinds and minimum amounts, has been secured. In addition, no less than ten (10) days prior to coverage expiration, Contractor shall furnish to Enterprise Services an updated or renewed certificate of insurance, satisfactory to Enterprise Services, that insurance, in the above-stated kinds and minimum amounts, has been secured. Failure to maintain or provide proof of insurance, as required, will result in contract cancellation. All policies and certificates of insurance shall include the Master Contract number stated on the cover of this Master Contract.

5. **PRIMARY COVERAGE**. Contractor's insurance shall apply as primary and shall not seek contribution from any insurance or self-insurance maintained by, or provided to, the additional insureds listed above including, at a minimum, the State of Washington and/or any Participant. All insurance or self-insurance of the State of Washington and/or Participants shall be excess of any insurance provided by Contractor or subcontractors.

6. **SUBCONTRACTORS**. Contractor shall include all subcontractors as insureds under all required insurance policies. Alternatively, prior to utilizing any subcontractor, Contractor shall cause any such subcontractor to provide insurance that complies will all applicable requirements of the insurance set forth herein and shall furnish separate Certificates of Insurance and endorsements for each subcontractor. Each subcontractor must comply fully with all insurance requirements stated herein. Failure of any subcontractor to comply with insurance requirements does not limit Contractor's liability or responsibility.

7. **WAIVER OF SUBROGATION**. Contractor waives all rights of subrogation against the State of Washington and any Participant for the recovery of damages to the extent such damages are or would be covered by the insurance specified herein.

8. **NOTICE OF CHANGE OR CANCELLATION**. There shall be no cancellation, material change, exhaustion of aggregate limits, or intent not to renew insurance coverage, either in whole or in part, without at least sixty (60) days prior written Legal Notice by Contractor to Enterprise Services. Failure to provide such notice, as required, shall constitute default by Contractor. Any such written notice shall include the Master Contract number stated on the cover of this Master Contract.

Exhibit D

Federal Transit Administration Clauses

1.1. NO FEDERAL GOVERNMENT OBLIGATIONS TO THIRD PARTIES.

(a) Participant 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 Participant, Contractor, or any other party (whether or not a party to that contract) pertaining to any matter resulting from the underlying Contract.

(b) Contractor agrees to include the above clause in each subcontract financed in whole or in part with 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.

1.2. FALSE STATEMENTS OR CLAIMS CIVIL AND CRIMINAL FRAUD.

(a) Contractor acknowledges that the provisions of the Program Fraud Civil Remedies Act of 1986, as amended, 31 U.S.C. § 3801 et seq. and U.S. DOT regulations, "Program Fraud Civil Remedies," 49 C.F.R. Part 31, apply to its actions pertaining to this Project. Upon execution of the underlying contract, Contractor certifies or affirms the truthfulness and accuracy of any statement it has made, it makes, it may make, or causes to be made, pertaining to the underlying contract or the FTA assisted project for which this contract work is being performed. In addition to other penalties that may be applicable, Contractor further acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification, the Federal Government reserves the right to impose the penalties of the Program Fraud Civil Remedies Act of 1986 on Contractor to the extent the Federal Government deems appropriate.

(b) 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 U.S.C. § 5307, the Government reserves the right to impose the penalties of 18 U.S.C. § 1001 and 49 U.S.C. § 5307(n)(1) on Contractor, to the extent the Federal Government deems appropriate.

(c) 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.

1.3. ACCESS TO THIRD PARTY CONTRACT RECORDS.

(a) Where the Participant is not a State but a local government and is the FTA Recipient or a subgrantee of the FTA Recipient in accordance with 49 C.F.R. 18.36(i), the Contractor agrees to provide the Participant, 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 which are directly pertinent to this contract for the purposes of making audits, examinations, excerpts and transcriptions. Contractor also agrees, pursuant to 49 C.F.R. 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 U.S.C. 5302(a)1, which is receiving federal financial assistance through the programs described at 49 U.S.C. 5307, 5309 or 5311.

(b) Where the Participant is a State and is the FTA Recipient or a subgrantee of the FTA Recipient in accordance with 49 C.F.R. 633.17, Contractor agrees to provide the Participant, 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 U.S.C. 5302(a)1, which is receiving federal financial assistance through the programs described at 49 U.S.C. 5307, 5309 or 5311. By definition, a major capital project excludes contracts of less than the simplified acquisition threshold currently set at $100,000.

(c) Where the Participant enters into a negotiated contract for other than a small purchase or under the simplified acquisition threshold and is an institution of higher education, a hospital or other non-profit organization and is the FTA Recipient or a subgrantee of the FTA Recipient in accordance with 49 C.F.R. 19.48, Contractor agrees to provide the Participant, FTA Administrator, the Comptroller General of the United States or any of their duly authorized representatives with access to any books, documents, papers and record of the Contractor which are directly pertinent to this contract for the purposes of making audits, examinations, excerpts and transcriptions.

(d) Where any Participant which is the FTA Recipient or a subgrantee of the FTA Recipient in accordance with 49 U.S.C. 5325(a) enters into a contract for a capital project or improvement (defined at 49 U.S.C. 5302(a)1) through other than competitive bidding, the Contractor shall make available records related to the contract to the Participant, the Secretary of Transportation and the Comptroller General or any authorized officer or employee of any of them for the purposes of conducting an audit and inspection.

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

(f) 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 Participant, 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).

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

1.4. CHANGES TO FEDERAL REQUIREMENTS. 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 Participant 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.

1.5. TERMINATION. See Section 16 Suspension & Termination and Section 18.13 Waiver.

1.6. CIVIL RIGHTS.

(a) Nondiscrimination. In accordance with Title VI of the Civil Rights Act, as amended, 42 U.S.C. § 2000d, section 303 of the Age Discrimination Act of 1975, as amended, 42 U.S.C. § 6102, section 202 of the Americans with Disabilities Act (ADA) of 1990, 42 U.S.C. § 12132, and Federal transit law at 49 U.S.C. § 5332, 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, Contractor agrees to comply with applicable Federal implementing regulations and other implementing requirements FTA may issue.

(b) Equal Employment Opportunity. The following equal employment opportunity requirements apply to the underlying contract:

1. Race, Color, Creed, National Origin, Sex. In accordance with Title VII of the Civil Rights Act, as amended, 42 U.S.C. § 2000e, and Federal transit laws at 49 U.S.C. § 5332, the Contractor agrees to comply with all applicable equal employment opportunity requirements of U.S. Department of Labor (U.S. DOL) regulations, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor," 41 C.F.R. 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 U.S.C. § 2000e note), and with any applicable Federal statutes, executive orders, regulations, and Federal policies that may in the future affect construction activities undertaken in the course of the Project. 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, Contractor agrees to comply with any implementing requirements FTA may issue.

2. Age. In accordance with section 4 of the Age Discrimination in Employment Act of 1967, as amended, 29 U.S.C. §§ 623 and Federal transit law at 49 U.S.C. § 5332, Contractor agrees to refrain from discrimination against present and prospective employees for reason of age. In addition, Contractor agrees to comply with any implementing requirements FTA may issue.

3. Disabilities. In accordance with section 102 of the Americans with Disabilities Act, as amended, 42 U.S.C. § 12112, 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 C.F.R. Part 1630, pertaining to employment of persons with disabilities. In addition, Contractor agrees to comply with any implementing requirements FTA may issue.

(c) 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.

1.7. DISADVANTAGED BUSINESS ENTERPRISES. The Disadvantaged Business Enterprise (DBE) requirements of 49 CFR Part 26 and USDOT's official interpretations (i.e., Questions & Answers) apply to this Contract. As such, the requirements of this Contract are to make affirmative efforts to solicit DBEs, provide information on who submitted a Bid or quote and to report DBE participation. No

preference will be included in the evaluation of Bids/Proposals, no minimum level of DBE participation shall be required as a Condition of Award and Bids/Proposals may not be rejected or considered non-responsive on that basis.

Transit Vehicle Manufacturer Compliance with DBE Requirements. Before a transit vehicle manufacturer (TVM) may submit a bid or proposal to provide vehicles to be financed with FTA assistance, 49 C.F.R. § 26.49 requires the TVM to submit a certification that it has complied with FTA's DBE requirements.

1.8. ADA ACCESS. Contractor shall comply with the requirements of 49 CFR FTA C 4710.1 as applicable to this Contract. Equal access and the opportunity should be given to individuals with disabilities to fully participate in or benefit from the goods, services, facilities, privileges, advantages, or accommodations.

Contractor must comply with the accessibility requirements of DOT regulations, "Transportation Services for Individuals with Disabilities (ADA)," 49 C.F.R. part 37, and Joint Access Board/DOT regulations, "Americans with Disabilities (ADA) Accessibility Specifications for Transportation Vehicles," 36 C.F.R. part 1192 and 49 C.F.R. part 38.

1.9. INCORPORATION OF FEDERAL TRANSIT ADMINISTRATION (FTA) TERMS. The preceding provisions include, in part, certain Standard Terms and Conditions required by DOT, whether or not expressly set forth in the preceding Contract provisions. All contractual provisions required by DOT, as set forth in FTA Circular 4220.1F, are hereby incorporated by reference. Anything to the contrary herein notwithstanding, all FTA mandated terms shall be deemed to control in the event of a conflict with other provisions contained in this Agreement. Contractor shall not perform any act, fail to perform any act, or refuse to comply with any (name of grantee) requests which would cause (name of grantee) to be in violation of the FTA terms and conditions.

1.10. DEBARMENT AND SUSPENSION. 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. 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 Enterprise Services. If it is later determined that the bidder or proposer knowingly rendered an erroneous certification, in addition to remedies available to Enterprise Services, 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 offer is valid and throughout the period of any contract that may arise from this offer. The bidder or proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

1.11. BUY AMERICA. Contractor agrees to comply with 49 U.S.C. 5323(j) and 49 C.F.R. 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 C.F.R. 661.7. Separate requirements for rolling stock are set out at 49 U.S.C. 5323(j)(2)(C) and 49 C.F.R. § 661.11. Rolling stock must be assembled in the United States and have at least a 65 percent

domestic stock content for rolling stock procurements with the first vehicle scheduled for delivery in fiscal years 2018 and 2019 and at least 70 percent domestic content for rolling stock procurements with the first vehicle scheduled for delivery in 2020 or thereafter.

Contractor must submit to Participants 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 Bus America certification are subject to the provisions of 49 CFR 661.13 and will be rejected as nonresponsive.

Pursuant to Appendix A to §661.7(b), a general public interest waiver from the Buy America requirements applies to microprocessors, computers, microcomputers, or 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 which merely contains a microprocessor or microcomputer and is not used solely for the purpose of processing or storing data.

1.12. RESOLUTION OF DISPUTES, BREACHES, OR OTHER LITIGATION. See Section 15.

1.13. LOBBYING. Byrd Anti-Lobbying Amendment, 31 U.S.C. 1352, as amended by the Lobbying Disclosure Act of 1995, P.L. 104-65 [to be codified at 2 U.S.C. § 1601, et seq.]. 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, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier shall also disclose the name of any registrant under the Lobbying Disclosure Act of 1995 who has made lobbying contacts on its behalf with non-Federal funds with respect to that Federal contract, grant or award covered by 31 U.S.C. 1352. Such disclosures are forwarded from tier to tier up to the recipient.

1.14. CLEAN AIR. Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. §§ 7401 et seq. Contractor agrees to report each violation to the Participant and understands and agrees that the Participant will, in turn, report each violation as required to assure notification to FTA and the appropriate EPA Regional Office.

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.

1.15. CLEAN WATER. The Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq. Contractor agrees to report each violation to the Participant and understands and agrees that the Participant will, in turn, report each violation as required to assure notification to FTA and the appropriate EPA Regional Office.

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.

1.16. CARGO PREFERENCE - Use of United States-Flag Vessels. Contractor agrees to:

(a) Use privately owned United States-Flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant

to the underlying contract to the extent such vessels are available at fair and reasonable rates for United States-Flag commercial vessels;

(b) Furnish within 20 working days following the date of loading for shipments originating within the United States or within 30 working days following the date of leading for shipments originating outside the United States, a legible copy of a rated, "on-board" commercial ocean bill-of -lading in English for each shipment of cargo described in the preceding paragraph to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590 and to the FTA recipient (through the contractor in the case of a subcontractor's bill-of-lading.)

(c) 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.

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

1.18. BUS TESTING. Contractor agrees to comply with the Bus Testing requirements under 49 U.S.C. A 5318(e) and FTA's implementing regulation at 49 CFR Part 665 to ensure that the requisite testing is performed for all new bus models or any bus model with a major change in configuration or components, and that the bus model has achieved a passing score. Upon completion of the testing, Contractor shall obtain a copy of the bus testing reports from the operator of the testing facility and make that report publicly available prior to final acceptance of the first vehicle by the recipient.

1.19. PRE-AWARD AND POST-DELIVERY AUDIT REQUIREMENTS. Contractor agrees to comply with 49 U.S.C. § 5323(m) and FTA's implementing regulation at 49 C.F.R. part 663. Contractor shall comply with the Buy America certification(s) submitted with its proposal/bid. Contractor agrees to participate and cooperate in any pre-award and post-delivery audits performed pursuant to 49 C.F.R. part 663 and related FTA guidance. Contractor shall submit manufacturer's FMVSS self-certification, Federal Motor Bus Safety Standards, that the bus complies with relevant FMVSS or manufacturer's certified statement that the contracted buses will not be subject to FMVSS regulations.

1.20. FLY AMERICA. 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. 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. Contractor agrees to include the requirements of this section in all subcontracts that may involve international air transportation.

1.21. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT. For all contracts in excess of $100,000 that involve the employment of mechanics or laborers, Contractor shall comply with the Contract Work Hours and Safety Standards Act (40 U.S.C. §§ 3701- 3708), as supplemented by the

Department of Labor regulations at 29 C.F.R. part 5. Under 40 U.S.C. § 3702 of the Act, Contractor shall compute the wages of every mechanic and laborer, including watchmen and guards, on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. § 3704 are applicable to construction work and provide that no laborer or mechanic be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchase of supplies or materials or articles ordinarily available on the open market, or to contracts for transportation or transmission of intelligence.

In the event of any violation of the clause set forth herein, Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Liquidated damages will be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of this clause in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by this clause.

The Participant will upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any other Federal contract with the same prime Contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime Contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in this section.

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

Exhibit E

Federal Transit Administration Certifications

[attached as a separate document from Solicitation Exhibit A-3]

SFMTA-2024-03-FTA

Agreement

Appendix A, Item A2

Exhibit B-1 – State of Washington Technical Specifications

Heavy Duty Bus

Exhibit B-1 Specifications

Heavy Duty Bus

Table of Contents

1 GENERAL

1.1 Scope

The State of Washington Department of Enterprise Services in collaboration with the Washington State Department of Transportation; Alaska Department of Transportation; Idaho Department of Transportation; Oregon Department of Transportation; and Nevada Department of Transportation, as initial members of the Transit Bus Purchasing Cooperative, intend to establish a Master Contract for the purchase of heavy-duty transit buses that will provide the best value and selection to purchasers that maximizes passenger appeal in appearance, comfort, and safety, combined with excellence in reliability, operating characteristics, and economy of operation. Heavy-duty buses purchased under this Master Contract will be 30', 35', 40', 45' and 60' BRT articulated; with low-floor or high floor (over the road buses); and diesel power, hybrid drive, standard drive, CNG, or electric propulsion system; or any combination thereof. Buses shall have a minimum expected life of twelve (12) years or 500,000 miles, whichever comes first, and are intended for a wide possible spectrum of passengers, including children, adults, the elderly, and people with disabilities. The buses shall be Altoona tested (or have completed Altoona testing by the delivery date in accordance with 49 CFR Part 665) and meet any other bus testing requirements under MAP-21.

1.2 Definitions

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

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

Analog Signals: A continuously variable signal that is solely dependent upon magnitude to express information content. **NOTE:** Analog signals are used to represent the state of variable devices such as rheostats, potentiometers, temperature probes, etc.

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

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

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

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

Burst Pressure: The highest pressure reached in a container during a burst test.

Capacity (fuel container): The water volume of a container in gallons (liters) or therms.

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

Code: A legal requirement.

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

Composite Container for CNG: A container fabricated of two or more materials that interact to facilitate the container design criteria.

Compressed Natural Gas (CNG): Mixtures of hydrocarbon gases and vapors consisting principally of methane in gaseous form that has been compressed for use as a vehicular fuel.

Container: A pressure vessel, cylinder, or cylinders permanently manifolded together used to store CNG.

Container Appurtenances: Devices connected to container openings for safety, control or operating purposes.

Container Valve: A valve connected directly to a container outlet.

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

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

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

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

Defueling: The process of removing fuel from a tank.

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

Destroyed: Physically made permanently unusable.

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

DPF: Diesel particulate filter.

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

Electric Bus Definition: A vehicle that is battery powered with electrically driven motor(s). Generally referred to as battery electric buses, but may include options for electric trolley buses or similar vehicles powered by electricity.

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

Energy Storage System (ESS): A component or system of components that stores high-voltage electrical energy and for which its supply of energy is rechargeable by a PPU and/or an off-vehicle energy source.

Fill Pressure for CNG: The pressure attained at the actual time of filling. Fill pressure varies according to the gas temperatures in the container, which are dependent on the charging parameters and the ambient conditions. The maximum dispensed pressure shall not exceed 125 percent of service pressure.

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

Fuel Cell Bus: A vehicle powered by a hydrogen fuel cell.

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

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

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 that protrudes into the standee area.

Fuel Management System: Natural gas fuel system components that control or contribute to engine air fuel mixing and metering, and the ignition and combustion of a given air-fuel mixture. The fuel management system would include, but is not limited to, reducer/regulator valves, fuel metering equipment (e.g. carburetor, injectors), sensors (e.g., main throttle, wastegate).

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

Gross Load: 150 lbs. for every designed passenger seating position, for the driver, and for each 1.5 square feet 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 Contractor, at which the vehicle can be safely and reliably operated for its intended purpose.

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

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

Hose: Flexible line.

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

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

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

Intermediate Pressure: The portion of a CNG system after the first pressure regulator, but before the engine pressure regulator. Intermediate pressure on a CNG vehicle is generally from 3.5 to 0.5 MPa (510 to 70 psi).

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

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

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

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

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

Local Regulations: Regulations below the state level.

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

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

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

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

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

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

Module: Assembly of individual components.

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

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

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

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

Pipe: Nonflexible line.

Pressure Relief Device (PRD): A pressure and/or temperature activated device used to vent the container/cylinder contents and thereby prevent rupture of an NGV fuel container/cylinder, when subjected to a standard fire test as required by fuel container/cylinder standards.

> **NOTE:** Since this is a pressure-activated device, it may not protect against rupture of the container when the application of heat weakens the container to the point where its rupture pressure is less than the rated burst pressure of the relief device, particularly if the container is partially full.

Power: Work or energy divided by time

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

Propulsion System: System that provides propulsion for the vehicle proportional to operator commands. Includes, as applicable, the HDS, energy storage system and the hybrid system controller.

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

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

Rejectable Damage: In terms of NGV fuel containers/cylinders, this is damage as outlined in CGA C-6.4, “Methods for External Visual Inspection of Natural Gas Vehicle Fuel Containers and Their Installations,” and in agreement with the manufacturer’s recommendations.

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

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

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

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

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

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

Service Pressure: The settled pressure at a uniform gas temperature of 21 °C (70 °F) and full gas content. It is the pressure for which the equipment has been constructed, under normal conditions. Also referred to as the nominal service pressure or working pressure.

Settled Pressure: The gas pressure when a given settled temperature, usually 21 °C (70 °F), is reached.

Settled Temperature: The uniform gas temperature after any change in temperature caused by filling has dissipated.

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

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

Special Tools: Tools not normally stocked by the Purchaser.

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

Standard: A firm guideline from a consensus group.

Standards: Standards referenced in “Part 5: 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 percent. 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 “pig-tails” commonly used to absorb flexing in piping.

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

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

NOTE: Since this is a thermally activated device, it does not protect against over-pressure from improper charging practices.

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

1.3 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 posting of this solicitation.

1.4 Legal Requirements

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

1.5 Overall Requirements

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 Purchaser shall identify subcomponent vendors that shall submit installation/application approval documents with the completion of a pilot or

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

Chassis structure (integrity & corrosion)	12 year/500,000 Miles
Engine	2 year/unlimited Miles
Transmission	5 year/Unlimited Miles
Axle Rear & Front	5 Year/300,000 Miles
Basic Bus Structure	3 year/150,000 Miles

The buses shall afford features essential for safe, efficient and comfortable operation by the operator. This implies the utmost in road and traffic visibility under all driving conditions and adequate means for safe passenger movement. The bus must be maneuvered easily in normal and heavy traffic. All Bidders must conform to these specifications and the product they furnish shall be of first-class quality, and workmanship, and shall be of the best obtainable in the various trades. The design of the body, chassis, and equipment, which the manufacturer proposes to furnish, shall be such as to produce a vehicle of substantial and durable construction in all respects.

To the extent practical, all systems, major sub-systems, and components shall be individually and permanently labeled with Manufacturer, Part Number, and Serial Number. Label is to be located, in each instance, for easiest access for reading while installed for use in the bus. List of all systems, subsystems, and components shall accompany each bus either on paper, CD or DVD.

The manufacturer shall use high pressure hydraulic hoses that meet or exceed SAE 100R5 specifications for all flexible lines except A/C and discharge from the air compressor to the wet tank.

The manufacturer shall be responsible for providing all parts or details which make each bus complete and ready for service, even though such part(s) or details(s) are not mentioned in these specifications.

All buses shall be in compliance with the Americans with Disabilities Act (ADA). These buses shall be new, unused, current model specifically designed for ether intra or inter-city service as applicable and substantially manufactured in the United States (in accordance with "Buy America" requirements). These units must meet all Federal requirements applicable to this type of vehicle. Buses provided under this contract shall be 30-foot, 35-foot, and 40-foot, 45-foot, 60-foot articulated in length, 102 inches wide, nominal with a low or high floor designs.

1.6 Worker and Protective Measures

All bolts or rods passing through wood shall be sealed with zinc chromate or other approved sealing compound. Where wood and wood are placed together, all outer edges of wood, as well as the edges of holes, cutouts and notches shall be coated with a linseed oil and titanium dioxide sealer or zinc chromate or other appropriate sealing compound.

All exterior light fixtures shall be fitted to the contour of the bus body and adequately sealed to prevent entrance of water.

All rubber seals on ventilator doors and compartment cabinet doors shall be placed in 'U' shaped channels to firmly hold the rubber in place. Equally, self-adhering closed cell neoprene seals may be used, without 'U' channels.

All burrs and sharp edges shall be dressed to prevent injury to passengers and employees, or damage to their clothing.

All buses shall be subjected to water tests simulating the severe rain conditions experienced in the Washington State environment. Windows, escape hatches, doors, etc. are subject to an approved water test to be conducted at the manufacturer's facility by the manufacturer and shall be observed by the Resident Inspector(s). Water testing may be verified by further testing at the Purchaser's Maintenance Facility prior to the acceptance of each vehicle if test observation or verification of leak repair is missed on or not observed by the Resident Inspector on any bus built. Any bus that fails to pass the water test shall be corrected by the contractor. The retest/corrective repair cycle shall repeat until the leak(s) have been eliminated to the Purchaser's satisfaction.

1.7 Water Test Description

The roof, roof hatches, front cap, rear cap, sidewalls, passenger windows, driver's windows, destination sign windows, windshields, wheel wells and all doors of all coaches shall be water tested prior to the delivery of each unit as follows:

1. The water test shall consist of a series of nozzles which are strategically located around the perimeter of the vehicle so as to spray water over the entire surface of the vehicle.
2. The nozzles shall eject a volume of water no less than 2.6 gallons per minute per nozzle under a pressure of no less than 22 lbs. per square inch measured at the nozzle tip.
3. The contractor shall be required to water test each vehicle under the conditions described above for no less than 30 minutes (15 minutes with A/C off, then 15 minutes with A/C on) to ensure there are no water leaks in the bus.
4. Bus road testing shall be conducted immediately after the water test. All road tests shall be conducted by the OEM on-site inspectors and verified by Purchaser inspector.

Contractor shall take the necessary steps of corrective action to repair any leaks found as a result of the described test and shall repeat the 30-minute water test to ensure that corrective steps have been successful. This process shall be repeated until no leaks are found. Documentation of each bus shall be kept by the manufacturer as to the location of the leak, what caused the leak to occur and shall describe the repair action taken to prevent the leak from reoccurring.

If the Contractor's bus manufacturing process water test differs from the water test process and criteria described above, then any deviations shall be approved by the Purchaser.

1.8 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. The plan shall be submitted to the Purchaser for approval.

All zerk grease testing fittings shall be accessible from a pit location with a standard straight nose grease gun.

All vehicles will be road-tested.

1.9 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 a capacity load shall not exceed the tire factor limits, brake test criteria or structural design criteria. All buses shall be weighed at a certified scale and weight slips will be included in the packet from the builder with each coach.

1.10 Capacity

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

1.11 Service Life

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

1.12 Maintenance and Inspection

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

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

Quantity tags shall be provided in a highly visible location next to the fill location for the engine, transmission, differential, power steering, etc. These quantity tags shall be permanently attached and will list the manufacturers recommended fill quantity.

Engines and/or Transmissions, if used, shall be supplied with the Titan Probalyzer # 0D1014 fittings or KP push button sampling valves (or equivalents) installed that are easy

to access: device and location selection to be made at pre-production meeting. (All electric powered buses are excluded from this requirement.)

The coach manufacturer shall give prime consideration to the routine problems of maintaining the vehicle. All coach 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 coach structure and/or equipment such as seats and flooring under seats in order to gain access to these areas. Each coach 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 coach 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.

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

NOTE: Tools such as compartment door and compartment access keys shall not be included in the special tool list and shall be furnished for each coach.

1.13 Interchangeability

Unless otherwise agreed, all units and components procured under this Contract, whether provided by Suppliers or manufactured by the Contractor, shall be duplicates in design, manufacture and installation to ensure interchangeability among buses in each order group in this procurement. This interchangeability shall extend to the individual components as well as to their locations in the buses. These components shall include, but are not limited to, passenger window hardware, interior trim, lamps, lamp lenses and seat assemblies. Components with non-identical functions shall not be, or appear to be, interchangeable. Any one component or unit used in the construction of these buses shall be an exact duplicate in design, manufacture and assembly for each bus in each order group in this Contract. Contractor shall identify and secure approval for any changes in components or unit construction provided within a Contract.

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

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

1.14 Training

Along with the purchase of new buses, it is the Purchaser's requirements to have the manufacturer provide an appropriate program of instruction targeted to the operator, servicing, and maintenance personnel. This will be accomplished through a combination of Purchaser on-site and contractor and/or supplier site training. Training will consist of Train the Trainer, Technical, and OEM.

Programs shall include training and testing materials, specific tools, equipment, and identified training aids. The Purchaser shall indicate the training desired and, by mutual agreement, when the performance period is to begin. The contractor will provide Purchaser with a CD-ROM using Portable Document Format (PDF) of all applicable lesson plans, training guides, student workbooks, along with any other videos, transparencies or additional instructional training aids. The contractor shall inform the Purchaser of any training support equipment and/or supplies required to be supplied by the Purchaser for the contractor portion of the training.

All training instructors shall be competent to teach the course area they are instructing. Further, all instructors shall speak English and have a complete understanding of the English language. If the instructor or vendor presenter lacks the skill or knowledge to provide instruction, or cannot communicate with the students, the Purchaser reserves the right to request that the instructor be replaced and the area of training be repeated.

1.15 Train the Trainer

The Contractor shall provide two (2) complete "Train the Trainer" programs of instruction for the Purchaser's training department personnel. One program, **Operator Orientation**, will be designed for Bus Operator Instructors, Street Supervisors and Dispatchers. A second program, **Maintenance Orientation**, will be designed for maintenance training personnel. This training is to be conducted at the Purchaser's facility and will be developed to encompass familiarization, operation, unique characteristics, service, and safety concerns of the vehicle and its systems. Initial training for a new bus order will be 8 hours for Operator Orientation and at least 24 hours for Maintenance Orientation, and shall be a combination of classroom instruction and hands-on instruction, the latter being presented on and around the bus. Additional training for subsequent orders of substantially similar buses will each be at least four hours in length for additional training on new systems. The Contractor shall also provide a training video, powerpoint presentation, or similar presentation for instructors to use for training bus operators on the operation of the bus.

1.16 Operator Orientation

The Contractor shall provide complete training and instruction for Purchaser designated Operations personnel. Class size is not to exceed 10 employees per session. The program shall include, but not be limited to the following:

Operator Compartment; Controls and Switches; Warning Indicators and Gauges; Seat Adjustment; Door Control; Walk Around Inspection; Compartment-by-Compartment Explanation; Mirror Adjustments; Climate Control system; Driving Instruction; Turns; Braking; Transmission; Backing; Wheelchair Ramp Equipment; Controls; Safety; Emergency Procedures; Securing Wheelchairs and Riders; Loading and Unloading.

Each trainee will be given an opportunity to operate the bus with the Contractor's instructor on board. The training shall be delivered on a schedule coordinated between the Purchaser's training department and the contractor. The number of sessions to be provided will be negotiated between the Purchaser's training personnel and the Contractor, with the base requirement being 8 hours.

1.17 Maintenance Orientation

The Contractor shall provide complete training and instruction for Purchaser designated maintenance personnel. Class size is not to exceed 10 employees per session. The program shall include, but not be limited to the following:

> All items indicated in Operator Orientation, in addition to Suspension; Steering; Axles; Electrical systems; Body; Engine & Fuel System; Parts; Engine and Vehicle Service Instruction; Air Conditioning; Doors; Towing; Brakes; Fire Suppression and Air System.

Each trainee will be given an opportunity to operate the bus with the Contractor's instructor on board. The training shall be delivered on a schedule coordinated between the Purchaser's training department and the contractor. The number of sessions to be provided will be negotiated between the Purchaser's training personnel and the Contractor, with the base requirement being 4 hours.

1.18 Technical

The contractor shall provide a structured program of technical training which will consist of specific and identifiably separate curriculum for each subject area. Each subject area training session shall be between eight (8) and forty (40) classroom/hands-on hours based on subject area, with class size being no more than (15) participants. The training will be delivered at the Purchaser's location on a schedule coordinated by the Purchaser's training department and the contractor.

The following subject areas will be offered:

> Body and Chassis, Suspension and Steering, Electrical and Electronics, Air and Brake system, HVAC/Climate Controls, Engine, Transmission, Wheelchair ramp system, Destination Signs, Doors, Axles and Tires, Hybrid Drive, and Fire Suppression. For electric buses propulsion batteries, battery systems, battery management systems, charging systems, drive motors and drive motor controllers offered.

The technical training shall be delivered on a schedule coordinated between the Purchaser's training department and the contractor. The subject area of sessions to be

provided will be negotiated between the Purchaser's training personnel and the Contractor, with the base requirement being 96 hours.

1.19 OEM

The contractor shall provide two (2) class slots at the manufacturer's suppliers training facility for a "train-the-trainer" technical instruction course on the operation, diagnostics, troubleshooting, repair, and servicing of the below listed areas:

1. Engine
2. Transmission
3. Data Communication System
4. Hybrid Drive
5. Fare Collection device.
6. Electric Drive

Each Purchaser will only be allowed to select two (2) of the six (6) training areas to send their two (2) representatives. This represents the OEM base requirement.

The Purchaser's training department shall coordinate the scheduling of training with the contractor. Each training subject area (module), to include manufacturer's supplier training facility slots, shall also be priced separately from the bus in the Price Sheet.

1.20 Operating Environment

The bus shall achieve normal operation in ambient temperature ranges of 10 ºF to 115 ºF, at relative humidity between 5 percent and 100 percent, and at altitudes up to 3000 feet above sea level. Degradation of performance due to atmospheric conditions shall be minimized at temperatures below 10 °F, above 115 °F or at altitudes above 3000 feet. Altitude requirements above 3000 feet will need separate discussions with the engine manufacturer to ensure that performance requirements are not compromised. Speed, gradability and acceleration performance requirements shall be met at, or corrected to, 77 °F, 29.31 in. Hg, dry air per SAE J1995.

Purchasers may define operating environments different from the description.

1.21 Secure Lines, Hoses, and Wiring

All lines, hoses, wiring, and similar connective materials shall be tied and secured to not interfere with operation of the vehicle or any component system. At a minimum, electrical wiring shall be insulated. All wiring loom and all wiring harnesses shall be wrapped in weather resistant tubing or wrap material in accordance with applicable local, state, and federal regulations.

2 NOISE

2.1 Interior Noise

The combination of inner and outer panels and any material used between them shall provide sufficient sound insulation so that a sound source with a level of 80 dBA measured at the outside skin of the bus shall have a sound level of 65 dBA or less at any point inside the bus. These conditions shall prevail with all openings, including doors and windows, closed and with the engine and accessories switched off. The bus-generated noise level experienced by a passenger at any seat location in the bus shall not exceed 80 dBA. The driver area shall not experience a noise level of more than 75 dBA. Articulated buses shall be exempted from this requirement for the turntable area, which shall be considered a separate environment.

2.2 Exterior Noise

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

2.3 Fire Safety

The bus shall be designed and manufactured in accordance with all applicable fire safety and smoke emission regulations. These provisions shall include the use of fire-retardant/low-smoke materials, fire detection systems, bulkheads and facilitation of passenger evacuation.

All materials used in the construction of the passenger compartment of the bus shall be in accordance with the Recommended Fire Safety Practices defined in FMVSS 302 and FTA Docket 90, dated October 20, 1993. Materials entirely enclosed from the passenger compartment, such as insulation within the sidewalls and sub-floor, need not comply. In addition, smaller components and items, such as seat grab rails, switch knobs and small light lenses, shall be exempt from this requirement.

2.4 Fire Suppression

CNG propelled buses must have a methane gas detection system installed and shall have a fire suppression installed per manufacturer's recommendation. Other fire suppression systems may be available as options (Fog Master or similar product).

Fire suppression system shall meet the minimum life cycle of the bus bid. Cylinders should be heavy duty type that can be hydro tested and recertified 12 years after

manufacture date. Cylinders offered must come from new stock that will not affect the life cycle of the bus. Fire suppression manufacture must provide Training on inspections and service as part of the purchase price. Bus OEM shall offer actuators, sensors and other key parts of the suppression system that will need to be replaced during the life of the bus, on the spare parts list.

2.5 Respect for the Environment

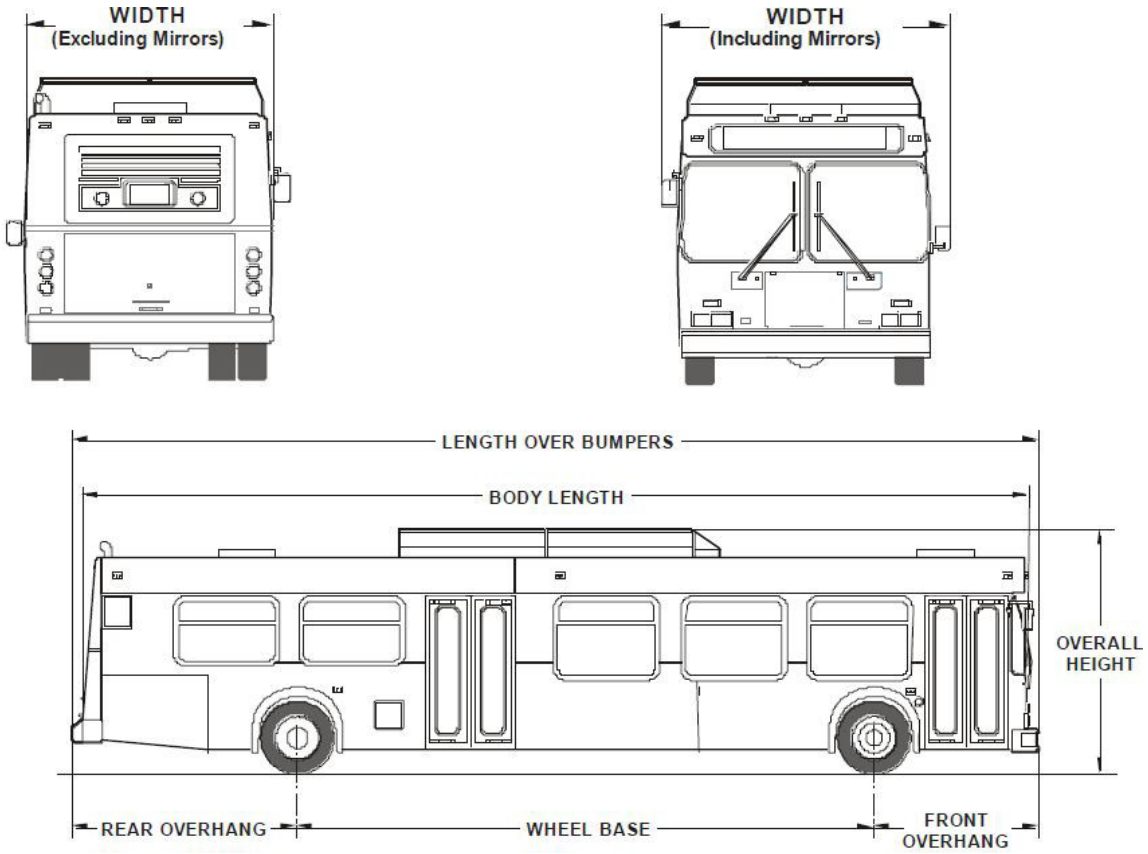
In the design and manufacture of the bus, the Contractor shall make every effort to reduce the amount of potentially hazardous waste. In accordance with Section 6002 of the Resource Conservation and Recovery Act, the Contractor shall use, whenever possible and allowed by the specifications, recycled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

3 DIMENSIONS

3.1 Physical Size

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

FIGURE 1



3.2 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.

1. **30-ft bus:** 29 ft, 11 in. to 34 ft, 11 in.
2. **35-ft bus:** 35 ft to 39 ft, 11 in.
3. **40-ft bus:** 40 ft to 44 ft, 11 in.
4. **45 ft bus:** 40 to 45 ft bus:
5. **60ft (articulated) Bus**: 59 to 65 ft

3.3 Bus Width

Body width shall be 102 in. (+0, -2 in.).

3.4 Bus Height

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

3.5 Step Height

The step height shall not exceed 16.5 in. (+.5, -.5 in.) at either doorway without kneeling and shall not exceed 15.5 in. at the step. A maximum of two steps is allowed to accommodate a raised aisle floor in the rear of the bus.

3.6 Underbody Clearance

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

3.7 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.

TABLE 2

Angle	30 to 45ft Bus	60ft Bus
Approach	8.6 degrees (min.)	8.6 degrees (min.)
Front breakover	8.0 degrees (min.)	10.2 degrees (min.
Rear breakover (articulated only)	N/A	8.7 degree (min.)
Departure	8.6 degree (min)	8.6 degree (min.)

3.8 Ground Clearance

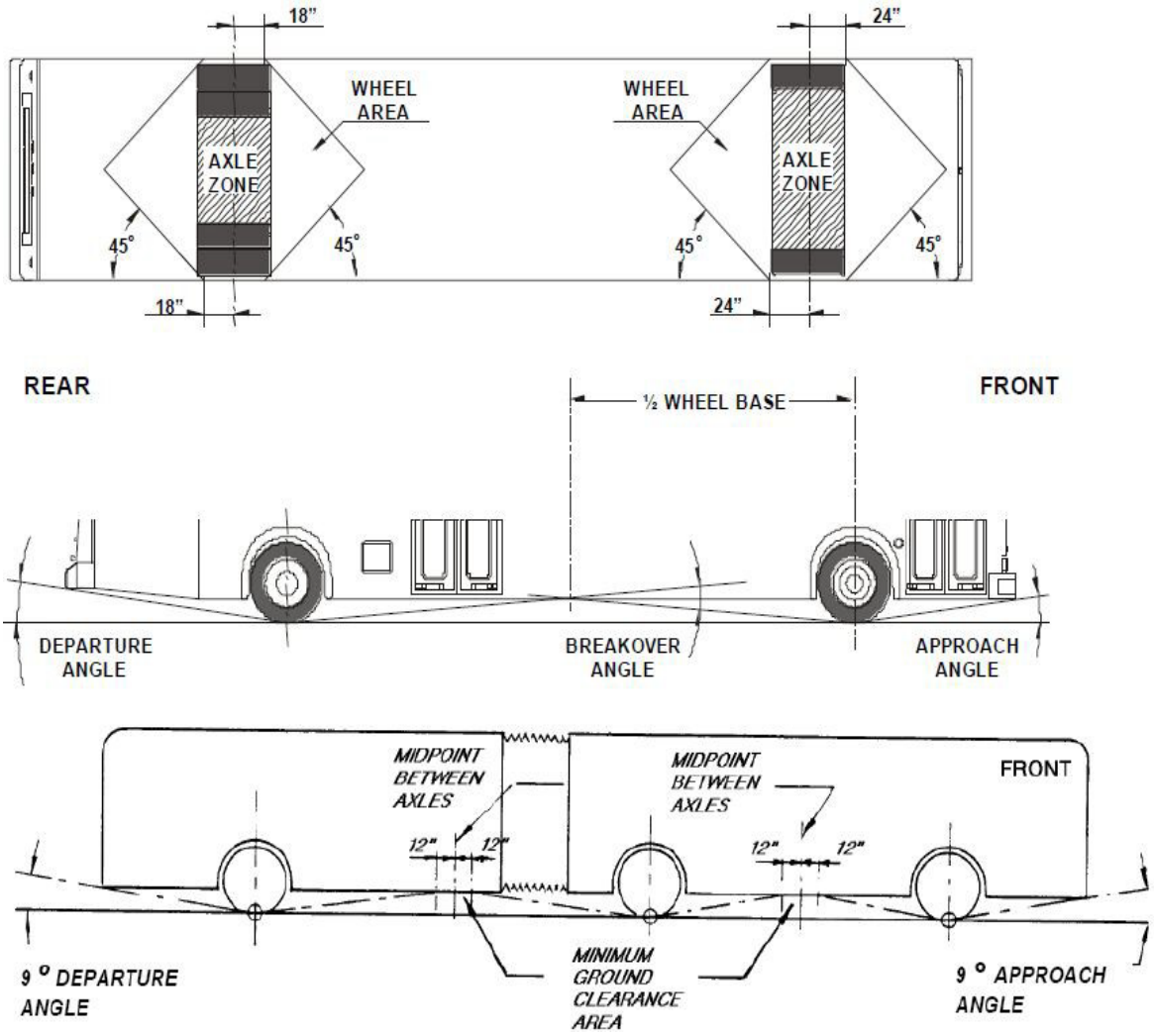
Ground clearance shall be no less than 9 in., (8 in. at jacking pad) except within the axle zone and wheel area.

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



3.9 Floor Height

Height of the step above the street shall be no more than 16 in. measured at the centerline of the front and rear doorway. The floor may be inclined along the longitudinal axis of the bus, and the incline shall not exceed 3.5 degrees off the horizontal except locally at the doors where up to 4 degree slope toward the door is allowed. 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 is allowed to accommodate a raised aisle floor in the rear of the bus.

An exception shall be added for the turntable area of the Articulated Bus where it shall not exceed 5 degrees.

3.10 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.

3.11 Aisle Width

The minimum clear aisle width between pairs of transverse seats with all attached hardware shall be at least 20 in.

The aisle width between the front wheelhouses shall be at least 34 inches, and the entire area between the front wheelhouses shall be available for passengers and mobility aid devices.

4 VEHICLE PERFORMANCE

4.1 Power Requirements

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

4.2 Top Speed

The bus shall be capable of achieving a top speed of 65 mph when driving 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.

*Articulated bus may vary depending on the propulsion system chosen

NOTE: Values are assumed to be sustained. Contractor shall supply Purchaser with data if there is a variance between peak performance and sustained vehicle performance.

4.3 Gradability

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

The propulsion system and drivetrain shall enable the bus to achieve and maintain a speed of 40 mph on a 2.5 percent ascending grade and 15 mph on a 10 percent ascending grade continuous.

NOTE: Values are assumed to be sustained. Contractor shall supply Purchaser with data if there is a variance between peak performance and sustained vehicle performance.

4.4 Acceleration

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

TABLE 3

Maximum Start Acceleration Times on a Level Surface[1] with full throttle and full brake applied starts.

Speed (mph)	Max Time (Seconds)
10	6
20	12
30	20
40	34
50	60
Top speed	

1. Vehicle weight = GVWR

4.5 Hybrid or Electric

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 Contractor shall supply the new performance data.

Electric bus must report a minimum range and operating cycle whether operating on a full charge or en route fast charging system.

4.6 Battery Charger

A cable ("pigtail") and battery charger shall be included with the purchase of each electric bus. En route charging systems will be available as an option and priced separately. The battery charger shall by manufacturer agnostic and non-proprietary.

4.7 Operating Range

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

4.8 Diesel

The operating range of the coach when run on the Altoona Test cycle described below shall be at least 350 mi (560 km) or 20 hrs. with full fuel capacity for 40' and larger bus

configurations. The operating range of the coach when run on the Altoona Test cycle described below shall be at least 290 mi (560 km) or 20 hrs. with full fuel capacity for 30' and 35' bus configurations.

4.9 CNG

The operating range of the coach when run on the Altoona Test cycle described below shall be at least 250 mi or 14 hrs. with an initial gas settled pressure of 3600 psi at 70 °F.

4.10 Hybrid

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

4.11 Battery Electric

The operating range of the coach when run on the "Design Operating Profile" shall be at least 120 miles on a full charge at any point during the 12 year useful life of the vehicle, regardless of seasonal loads and driver efficiency.

Alternatively, buses that utilize on-route charging (the ability to fast charge bus batteries while the bus is in revenue service) must be able to travel a minimum of 30 miles on a single charge and be fully chargeable within 10 minutes throughout its designated route, at any point during the 12 year useful life of the vehicle, regardless of seasonal loads and driver efficiency.

4.12 Design Operating Profile (Fuel Economy or Energy Economy/Range Test)

Test results from the Altoona fuel economy tests or other applicable test procedures shall be provided to the Purchaser, when available. Results shall include vehicle configuration and test environment information. Fuel economy data shall be provided for each design operating profile. The design operating profile is assumed to be defined by the Altoona fuel duty cycles as stated below.

Fuel economy tests shall be run on these four duty cycles.

- Duty Cycles (avg speed)
- Manhattan: 6.8 mph
- Orange County: 12.7 mph
- UDDS: 19 mph
- Idle time

Results from Testing of Battery Electric Buses shall be reported in kWh per mile.

Purchaser will provide a percentage of each duty cycle that is representative of Purchaser's service.

4.13 Hybrid

Energy storage system state of charge correction methods stated in SAE J2711 shall be utilized.

4.14 Electric

The Design Operating Profile must be met under maximum auxiliary loads and at GVWR. It is assumed that buses will start daily duty cycle at maximum standard operating SoC. Batteries shall not be depleted below minimum standard operating SoC during operations. Minimum standard operating SoC shall allow for reserve battery capacity 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.

Nominal conditions

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

Worst-case conditions

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

The Bidder shall provide the following narratives with its Evaluation Response:

• Narrative description of the methods used to validate that the proposed system will meet the Purchaser 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 Purchaser design operating profile when the battery reaches end-of-life (EOL) state. The Bidder 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 Purchaser design operating profile. Note that the Purchaser requires that operational impacts be minimized.

• Description of the flexibility and considerations necessary to place the proposed bus and its charging solution on any Purchaser route at the Purchaser'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 Purchaser design operating profile. Note that the Purchaser requires that operational impacts be minimized.
- Description of the flexibility and considerations necessary to place the proposed bus and its charging solution on any Purchaser route at the Purchaser's discretion.

5 POWERPLANT

Engine (Diesel or CNG)

The engine shall comply with applicable local, state and/or federal emissions and useful life requirements.

The engine shall have a design life of not less than 300,000 miles without replacement or major service. The lifetime estimate is based on the design operating profile.

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

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

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

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

5.1 Automatic Engine Protection/Shutdown Override Feature

A control shall be available to the operator/driver that when constantly depressed and released will delay the engine shutdown or allow the bus to be moved. Override action shall be recorded. This data shall be retrievable by the Purchaser. The engine control system shall protect the engine against progressive damage. The system shall monitor conditions critical for safe operation and automatically de-rate power and/or speed and initiate engine shutdown as needed. The on-board diagnostic system shall trigger an audible alarm and warning light to signal the operator when the engine control unit detects a malfunction and the engine protection system is activated.

Automatic shutdown shall occur when parameters established for the functions below are exceeded:

- Coolant Level
- Coolant Temperature
- Oil Pressure
- Oil Temperature
- 15 minutes of idling
- Exhaust Temperature
- Fire Suppression

5.2 Excessive Idle Shutdown

Provisions will be made for the automatic shutdown after 15 minutes of idling shall occur when the engine has been in idle speed or fast idle for fifteen (15) minutes with the front master switch in “Day” or “Night” position, parking brake applied, and the ramp in stow position. Also, the interior lights shall be extinguished and all the exterior lights shall be extinguished except that in “night run” the parking/marker/ID lights shall remain on. (The headlights and the daylight running headlights will be extinguished.) **Purchaser approval is required for this shutdown option, selection to be made at the pre-production meeting**. (Intermotive Engine Monitoring System or equivalent if required by the engine manufacturer)

The automatic shutdown for the Fire Suppression feature shall occur when the Fire Suppression system is discharged.

A control shall be available to the operator/driver, to allow temporary override (30-45 seconds) of the engine protection/shutdown system if engine power is required to move the bus in emergency conditions. Override action shall be recorded. This data shall be retrievable by the Purchaser.

The integration of all systems on the vehicle relative to engine idle speed shall be the responsibility of the Contractor and shall meet the requirements of the transit property.

The engine starting system shall be protected by an interlock that prevents its engagement when the engine is running.

Engine throttle operation shall be inhibited, through interlocks, whenever:

1. Front or rear door open (front door optional: selection made by Purchaser)
2. The vehicle is kneeled
3. Wheelchair ramp is in operation
4. Rear door emergency release
5. Fast Idle Operation

Failure of the engine throttle control shall not result in an unsafe condition. Loss of air or electrical throttle control shall inhibit throttle.

The engine shall have on-board diagnostic capabilities, able to monitor vital functions, store out of parameter conditions in memory, and communicate faults and vital conditions to service personnel. Diagnostic reader device connector ports, suitably protected against dirt and moisture, shall be provided in operator's area and near or inside engine compartment. The on-board diagnostic system shall inform the operator via visual and/or audible alarms when out-of-parameter conditions exist for vital engine functions. All removable caps shall be tethered including the caps for the diagnostic connector ports in the operator's area and in the engine compartment.

5.3 Fast-Idle System

The fast-idle device shall be activated and controlled automatically by the engine control system. This device will operate only when the transmission is in neutral. This is not required for electric buses.

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

5.4 Engine (CNG)

The engine shall meet all regulatory requirements when operating on fuel equal to CARB Specifications for Compressed Natural Gas #2292.5. The four predominant characteristics that must be met are methane, ethane, butane, and propane.

5.5 Hybrid Propulsion System

Propulsion System Description

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

The Hybrid Drive System shall be rated for the GVWR or greater of the bus.

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

A detailed description of the propulsion system shall be provided with the bid. 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. Bidder is required to provide a list of applicable industry standards that the proposed propulsion system meets.

5.5.1 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 COC correction methods stated in SAE J2711 shall be utilized.

5.5.2 Engine (Hybrid)

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

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

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

The engine shall have onboard diagnostic capabilities, be able to monitor vital functions, store out-of-parameter conditions in memory, and communicate faults and vital conditions to service personnel. Diagnostic reader device connector ports, suitably protected against dirt and moisture, shall be provided in the operator's area and near or inside the engine compartment. The onboard diagnostic system shall inform the operator via visual and/or audible alarms when out-of-parameter conditions exist for vital engine functions.

The engine starting system shall be protected by an interlock that prevents its engagement when the engine is running. Special equipment or procedures may be employed to start the engine when exposed to temperatures less than 30 °F (−1 °C) for a minimum of 4 hours without the engine in operation. All cold-weather starting aids, engine heating devices and procedures shall be of the type recommended by the engine manufacturer and approved by the Purchaser.

5.6 Electric Propulsion System

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

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

A detailed description of the propulsion system shall be provided with the bid. 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. Bidder is required to provide a list of applicable industry standards that the proposed propulsion system meets.

5.7 Propulsion System Service (ALL)

The propulsion system shall be arranged so that accessibility for all routine maintenance is assured. No special tools, other than dollies and hoists, shall be required to remove the propulsion system or any subsystems. However, the Purchaser shall recognize that properly rated test equipment and safe electrical work practices are essential when servicing high voltage hybrid components. The exhaust system, air cleaner, air compressor, starter (if used), alternator, radiator, all engine accessories, and any other component requiring service or replacement shall be easily removable. Contractor shall provide all specialty tools and diagnostic equipment required for maintaining the Propulsion System in accordance with Special Tools List.

5.8 Primary Propulsion Unit and Traction Motor (electric and hybrid)

The primary propulsion unit and traction motor may be configured in a variety of methods dependent upon type of drive, series and/or parallel. The definition of motor in the context of this specification assumes the device can provide or consume energy as well as provide or retard mechanical motion.

5.9 Prime Power Unit (PPU)

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

Contractor shall provide Purchaser with expected durability of the PPU and related emission systems.

5.10 Propulsion System Service

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

5.11 Propulsion System Controller

Motor Controller(s) shall regulate energy flow throughout system components. The controller(s) shall monitor and process inputs and execute outputs as appropriate to control the operation of all propulsion system components. Controller(s) shall have bi-directional power control providing drive and charging functions with inverter and motor control.

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

Energy Storage System State of Charge (SoC) correction methods stated in SAE J2711 shall be used (for all-electric or hybrid).

5.12 Traction System

The traction system shall provide the necessary torque to meet the gradeability, startability, and acceleration specifications.

The motor(s) shall have thermal warning to prevent damage in the event there is an over temperature situation. The Contractor shall comply with all subcomponent vendor's requirements and recommendations regarding motor design, sizing, and method of cooling or loading specifications. The inverter/motor combination shall be designed to operate for not less than 200,000 miles in the anticipated duty cycle without major failure or significant deterioration.

Adequate provision for lubrication, cooling, and monitoring of these functions shall be provided. The motor(s) are to be mounted on resilient mounts to provide for maximum isolation of noise and vibration.

5.13 Energy Storage System and Controller (hybrid or electric)

The Energy Storage System (ESS) shall be of a commercial design capable of operating in the Purchaser transit environment and design operating profile. The ESS shall use battery technology with a field-proven track record of safe, reliable and durable operation in similar transit applications. The ESS shall be designed, sized and selected to ensure that

the vehicle performance specifications, compatibility with charging, and other related requirements are met or exceeded, bearing in mind cost/benefit and reliability variables as they relate to the characteristics of the different battery types.

The ESS shall comply with 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, functioning ESS charged with at least 25 kWh of usable energy. 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 bid. The bid shall include a description of all battery maintenance requirements including any periodic charge requirements necessary for cell balancing. The bid 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 bid, 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.

Bids 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. Bidders shall include documented results of life-cycle testing. Bidders shall include certification of battery life-cycle testing by an independent testing agency.

The energy controller shall be provided with operating software capable of monitoring features such as temperature, voltage, current.

Propulsion batteries shall not exist within the passenger compartment of the transit bus and the impact to range and performance, per section 4.12, shall be noted, communicated and agreed upon prior to issuing a notice to proceed by the Purchaser.

5.14 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 an example if the capacity when new is 300 kWh and the WEOL is at 80 percent, then the useable capacity range shall be from 300 to 240 kWh.

The ESS shall be measured periodically during the 12-year design life of the buses per the following protocol by the Contractor at an interval of at least every 3 years. The Contractor will propose the test method, and certify the results are true and accurate. The test will be performed according to a documented test procedure. The Purchaser is allowed to engage third-parties for capacity testing.

5.15 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 Purchaser. The vehicle and energy storage system shall be designed and constructed to prevent gassing or fumes from the energy storage system from entering the interior of the bus, i.e., a vent path to the exterior, preferably at or above the roof, rearward.

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

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

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

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

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

- Offers a quick, safe and organized means for the operator, maintenance personnel and/or first responders to shut down the HV system.
- Shutting down the system shall include at least:
    - "opening" all HV contactors;
    - discharging capacitors (if used); and
    - disconnecting any devices that could provide HV, during normal operation and including during charging.
- Devices used to initiate shutdown shall be located within and outside the bus to satisfy ease of use by the mentioned personnel and 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.

5.16 Battery Containers

Battery containers shall be constructed to withstand the rigors of transit service for the design life of the buses. Connector and cabling design shall be such that inappropriate or unsafe connections are not possible. 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. Battery pack design shall ensure the protection of battery cabling and vent/watering system components during pack removal and installation. The batteries, when installed, shall be secured to prevent any movement while the vehicle is in operation.

5.17 Battery Management System

An imbedded battery management system (BMS) shall be provided for diagnostic and management of power to the batteries. 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 managing the charging and discharging of the battery power contactors, power limit, current detection, battery temperature, and voltage sampling.
2. The BMS must be capable of balancing the voltage among the individual cells within the battery modules.
3. 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.

4. The BMS must be capable of monitoring battery temperatures, mitigating damage to the battery and surroundings, and preventing thermal runaway.
5. 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.
6. The BMS must be capable of engaging prudent safety interlocks when an unsafe battery condition has been detected.
7. The BMS must be able to monitor the battery SoC and provide information to the rest of the vehicle.
8. The BMS must be able to communicate all data to the bus level information system for storage and communication

5.18 Battery Charging

The bus shall support an SAE-approved charging standard (SAE J1772 DC and/or SAE J3068 AC). Contractor shall provide a detailed description of its charging system and specify its compliance with one of the above-listed standards. Bidders 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 nontractive and the brakes applied.

Contract can provide options for charging of the energy storage system for determination by the Purchaser. The options can include conductive charging or inductive charging options as needed to meet the required duty cycle. The charging systems can provide for options of quick charging, inductive charging, and stationary depot charging.

The Energy Storage System shall also make use of regenerative braking. The Energy Storage System shall comply with UN/DOT 38.3 requirements for lithium batteries or similar standards for non-lithium batteries.

5.19 Battery Thermal Management

If required by the battery manufacturer, thermal management via refrigeration or external cooling shall be provided to ensure optimal life and performance of the ESS over the environmental operating range.

6 Cooling Systems

The cooling systems shall be of sufficient size to maintain all engine and transmission fluids and engine intake air at safe, continuous operating temperatures during the most severe operations possible and in accordance with engine and transmission manufacturers' cooling system requirements. The cooling system fan controls should sense the temperatures of the operating fluids and the intake air, and if either is above safe operating conditions the cooling fan should be engaged. The fan control system shall be designed with a fail-safe mode of "fan on." The cooling system shall meet the requirements stated in the operating environment. The base bus will utilize an electric fan system. A hydraulic drive, mechanical drive or electrical drive fan system to maintain efficient operating temperatures, per engine manufacturer's specifications, will be made available as options.

6.1 Motor Cooling System (Electric)

The cooling system fan controls shall sense the temperatures of the operating fluids and the intake air, and will engage the cooling fan to ensure safe operating conditions. The fan control system shall be designed with a fail-safe mode of "fan on." The cooling fan shall be temperature controlled.

The radiator shall be of durable corrosion-resistant construction with non- removable tanks. The radiator shall be designed to withstand thermal fatigue and vibration associated with the installed configuration

The motors shall be liquid cooled. Motor temperature sensors shall be easily accessible for replacement. Motor temperature sensors shall not disable the bus at any time.

The bus shall be equipped with an electric fan drive bus cooling system. A screen guard shall be installed on electric motor fans per SAE J1308. The cooling fan and mounting bracket shall be designed to withstand thermal fatigue and vibration associated with the installed configuration.

The cooling fan shall be temperature controlled. Variable fan speed shall be used to keep the engine within operation temperature. Engine cooling, Charge Air Cooling and Hybrid Drive Cooling shall be managed has different fan groups.

6.2 Transmission Cooling

The transmission, if used, shall be cooled in order to maintain operating fluids within the transmission manufacturer's recommended parameters of flow, pressure and temperature. The cooling system shall be able to cool the transmission while operating continuously at highway speeds

6.3 Electric Drive System Cooling

Thermal management system shall maintain electric drive system components within design operating temperature limits in all driving conditions

6.4 Engine Cooling

The engine shall be cooled by a water-based, pressure type, cooling system that does not permit boiling or coolant loss during the operations described above. Engine thermostats shall be easily accessible for replacement. Shutoff valves shall allow filter replacement without coolant loss. Valves shall permit complete shutoff of lines for the heating and defroster units, and water booster pumps. The water boost pump shall be a long life brushless design. All low points in the serviceable cooling system shall be equipped with brass drain plugs. Air vent valves shall be fitted at high points in the cooling system unless it can be demonstrated that the system is self-purging.

Electric fans shall be brushless, variable speed, reversible and have a corrosion resistant metal shroud with finger guards that meet SAE spec J1308 200808. The fans should provide discreet fault reporting and have diagnostics capability through the standard SAE J1939 diagnostics port or the multiplex system. The cooling system shall consist of multiple electric DC brushless pusher type variable speed fans with electronic feedback controls. Electric fan motor speeds shall have a minimum operating range of 0-4100 RPM with capability of manual or automatic reverse operation in order to assist in debris removal.

The entire cooling system shall be self-purging.

If applicable, the cooling system shall be equipped with a master controller with the following capabilities; automatically reduce fan speed when the vehicle stops to minimize noise at the curbside, communicate on the J1939 CAN data link with system diagnostic reporting via DM1 messaging, review and download data via a laptop with service tool software, capable of software and calibration up-dates, receive commands from the engine or transmission ECM, report fault codes by lighting an engine compartment LED flashing light, sense engine compartment temperature and activate fans if maximum temperature is exceeded, collect and store cooling system and vehicle performance histogram data. If system controller loses communication with the engine or sensors it shall direct all fans to go into a default speed mode to avoid vehicle shutdown. If fans lose communication with system controller, they shall go into a default speed mode to avoid vehicle shutdown.

This communication shall use the industry standard RP1210 compliant data link adapters connected via the standard 9-pin diagnostic connector found in the engine compartment and interior of the bus. Diagnostic detection shall be capable of identifying which fan group is experiencing a fault condition. Report both active and previously active fault codes with the number of detections/occurrences, time of the first and most recent fault detection, and cumulative time the fault was active. Where electric fans are used for cooling there shall be ample field experience.

A means of determining satisfactory engine coolant level shall be provided. A spring-loaded, push-button type valve or lever shall be provided to safely release pressure or vacuum in the cooling system with both it and the water filler no more than +/- 60 in. above the ground. When activated, any coolant exiting this pressure relief shall drain to

the overflow tank. Both shall be accessible through the same access door. This section does not applicable to electric bus.

The radiator, and charge air cooler if integrated, shall be of durable corrosion-resistant construction. Brazed aluminum radiators shall have welded cast tanks. The radiator shall be designed so a mechanic can gain access to a substantial portion of the side facing the engine for the purpose of cleaning the radiator in five minutes or less.

Radiators shall have a fin density 10 fins per inch or less and shall not have louvered/slit designs. These are more susceptible to clogging and deteriorating cooling performance over time and shall not be used. Radiators shall utilize a bar and plate design or fin and tube type heat exchanger, so they are robust and can be cleaned with high pressure spray wash.

A secondary cooler may be used to increase the ambient temperature capacity for a cooling system. The secondary cooler shall be remote mounted, but below the coolant surge tank. Air flow should be provided with brushless electric fans. If an application requires a boost pump to maintain coolant flow to the secondary cooler, a brushless electric water pump shall be used.

No heat producing components or climate control system components shall be mounted between the engine cooling air intake aperture and the radiator.

The radiator and charge air cooler shall be designed to withstand thermal fatigue and vibration associated with the installed configuration.

6.5 Electronic Fans

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

6.6 Screen in Front of Radiator

The radiator input shall be protected by an easily cleanable screen designed to collect large debris.

Radiators with a fin density greater than 12 fins per in. or a louvered slit design shall not be used. No heat-producing components or climate control system components shall be mounted between the engine cooling air intake aperture and the radiator. The radiator and charge air cooler shall be designed to withstand thermal fatigue and vibration associated with the installed configuration. The radiator and charge air cooler cores shall be easily cleaned (to include engine side core surface) with standard pressure-washing equipment.

6.7 Standard Requirement for Coolant Filtration

The engine cooling system shall be equipped with a properly sized water filter with a spin-on element and an automatic system for releasing supplemental coolant additives as needed to replenish and maintain protection properties. When replacing the water filter, only the water in the filter will be lost.

6.8 Self-Cleaning

Radiator and charge air cooler fan(s) shall be electrically driven and capable of automated reverse operations for periodic self-cleaning of the radiator and charge air cooler.

6.9 Standard Mounting Design

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

6.10 Cooling Fan Controls

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

6.11 Charge Air Cooling

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

6.12 Transmission Cooling

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

6.13 Hybrid Drive System Cooling

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

6.14 Electric Drive System Cooling

Thermal management system shall maintain electric system components within design operating temperature limits.

7 Transmission (Conventional Powertrain)

The transmission shall be multiple speed, automatic shift with torque converter, retarder and electronic controls. Gross input power, gross input torque and rated input speed shall

be compatible with the engine. The transmission shall be designed to operate for not less than 300,000 miles on the design operating profile without replacement or major service. The transmission should be easily removable without disturbing the engine and accessible for service.

The electronic controls shall be capable of transmitting and receiving electronic inputs and data from other drivetrain components and broadcasting that data to other vehicle systems. Communication between electronic drivetrain components and other vehicle systems shall be made using the communications networks. Electronic controls shall be compatible with either 12- or 24-volt power distribution, provide consistent shift quality and compensate for changing conditions such as variations in vehicle weight and engine power.

At a minimum, drivetrain components consisting of the engine, transmission, retarder, ASR, and anti-lock braking systems shall be powered by a dedicated and isolated ignition supply voltage to ensure data communication among components exists when the 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 transmission shall have on-board diagnostic capabilities, be able to monitor functions, store and time stamp out-of-parameter conditions in memory, and communicate faults and vital conditions to service personnel. The transmission shall contain built-in protection software to guard against severe damage. The on-board diagnostic system shall trigger a visual alarm to the driver when the electronic control unit detects a malfunction.

An electronic transmission fluid level monitoring and protection system shall be provided. Models with remote mounted transmission vents shall have vents mounted to prevent plugging and/or the entry of foreign materials. Automatic neutral functions are optional.

8 Retarder Transit Coach

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

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

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

8.1 Retarder- Regenerative Braking (Electric Bus)

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 need not activate the brake lights.

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

The system shall be designed whereby increasing the pressure on the brake pedal increases the amount of regenerative capability up until a preset point is reached within the brake pedal travel whereby the mechanical brake is engaged. Regenerative braking shall continue to operate during mechanical braking.

Red lights shall illuminate when regenerative braking is activated. The regenerative braking shall be adjustable within the limits of the powertrain and activated when the brake pedal is depressed or upon release of accelerator pedal.

8.2 Braking Resistors

The system shall include a means of maintaining dynamic braking (braking retardation) after the hybrid energy storage system can no longer accept regenerative braking energy. The system may use air cooled braking resistors, liquid cooled braking resistors, electrically back-driving the diesel engine, other means or a combination of means. The system shall be sized to dissipate sufficient energy to allow the bus to maintain a speed of no greater than 30 mph on a 6% downgrade for a minimum of 4 miles at GVWR. The system shall allow the bus to maintain this speed without engaging the service brakes.

8.3 Engine Brake (Commuter Coach)

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

Brake lights shall not illuminate when the retarder is activated.

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

8.4 Standard Requirement for Retarder Activation

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

8.5 Accessible Retarder Disable Switch

The retarder disable switch shall be accessible to the seated driver. This requirement is not applicable to electric bus.

Disabling retarder shall be recorded for Purchaser data collection.

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

9.1 Service (Electric)

The Propulsion System shall be arranged for ease of access and maintenance. The Contractor shall list all special tools, fixtures or facility requirements recommended for servicing. The, air compressor, radiator, all accessories and any other component requiring service or replacement shall be easily removable.

Radiator filler caps shall be closed with spring pressure or positive locks to prevent leakage. All fluid fill locations shall be properly labeled to help ensure that correct fluid is added. All fillers shall be easily accessible with standard funnels, pour spouts and automatic dispensing equipment.

9.2 Service (Diesel, CNG or Hybrid)

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

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

The engine and transmission shall be equipped with sufficient heavy-duty fuel and oil filters for efficient operation and to protect the engine and transmission between

scheduled filter changes. All filters shall be easily accessible and the filter bases shall be plumbed to ensure correct reinstallation.

9.3 Engine Oil Pressure and Coolant Temperature Gauges

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

9.4 Engine Air Cleaner

An air cleaner with a dry filter element and a graduated air filter restriction indicator shall be provided. The location of the air intake system shall be designed to minimize the entry of dust and debris and to maximize the life of the air filter. The engine air duct shall be designed to minimize the entry of water into the air intake system. Drainage provisions shall be included to allow any water/moisture to drain prior to entry into air filter. The engine air cleaner must be able to be changed out easily. The engine air cleaner shall be easily accessible without the need to disassemble other parts to access the filter.

Contract shall provide an approved air filter gauge in a location that is both approved by the engine manufacturer and approved by the Purchaser, if required by the Purchaser.

9.5 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 tamper-proof priority system shall prevent the loss of power steering during operation of the bus if other devices are also powered by the hydraulic system.

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

9.6 Hydraulic System Sensors

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

9.7 Fluid Lines

All lines shall be rigidly supported to prevent chafing damage, Fatigue Failures, degradation and tension strain. Lines should be sufficiently flexible to minimize mechanical loads on the components. Lines passing through a panel, frame or bulkhead shall be protected by grommets (or similar devices) that fit snugly to both the line and the perimeter of the hole that the line passes through to prevent chafing and wear. Pipes and fluid hoses shall not be bundled with or used to support electrical wire harnesses. Lines shall be as short as practicable and shall be routed or shielded so that failure of a line shall not allow the contents to spray or drain onto any component operable above the

auto-ignition temperature of the fluid. All hoses, pipes, lines and fittings shall be specified and installed per the manufacturer's recommendations.

All hydraulic hoses in engine compartment should have outer cover or sheath to reduce the chance of a fluid leak contacting hot exhaust.

9.8 Fittings and Clamps

All clamps shall maintain 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.

9.9 Charge Air Piping

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

Charge air piping shall be constructed of stainless steel, aluminized steel or anodized aluminum, except between the air filter and turbocharger inlet, where piping may be constructed of fiberglass. Connections between all charge air piping sections shall be sealed with a short section of reinforced hose and secured with stainless steel constant tension clamps that provide a complete 360-degree seal.

Charge air piping not required for electric buses.

9.10 Radiator

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

Radiator piping shall be stainless steel or brass tubing, and if practicable, hoses shall be eliminated. Necessary hoses shall be impervious to all bus fluids. All hoses shall be secured with stainless steel clamps that provide a complete 360-degree seal. The clamps

shall maintain constant tension at all times, expanding and contracting with the hose in response to temperature changes and aging of the hose material.

9.11 Oil and Hydraulic Lines

Oil and hydraulic lines shall be compatible with the substances they carry. The lines shall be designed and intended for use in the environment where they are installed. For example, high–temperature resistant in the engine compartment, resistant to road salts near the road surface, and so on. Lines within the engine compartment shall be composed of steel tubing where practicable, except in locations where flexible lines are required.

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

10 FUEL

10.1 Fuel Lines

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

Manifolds connecting fuel containers shall be designed and fabricated to minimize vibration and shall be installed in protected locations to prevent line or manifold damage from unsecured objects or road debris. Fuel hose and hose connections, where permitted, shall be made from materials resistant to corrosion and fuel and protected from fretting and high heat. Fuel hoses shall be accessible for ease of serviceability. Fuel lines shall be capable of carrying the type of fuel specified by the Purchaser (i.e., up to B20 type fuel).

10.2 Fuel Lines, CNG

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

High-pressure CNG lines shall be pressure tested to a minimum of 115 percent of system working pressure prior to fueling. CNG, nitrogen or clean, dry air shall be used to pressure test the lines/assembly. The Contractor shall have a documented procedure for testing the high-pressure line assembly. Fuel lines shall be securely mounted, braced and supported using “split-block” type or stainless-steel P clamps; all mounting clamps shall be mounted to a rigid structure to minimize vibration and shall be protected against damage, corrosion or breakage due to strain, rubbing, or wear by using stress loops or “z” bends or equivalent as needed. “Floating clamps” (not mounted to a rigid structure) shall not be permitted. Fuel lines shall not be used to secure other components (wires, air lines, etc).

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

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

11 DESIGN AND CONSTRUCTION

11.1 Design and Construction, Diesel, (Not applicable to Electric Buses)

11.1.1 Fuel Tank(s)

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

Cross-Linked Polyethylene fuel tank with internal baffling to minimize fuel movement may be listed as an option.

11.1.2 Installation

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

The fuel tank(s) shall be equipped with an external, hex head, drain plug. It shall be at least a ⅜-inch size and shall be located at the lowest point of the tank(s). The fuel tank(s) shall have an inspection plate or easily removable filler neck to permit cleaning and inspection of the tank(s) without removal from the bus. The tank(s) shall be baffled internally to prevent fuel-sloshing noise regardless of fill level. The baffles or fuel pickup location shall assure continuous full power operation on a 6 percent upgrade for 15 minutes starting with no more than 25 gallons of fuel over the unusable amount in the tank(s). The bus shall operate at idle on a 6 percent downgrade for 30 minutes starting with no more than 10 gallons of fuel over the unusable amount in the tank(s). All systems/engines on all model buses will be compatible with all blends of Bio-Diesel fuel based on manufacturer's recommendations up to 20% maximum.

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

11.1.3 Labelling

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

11.1.4 Fuel Filler

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

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

11.1.5 Dry-break fuel filler

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

11.2 Design and Construction, CNG

11.2.1 Fuel Containers/Cylinders

CNG fuel containers/cylinders must satisfy current 20 years from date of manufacture rating. Fuel tanks should be visually inspected at least every 36 months or 36,000 miles, whichever comes first, and

- After an accident or fire and;
- After a dispenser malfunction that results in pressure greater than 125% service pressure.

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

11.2.2 U.S. Applications:

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

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

11.2.3 Installation

Fuel cylinders shall be installed in accordance with ANSI/IAS NGV2 - 1998, Basic Requirements for Compressed Natural Gas Vehicles (NGV) Fuel Containers and NFPA 52, Compressed Natural Gas (CNG) Vehicular Fuel Systems Code, 1998 edition Section 303. In the case of a low floor transit bus, the placement of tanks shall be limited to the roof of the vehicle or in the compartment above the engine of the vehicle.

Fuel cylinders, attached valves, pressure relief devices, and mounting brackets should be installed and protected so that their operation is not affected by bus washers and environmental agents such as rain, snow, ice or mud. These components should be protected from significant damage caused by road debris or collision.

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

CNG fueled buses shall be equipped with an active automatic gas detection system which shall have an audible warning buzzer unsafe levels of methane. The automatic gas detection system shall be integrated with an onboard fire suppression system.

11.2.4 Labelling

CNG fuel systems shall be labeled in accordance with NFPA 52, “Compressed Natural Gas (CNG) Vehicular Fuel Systems Code,” 1998 edition. Fuel tanks that have reached their labeled expiration date (EO) or been condemned by inspection shall be remove from service (and destroyed).

Heavy duty buses shall be labeled at the fueling connection with the EOL date and the date for the next inspection.

11.2.5 Pressure Relief Devices (PRDs)

PRDs must be designed, constructed, manufactured and tested in accordance with ANIS/IAS PRD1 - 2013, “Pressure Relief Devices for Natural Gas Vehicle (NGV) Fuel Containers” and ANSI/IAS NGV2- 2007, “Basic Requirements for Compressed Natural Gas Vehicle (NGV) Fuel Containers.” All natural gas fuel system piping, including the PRD vent line, shall be stainless steel. All PRDs must be vented to outside. Vent lines must be plugged with rubber or other material that will prevent water from entering the vent lines, and positioned in the tube in such a manner to prevent bus washes, tree limbs etc. from knocking the plug out of the line while not being too secure to prevent the plug from blowing out in the event the relief valve opens. Vent lines must be plugged with rubber or other material that will prevent water from entering the vent lines, and positioned in the tube in such a manner to prevent bus washes, tree limbs etc. from knocking the plug out of the line while not being too secure to prevent the plug from blowing out in the event the relief valve opens.

11.2.6 Valves

Valves must be installed in accordance with ANIS/IAS NGV2 - 2007, “Basic Requirements for Compressed Natural Gas Vehicle (NGV) Fuel Containers” and NFPA 52, “Standard for Compressed Natural Gas (CNG) Vehicular Fuel Systems.”

11.2.7 Fuel Filler

The fuel filler shall be located 7 to 38 feet (on a 30-, 35- and 40-foot coach) behind the centerline of the front door on a side determined by the Purchaser. The filler cap shall be retained to prevent loss and shall be recessed into the body.

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

The fuel fill receptacle and vent receptacle attachment shall be robust and capable of routine fueling connects/disconnects without deflection or metal fatigue, and capable of

withstanding mechanical loads induced by a fueling drive away incident without attachment failure.

11.2.8 Fueling System

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

Within 24" of the fuel port the fuel fill line shall have a bulkhead fitting securely mounted to the frame or other substantial member with a check valve on the back side of the bulkhead fitting. This is a last chance safety measure to prevent a fuel release if all other safety measures fail and the fuel receptacle is ripped from the bus in a drive a way.

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

11.2.9 Defueling System

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

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

12 EMISSIONS AND EXHAUST

12.1 Exhaust Emissions

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

12.2 Exhaust System

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

12.3 Exhaust After Treatment

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

12.4 Diesel Exhaust Fluid Injection

If required by the engine manufacturer to meet NOx level requirements specified by EPA, a DEF injection system will be provided. The DEF system will minimally include a tank, an injector, a pump, an ECM and a selective catalytic converter. The tanks shall be designed to store DEF in the operating environment described in the “Operating Environment” section. The DEF fluid lines shall be designed to prevent the DEF from freezing. The DEF injection system shall not be damaged from a cold soak at 10 °F.

12.5 Particulate After Treatment

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

12.6 Emissions and Exhaust Electric buses

The vehicle shall not have any exhaust emissions, nor the need for exhaust systems, after treatment or particulate filters

12.7 Fire Suppression System

Each vehicle shall be equipped with an automatic thematic fire suppression system to provide adequate coverage of fire suppression in the engine compartment and main electrical box areas. At a minimum, units shall consist of a 25-pound (lb.) ABC chemical cylinder, 3 stainless steel temperature sensitive weather proof thermostats, 4 nozzles,

and a control panel mounted in the driver's compartment as minimum equipment. Units shall be totally self-contained with all lines, fittings, brackets, and thermal release heads within the appropriate compartments, strategically placed, to provide the best protection.

The system shall incorporate a telltale, dash mounted operator warning light, audible indicator and switch, automatically shutting off all fans and climate control systems in the event of discharge.

The system installed shall be certified by the Contractor that it is suitable for use in the proposed vehicle in case the unit fails to function during an on-board vehicle event or fire. Each vehicle shall be delivered with a certificate identifying the vehicle identification number (VIN) for which it applies. The system shall be U.L., U.C.L., and F.M. listed and meet all D.O.T. and F.M.V.S.S. Regulations and be certified by the vehicle and equipment manufacturer.

This requirement does not apply to batteries electric buses. However, an appropriate fire suppression system to detect fire in the batteries compartment or electric motors, if available, shall be listed as an option.

13 STRUCTURE

13.1 General Design

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

13.2 Altoona Testing

Prior to acceptance of first bus, the vehicle must have completed any FTA-required Altoona testing. Any items that required repeated repairs or replacement must undergo the corrective action with supporting test and analysis. A report clearly describing and explaining the failures and corrective actions taken to ensure any and all such failures will not occur shall be submitted to the Purchaser. If available, the Bidder shall be provide the Altoona Test Report with the submittal. If not available, then the report shall be provided prior to acceptance of first bus.

13.3 Altoona Test Report Provided to Purchaser Prior to Start of Bus Production

Prior to the start of any bus manufacturing or assembly processes, the structure of the proposed bus model shall have undergone appropriate structural testing and/or analysis, including the complete regimen of FTA required Altoona tests. Prior to assembly of the first bus, the OEM shall provide the Purchaser with a completed report of Altoona testing for the proposed bus model along with a plan of corrective action to address deficiencies, breakdowns and other issues identified during Altoona testing. The bus model tested shall match the bus model proposed for procurement, including structure, axles and drive-train. Base model and partial Altoona test reports are acceptable when the combination of these tests adequately represents the proposed bus model per SAFETEA-LU and MAP-21.

13.4 Structural Validation - 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), if available.

13.5 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.

13.6 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.

13.7 Engine or Motor Compartment Bulkheads

The passenger and engine compartment shall be separated by fire-resistant bulkheads. The engine compartment shall include areas where the engine and exhaust system are housed. This bulkhead shall preclude or retard propagation of an engine compartment fire into the passenger compartment and shall be in accordance with the Recommended Fire Safety Practices defined in FTA Docket 90A, dated October 20, 1993. Only necessary openings shall be allowed in the bulkhead, and these shall be fire-resistant. Any passageways for the climate control system air shall be separated from the engine compartment by fire resistant material. Piping through the bulkhead shall have fire-resistant fittings sealed at the bulkhead. Wiring may pass through the bulkhead only if connectors or other means are provided to prevent or retard fire propagation through the bulkhead. Engine access panels in the bulkhead shall be fabricated of fire resistant material and secured with fire-resistant fasteners. These panels, their fasteners and the bulkhead shall be constructed and reinforced to minimize warping of the panels during a fire that will compromise the integrity of the bulkhead.

13.8 Crashworthiness

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-pound automobile at any side, excluding doorways, along either side of the bus with no more than 3 in. of permanent structural deformation at seated passenger hip height. This impact shall not result in sharp edges or protrusions in the bus interior.

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

The transit bus, at GVWR and under static conditions, shall not exhibit deformation or deflection that impairs operation of doors, windows, or other mechanical elements. Static conditions include the vehicle at rest with any one wheel or dual set of wheels on a 6 inch curb or in a 6 inch deep hole.

The sidewall structure shall be capable of withstanding impacts of 200 foot pounds of energy from a steel faced spherical missile no less than 9 inches in diameter and of a 500 pound load applied anywhere along their length by a rigid plate 1 foot in length with no visible damage to the supporting structure. A damaged portion of the supporting structure shall be replaceable without requiring removal or replacement of the entire structure.

13.9 Corrosion

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

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

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

13.11 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.

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

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

13.12 Lifted (Supported) Front Axle and Flat Towing Capability (additional requirement)

The front towing devices shall allow attachment of adapters for a rigid tow bar and shall permit the lifting of the bus until the front wheels are clear off the ground in order to position the bus on the towing equipment by the front wheels. These devices shall also permit common flat towing. Two rear recovery devices/tie downs shall permit lifting and towing of the bus for a short distance, such as in cases of an emergency, to allow access to provisions for front towing of bus. The method of attaching the tow bar or adapter shall require the specific approval of the Purchaser. Any tow bar or adapter exceeding 50 pounds should have means to maneuver or allow for ease of use and application. Each towing device shall accommodate a crane hook with at least a 1 in. throat. The bumper and frame shall have sufficient strength to allow another bus or a maintenance push/tow vehicle to push the bus from either end, at up to 45 deg. off axis without body or bumper damage.

13.13 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 inch high run-up block not wider than a single tire. The bus shall withstand such jacking at any one or any combination of wheel locations without permanent deformation or damage.

13.14 Yellow Pads

Jacking pads/points shall be painted safety yellow. Alternative jacking pad color to be specified by the Purchaser.

13.15 Hoisting

The bus axles or jacking plates shall accommodate the lifting pads of a two-post (or three-post if 60 foot 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 Contractor shall specify the lifts and equipment necessary to lift each model of bus with the submittal documentation.

14 FLOOR

14.1 Design (Transit Coach)

The floor shall be essentially a continuous plane, except at the wheel housings and platforms. Where the floor meets the walls of the bus, as well as other vertical surfaces such as platform risers, the surface edges shall be blended with a circular section of radius not less than ¼ inch or installed in a fully sealed butt joint. Similarly, a molding or cover shall prevent debris accumulation between the floor and wheel housings. The vehicle floor in the area of the entrance and exit doors shall have a lateral slope not exceeding 4 degrees to allow for drainage. All aisles, steps, floor areas where people walk, and floors in securement locations shall have slip-resistant surfaces. Floor coverings should be continuously attached to the sub-flooring without voids or trapped debris, as far as practical. Floor coverings must be easy to clean by dry methods and wet wash with cleaning solutions. Bus floors shall be undamaged for the life of the bus by routine cleaning with wet wash methods. It is expected that the floor covering with the possible exception of step treads will last the life of the bus.

14.2 Design (Commuter)

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 degrees to allow for drainage.

The aisle of the bus shall be a sloped floor design and shall not exceed 5.5 degrees 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.

14.3 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 degrees to allow for drainage.

14.4 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 inch 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 lbs. applied through the flat end of a ½ inch diameter rod, with 1/32-inch radius, without permanent visible deformation.

14.5 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.

14.6 Pressure-Preserved Plywood Panel

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

Option for composite flooring for weight reduction.

14.7 Construction (Commuter Coach)

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

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

15 Platforms

15.1 Driver's Area

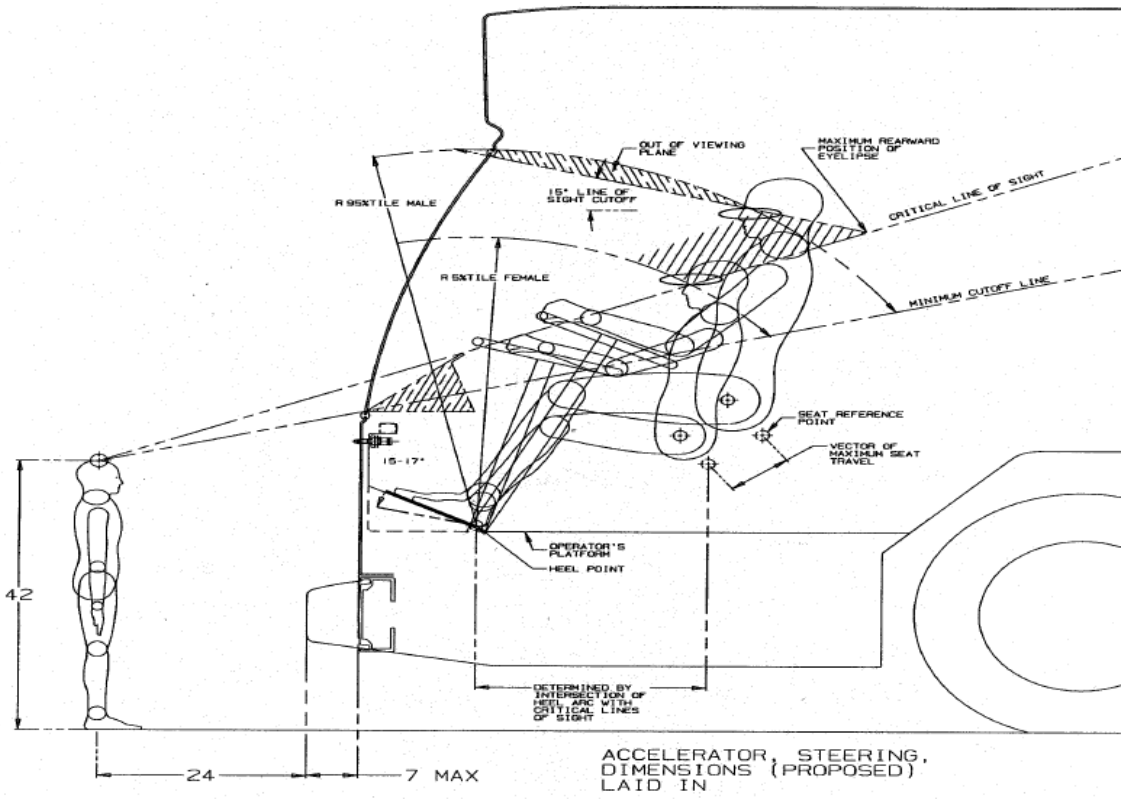
The covering of platform surfaces and risers, except where otherwise indicated, shall be the same material as specified for floor covering. Trim shall be provided along top edges of platforms unless integral nosing is provided.

15.2 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 inches above the road surface, 24 inches from the leading edge of the bumper. Notwithstanding this requirement, the platform height shall not position the driver such that the driver's vertical upward view is less than 15 degrees. A warning decal or sign shall be provided to alert the driver to the change in floor level. Figure 3 illustrates a means by which the platform height can be determined, using the critical line of sight.

FIGURE 3

Determining Platform Height. Applicable to high floor over the road coach only.



15.3 Farebox

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

15.4 Rear Step Area to Rear Area

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

16 WHEEL HOUSING

16.1 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.

16.2 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 floor shall be equipped with scuff-resistant coating or stainless steel trim.

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

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.

16.3 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. Under-floor 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 under-floor 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 Purchaser 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 Purchaser.

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.

16.4 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 Purchaser.

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.

16.5 Bellows (Articulated Transit Coach)

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 under-floor 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 Purchaser's option. Bellows shall be approved by the Purchaser.

17 CHASSIS

17.1 Suspension - General Requirements

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

17.2 Alignment

All axles should be properly aligned so the vehicle tracks accurately within the size and geometry of the vehicle. Alignment must be performed after build and prior to delivery. A computerized alignment printout must be supplied with the vehicle.

17.3 Springs and Shock Absorbers - Suspension Travel

The suspension system shall permit a minimum wheel travel of 2.75 inches jounce-upward travel of a wheel when the bus hits a bump (higher than street surface), and 2.75 inches 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 inch at any point from the height required. The safe operation of a bus cannot be impacted by ride height up to 1 inch from design normal ride height.

17.4 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 less after hitting road perturbations. The shock absorber bushing shall be made of elastomeric material that will last the life of the shock absorber. The damper shall incorporate a secondary hydraulic rebound stop.

17.5 Lubrication - Standard Grease Fittings

All elements of steering, suspension and drive systems requiring scheduled lubrication shall be provided with grease fittings conforming to SAE Standard J534. These fittings shall be located for ease of inspection and shall be accessible with a standard grease gun from a pit or with the bus on a hoist. Each element requiring lubrication shall have its own grease fitting with a relief path. The lubricant specified shall be standard for all elements on the bus serviced by standard fittings and shall be required no less than every 6,000 miles.

17.6 Kneeling

A kneeling system shall lower the entrance(s) of the bus a minimum of 2.5 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 kneeling control shall be disabled when the bus is in motion. 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 3 seconds to a height permitting the bus to resume service and shall rise to the correct operating height within 7 seconds regardless of load up to GVWR. During the lowering and raising operation, the maximum vertical acceleration shall not exceed 0.2g, and the jerk shall not exceed 0.3g/second.

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.

18 WHEELS AND TIRES

18.1 Wheels

All wheels shall be interchangeable 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.

18.2 Painted Steel

Wheels and rims shall be hub-piloted steel with white powder coat (maximum 3.5 mil) and shall resist rim flange wear. Aluminum wheels shall be priced separately as an option.

Electric bus tires rims shall be aluminum as standard.

18.3 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.

If procuring Purchaser has a tire supplier, either purchase or lease, arrangements will be made for the supplier to furnish tires. Tires will be approved for transit application with a load range appropriate to bus weight and size. Bidders should offer tires as a separately priced option for those agencies that wish to purchase under this contract.

18.4 Steering

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

Electrically assisted steering shall be provided as an option to reduce steering effort. An option for using TranSynd in the power steering pump and system will be made available. A remote mounted fluid sampling port, for the KP Series Pushbutton Sampling Valve or similar, shall be provided for the hydraulic system.

18.5 Steering Axle Transit Coach - Solid Beam or Independent suspension type Axle and Grease-Type Front Bearings and Seals

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

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

18.6 Steering and Tag Axles Commuter Coach

The front and tag axles shall be a solid beam or independent suspension, 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 (frontlock) wheel shall be within 2 degrees of true Ackerman up to 50 percent lock measured at the inside (backlock) wheel. The steering geometry shall be within 3 degrees of true Ackerman for the remaining 100 percent lock measured at the inside (backlock) wheel.

18.7 Steering Wheel - 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 degrees shall be no less than 5 ft.-lbs. and no more than 10 ft-lbs. Steering torque may increase to 70 ft.-lbs. when the wheels are approaching the steering stops, as the relief valve activates.

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

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.

18.8 Steering Wheel - General

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

Steering wheel spokes and wheel thickness shall ensure visibility of the dashboard so that vital instrumentation is clearly visible at center neutral position (within the range of a 95th-percentile male, as described in SAE 1050a, Sections 4.2.2 and 4.2.3). Placement of steering column must be as far forward as possible, but either in line with or behind the instrument cluster. The steering wheel shall be telescoping and shall have two separate tilt locations, one near the top of the column and one at the universal joint below the floor where the column is connected to the right angle steering box; tilt and telescope are controlled by levers on the left side of the column.

18.9 Steering Column - Tilt

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

18.10 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 5

Steering Wheel Height[1] Relative to Angle of Slope

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

1. Measured from bottom portion closest to driver.

19 Drive Axle

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

NOTE: The retardation duty cycle can be more aggressive than propulsion. The drive shaft shall be guarded to prevent hitting any critical systems, including brake lines, coach floor or the ground, in the event of a tube or universal joint failure.

19.1 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.

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

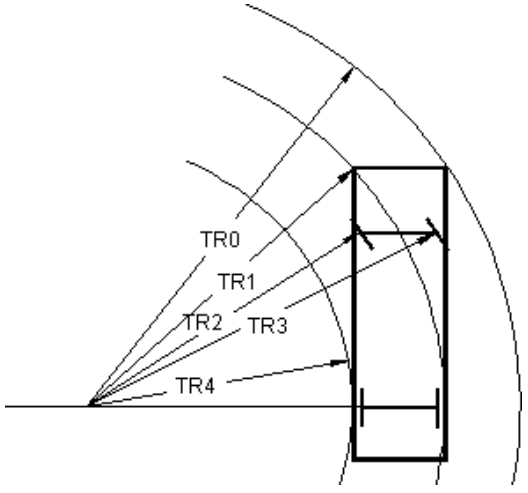
19.3 Turning Radius

The bus shall meet the standards for turning in the table below on a straight, level road at GVWR with all accessories operating. The Contractor shall provide documentation for the turning radius of the bus when the bus has a 48 in. box bike rack attached to the front end.

Bus Length(approximate)	Maximum Turning Radius(see Figure 4)
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) ft (TR0)

FIGURE 4

Turning Radius (copy for APTA chart TS36)



20 BRAKES

20.1 Service Brake

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

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

In addition to traditional mechanical friction service braking, the electric and hybrid buses 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.

20.2 Air-Actuated Brakes

Service brakes shall be controlled and actuated by a compressed air system. Force to activate the brake pedal control shall be an essentially linear function of the bus deceleration rate and shall not exceed 70 lbs. 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 between all wheels in such a ratio as to ensure equal friction material wear rate at all wheel locations. Contractor shall demonstrate compliance by providing a copy of a thermo dynamic brake balance test upon request.

20.3 Automatic Traction Control

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

20.4 Friction Material

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

20.5 Hubs

Replaceable wheel bearing seals shall run on replaceable wear surfaces or be of an integral wear surface sealed design. Wheel bearing and hub seals and unitized hub

assemblies shall not leak or weep lubricant when operating on the design operating profile for the duration of the component manufacturer's warranty or the life of the brake lining whichever is longer.

20.6 Drum Brakes

Brake shoe return springs shall be the heaviest available.

The service brakes shall be two (2) shoe, internal-expanding, air operated S-cam type brakes at each wheel. The brakes must be capable of stopping the vehicle in accordance with the performance requirements of State and Federal regulations in effect at the time of manufacture. Parking brake shall be spring applied, air released chamber mounted on the rear axle assembly. All brake linings shall be of non-asbestos material three quarters (3/4) inch thick.

Spring brake chambers shall be provided and shall comply with requirements of State and Federal regulations FMVSS 121 in effect at time of manufacture on the front and rear of these buses. At a minimum the front chamber shall be size 24 to 30 inches and the rear shall be size 30 to 36 inches depending on the length of the bus. The emergency air tank shall be piped to a service valve at the left front corner of the bus to fill the tank for towing the vehicle. Brake shoe effective area shall total a minimum of eight-hundred twenty-two (822) square inches for 30 to 35 foot buses and nine-hundred thirty-two (932) square inches for buses greater than 35 feet in length.

Brake shoes shall be operated by cams which in return are operated by automatic slack adjusters. Slack adjusters shall be equipped with grease fittings and be capable of automatic adjustments throughout the life of the lining and drum assembly. Brake lines shall be installed so that the possibility of damage is minimized. Lines and hoses shall be clamped and supported in a manner which minimizes long, unsupported hose lengths and precludes rubbing against any part of the bus.

The parking and emergency brakes shall be with a 40 PSI setting, controlled by a manual valve located convenient to the driver for safe, convenient access. Valve operation shall be "pull to set brakes" and "push to release" type brake system.

This brake shall have stopping ability that is equal to or better than required by Federal and State regulations. It shall automatically apply if air system pressure falls below half the normal value or such other value as is recommended by the component manufacturer. This parking/emergency brake shall be of spring brake design. The bidder will provide in their bid a statement of brake efficiency at empty and loaded capacity. A brake stroke and wear monitoring system will be made available as an option and be priced separately.

20.7 Disc Brakes on All Axles (optional)

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 component 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 brake linings.

Typical brake drum/shoe set up will be made available as an option and a price deduction will be given as appropriate.

20.8 Hub 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 component manufacturer's warranty.

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

20.9 Parking/Emergency Brake

20.9.1 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.

20.9.2 Hydraulic Brakes

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

21 INTERLOCKS

21.1 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 engine at idle and the transmission in gear, until the interlocks are released. These interlock functions shall be active whenever the vehicle Master Run Switch is in any run position.

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 and unsecured condition, unless the door master switch has been actuated to intentionally release the interlocks.

21.2 Option 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, selection to be made by Purchaser at pre-production meeting.

21.3 Pneumatic System - 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.

21.4 Air Compressor

For diesel and hybrid buses, an engine-driven air compressor shall be sized to charge the air system from 40 psi to the governor cutoff pressure in less than 4 minutes while not exceeding the fast-idle speed setting of the engine.

For electric bus, the electrically driven air compressor shall be sized to charge the air system from 40 psi to the governor cutoff pressure in less than 4 minutes while not exceeding the fast-idle speed setting of the engine. The electrically driven air compressor shall be available as an option for diesel and hybrid buses if available.

21.5 Air Lines and Fittings

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

- **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 powerplant and body-mounted equipment shall be flexible convoluted copper or stainless-steel line, or may be flexible Teflon hose with a braided stainless steel jacket. Other lines necessary to maintain system reliability shall be flexible Teflon hose with a braided stainless-steel jacket. End fittings shall be standard SAE or JIC brass or steel, flanged, swivel-type fittings. Flexible hoses shall be as short as practicable and individually supported. They shall not touch one another or any part of the bus except for the supporting grommets. Flexible lines shall be supported at 2-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. All air lines shall be installed and routed in such a way as to eliminate any chance for water buildup in the lines.

21.6 Air Reservoirs

All air reservoirs shall meet the requirements of FMVSS Standard 121 and SAE Standard 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. All air tanks and drain valves shall be clearly labeled.

21.7 Air System Dryer

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

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

22 ELECTRICAL, ELECTRONIC AND DATA COMMUNICATION SYSTEMS

22.1 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 bi-directional communications networks that electronic devices use to share data with other electronic devices and systems. Communication networks are essential to integrating electronic functions, both onboard the vehicle and off.

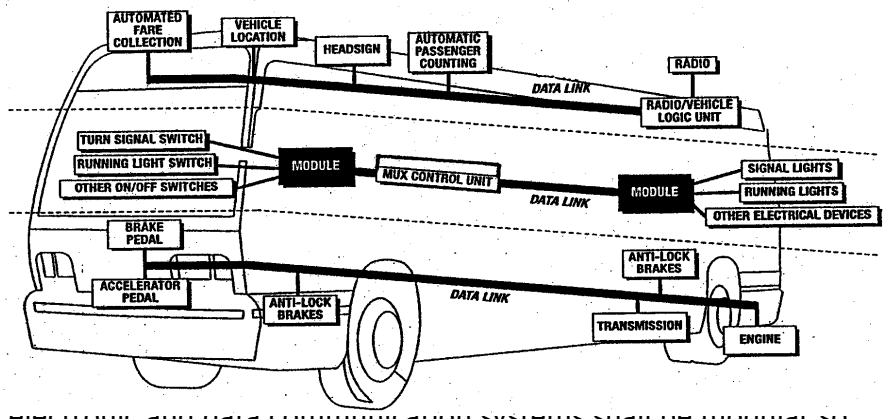
Information level systems that require vehicle information for their operations or provide information shall adhere to J1939 data standard.

Data communications systems are divided into three levels to reflect the use of multiple data networks:

- **Drivetrain level:** Components related to the drivetrain including the propulsion system components (engine, transmission and hybrid units or electric energy storage, motors, inverters/converters), and anti-lock braking system (ABS), which may include traction control.
- **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, fare boxes, 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; and gateway devices.

FIGURE 5

Data Communications Systems Levels



22.2 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.

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

22.3 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. As a recommendation, no vehicle component shall generate, or be affected by, electromagnetic interference or radio frequency interference (EMI/RFI) that can disturb the performance of electrical/electronic equipment as defined in SAE J1113 and UNECE Council Directive 95/54 (R 10).

The Purchaser shall follow recommendations from Contractors and subsystem Suppliers regarding methods to prevent damage from voltage spikes generated from welding, jump starts, shorts, etc.

All electrical/electronic hardware mounted in the interior of the vehicle shall be inaccessible to passengers and hidden from view unless intended to be viewed. The hardware shall be mounted in such a manner as to protect it from splash or spray.

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

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

The voltage regulator shall be a solid-state type coordinated with and adjusted for the alternator and batteries used. The regulator shall be remotely mounted and be easily accessible for maintenance purposes. The stainless-steel battery tray and slide shall be protected against the accumulation of debris and road spray. The battery tray shall slide out, on stainless steel rollers, with less than 50 lbs. of effort.

The battery tray shall have drain holes. Two twelve volt lead acid filled thermal battery units, size 8D, with side post or top post connectors with minimum 1300 cold cranking amps at zero degrees Fahrenheit with a reserve capacity of 425 minutes or greater will be required, except for electric buses which shall be supplied with at minimum two group AGM Group 31 batteries each with a minimum of 1150 cold cranking amps. Protective interlocks or programming shall be provided so the starter will not operate if the engine is running or the transmission is not in neutral. Electrical cables and wiring shall be adequate for all anticipated loads. The main wiring harness shall, to the maximum extent practical, be installed inside the bus body passenger compartment and, where that is not practical, shall be secured in frame rail raceways. The Contractor shall route and secure all wiring so that it does not rub anywhere. Routing of step well light wiring shall be such as to avoid rubbing door posts, etc. When wires or looms pass through metal, the wires shall be protected by a rubber grommet. Each electrical panel i.e. front and exit door panels, battery compartment, and front electrical panel shall provide an explanation of the respective electrical circuits and components contained within and shall be furnished in a silk-screened or water/oil proof diagram on the inside of the door panel.

Four AGM batteries or equivalent shall be an option in lieu of two size 8D batteries.

All engine compartment wiring and light wiring shall be insulated from the heat and be resistant to oil and grease. Electrical equipment, junction boxes and connectors shall not be placed where they are subjected to excessive heat, oil, grease, or road spray. All multiple terminal connectors shall be military (cannon plug) type, fully sealed and protected with a potting compound to prevent outside dirt and corrosives from entering the wiring, connectors, or plugs.

All main power supply terminals shall be covered with electric post rubber cover. All electrical end plugs shall be covered. The wiring harnesses shall incorporate 10% spare wires. Wiring located in the engine compartment shall be routed away from high-heat sources or shielded and/or insulated from temperatures exceeding the wiring and connector operating requirements. All cables and harnesses shall be secured to prevent chafing or shorting against each other or any part of the vehicle. Clamps shall be rubber or PVC clad aircraft type. Grommets or other protective material shall be installed at points where wiring penetrates metal structures.

All wiring shall start and end at a junction block or component. All inline and bulkhead connectors are to be of the weather pack sealed type.

Multi-pin connectors shall be protected internally from corrosion with silicone dielectric grease (Dow Corning #4), if required. All circuits except the engine emergency shut-off and speedometer circuits must be protected by reset circuit breakers that clearly indicate

their position when tripped. Each breaker must be labeled. Circuit breakers must have plastic dust caps or be environmentally sealed. Provide constant power for powering systems, such as but not limited to the fire suppression, radio, farebox, and DC-DC converter that require constant power when battery cutoff switch is off.

The vehicle shall be equipped with a 12VDC and 24VDC quick disconnect switch. The battery compartment door shall conveniently accommodate operation of the 12VDC and 24VDC quick disconnect switch.

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

Remote (divorce) mount alternator voltage regulator A2-377 or equivalent with jumper cable and 5 amp fuse shall be provided. This requirement does not apply to battery electric buses.

The windshield wiper and headlamps electric circuit shall be protected by modified auto-reset circuit breakers sized to the requirement of the load or run through the multiplex - programmable logic controller (PLC), and are fuse protected.

Rubber Covers shall be provided for all the Electric Posts.

All junction boxes located in the engine compartment shall be designed to allow thorough steam cleaning of the engine compartment area without intrusion of water.

An optional voltage spike arrestor, S.K.I. Products SKI241-101445, or approved equal, shall be provided in the main power circuit and be priced separately.

Major junction panels shall be readily accessible for maintenance, not located behind or alongside seat or other fixed/semi-fixed obstructions. Access panels and junction box covers shall have seals which will preclude entry of rain, wash water, road debris, etc. All wiring and junction panel terminals shall be numbered and color coded for easy identification. A diagram showing the coding as the bus was built shall be furnished.

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

22.4 Hardware Mounting

The mounting of the hardware shall not be used to provide the sole source ground, and all hardware shall be isolated from potential EMI/RFI, as referenced in SAE J1113.

All electrical/electronic hardware mounted in the interior of the vehicle shall be inaccessible to passengers and hidden from view unless intended to be viewed. The hardware shall be mounted in such a manner as to protect it from splash or spray.

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

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

23 GENERAL ELECTRICAL REQUIREMENTS BATTERIES

23.1 Low-Voltage Batteries (24V)

23.2 Two 8D Battery Units

Two 8D battery units with side post or top post connectors, conforming to SAE Standard J537, shall be provided. Each battery shall have a minimum of 1300 cold cranking amps. Each battery shall have a purchase date no more than 120 days from the date of release and shall be fully maintained prior to shipment to the Purchaser. The battery compartment must be well-ventilated to prevent hydrogen buildup while protecting the compartment from road spray, water intrusion and de-icing chemicals.

Hybrid Electric buses that do not utilize the 24V coach batteries to crank the diesel engine may disregard the Cold Cranking Amp requirement and provide batteries as follows:

A minimum of 2 AGM type Group 31 batteries with a total of N Amp-hours capacity. The batteries will be of a type that is rated for deep cycle use.

The N will be calculated as follow:

The N will probably have to vary from Purchaser to Purchaser unless they would like to take the worst-case maximum and specify that number as the common requirement.

N is calculated as follows:

1) Determine the total current draw (A) for all equipment that remains powered up when the bus is turned off – Radio systems, fare-box alarms, camera systems, Fire suppression systems, etc., etc.
2) Determine the longest time interval that a bus will remain off on a regularly scheduled basis (H) - (eg. – from Friday at midnight until Monday at 5 am – 53 hours).
3) Finally, plan for a maximum battery discharge of 80% to allow some charge for system startup on Monday morning and allow for end-of-life capacity degradation. So the formula is: $A \times H \div 80\%$.

For Example:

Total “always on” current draw = 3 amps
Maximum routine bus-off time = 53 hours
Amp-Hour Requirement = $3 \times 53 \div 0.8 = 198.75$ or ≈ 200 Amp-hours

To be more conservative and allow for other factors, such as unanticipated current drain, cold weather conditions and others they could plan on 75% of usable capacity rather than 80%

23.3 Battery Cables

The battery terminal ends and cables shall be color-coded with red for the primary positive, black for negative and another color for any intermediate voltage cables. Positive and negative battery cables shall not cross each other if at all possible, be flexible and sufficiently long to reach the batteries with the tray in the extended position without

stretching or pulling on any connection and shall not lie directly on top of the batteries. Except as interrupted by the master battery switch, battery and starter wiring shall be continuous cables with connections secured by bolted terminals and shall conform to specification requirements of SAE Standard J1127 – Type SGT, SGX or GXL and SAE Recommended Practice J541.

2100 strand 4/0 cable or greater recommended.

23.4 Jump-Start Connector

A jump-start connector, red for 24V and blue for 12V, whichever is applicable, shall be provided at a location determined at the pre-production meeting and shall be equipped with dust cap and adequately protected from moisture, dirt and debris.

23.5 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 vehicle shall be equipped with a 12VDC and 24VDC quick disconnect switch(es). The battery compartment door shall conveniently accommodate operation of the 12VDC and 24VDC quick disconnect switch(es).

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 battery hold-down bracket shall be constructed of a non-metallic material (plastic or fiberglass).

This access door shall not require any special locking devices to gain access to the switch, and it shall be accessible without removing or lifting the panel. The door shall be flush-fitting and incorporate a spring tensioner or equal to retain the door in a closed position when not in use. The batteries shall be securely mounted on a stainless steel, or equivalent tray that can accommodate the size and weight of the batteries. The battery tray 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 and filled. A locking device shall retain the battery tray to the stowed position.

Polyethylene battery tray and enclosure can be listed as option and priced separately.

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

23.6 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.

23.7 Master Battery Switch

A single master switch shall be provided near the battery compartment for the disconnecting of all battery positives (12V and 24V), except for safety devices such as the fire suppression system and other systems as specified. The location of the master battery switch shall be clearly identified on the exterior access panel, be accessible in less than 10 seconds for deactivation and prevent corrosion from fumes and battery acid when the batteries are washed off or are in normal service. The access door shall be labeled "Battery Emergency Shut-Off Switch." A 12V power supply with cover shall be provided in the driver's area.

Turning the master switch off with the powerplant operating shall shut off the engine and shall not damage any component of the electrical system. The master switch shall be capable of carrying and interrupting the total circuit load.

23.8 Single Switch

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

23.9 Low-Voltage Generation and Distribution

The low-voltage generating system shall maintain the charge on fully charged batteries, except when the vehicle is at standard idle with a total low voltage generator load exceeding 70 percent of the low voltage generator nameplate rating. A low voltage generating system shall be a solid-state DC/DC converter for Battery Electric and Hybrid-Electric buses.

Voltage monitoring and over-voltage output protection (recommended at 32V) shall be provided. Dedicated power and ground shall be provided as specified by the component or system manufacturer. Cabling to the equipment must be sized to supply the current requirements with no greater than a 5 percent volt drop across the length of the cable.

An optional 24 volt to 13.6 volt DC-DC converter, 30 ampere output, Model 1645-24-12-30, manufactured by Wilmore Electronics Co., Inc. or equivalent will be made available and priced separately. The unit shall be located in the communications equipment box and will provide power to a terminal block for the Radio, VLU, DR600 stop announcement system, CCTV system, fare-box, and destination sign. Continuous power to the DC-DC converter must be supplied with the master run switch in "off" position.

An optional 110 volt inverter shall be supplied that allows the interior dome lights to operate when connected to a 110 volt outlet, even with all other bus systems "asleep".

This system will include an external weatherproof port that a regular 110 volt extension cord can be connected to. Consideration should be given to other loads that could be included in this system such as a laptop charger or vacuum cleaner.

23.10 Circuit Protection

All branch circuits, except battery-to-starting motor and battery-to-generator/alternator circuits, shall be protected by current-limiting devices such as circuit breakers, fuses or solid-state devices sized to the requirements of the circuit. Electronic circuit protection for the cranking motor shall be provided to prevent engaging of the motor for more than 30 seconds at a time to prevent overheating. The circuit breakers or fuses shall be easily accessible for authorized personnel. Fuses shall be used only where it can be demonstrated that circuit breakers are not practicable. This requirement applies to in-line fuses supplied by either the Contractor or a Supplier. Fuse holders shall be constructed to be rugged and waterproof. All manual reset circuit breakers critical to the operation of the bus shall be mounted in a location convenient to the Purchaser mechanic with visible indication of open circuits. The Purchaser shall consider the application of automatic reset circuit breakers on a case-by-case basis. The Contractor shall show all in-line fuses in the final harness drawings. All 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.

23.11 Grounds

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

23.12 Low Voltage/Low Current Wiring and Terminals

All power and ground wiring shall conform to specification requirements of SAE Recommended Practice J1127, J1128 and J1292. Double insulation shall be maintained as close to the junction box, electrical compartment or terminals as possible. The requirement for double insulation shall be met by wrapping the harness with plastic electrical tape or by sheathing all wires and harnesses with non-conductive, rigid or flexible conduit.

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

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

To the extent practicable, wiring shall not be located in environmentally exposed locations under the 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 data links 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 either use 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 7 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.

Wiring located in the engine compartment shall be routed away from high-heat sources or shielded and/or insulated from temperatures exceeding the wiring and connector operating requirements.

The instrument panel and wiring shall be easily accessible for service from the driver's seat or top of the panel. The instrument panel shall be separately removable and

replaceable without damaging the instrument panel or gauges. Wiring shall have sufficient length and be routed to permit service without stretching or chafing the wires.

23.13 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 less than 40,000 hours (except cranking motors, washer pumps and wiper motors). All electric motors shall be easily accessible for servicing.

23.14 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 if applicable. "Rear start and run" controls shall be mounted in an accessible location in the engine compartment and shall be protected from the environment.

23.15 General Electronic Requirements

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

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

23.16 Wiring and Terminals

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

23.17 Discrete I/O (Inputs/Outputs)

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

23.18 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 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.

23.19 Communications

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

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

23.20 Radio Frequency (RF)

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

During OEM service intervals, Extremely Low frequency (ELF) electromagnetic fields (EMF) shall be monitored within safe exposure levels for all occupants and conform to

guidelines for human exposure to RF electromagnetic fields in accordance with the International Commission on Non-Ionizing Radiation Protection (ICNIRP). The Federal Communications Commission (FCC) the National Council on Radiation Protection and Measurements (NCRP) and the Institute of Electrical and Electronics Engineers (IEEE).

23.21 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.

24 MULTIPLEXING

24.1 General

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

Versatility and future expansion shall be provided for by expandable system architecture. The multiplex system shall be capable of accepting new inputs and outputs through the addition of new modules and/or the utilization of existing spare inputs and outputs. All like components in the multiplex system shall be modular and interchangeable with self-diagnostic capabilities. The modules shall be easily accessible for troubleshooting electrical failures and performing system maintenance. Multiplex input/output modules shall use solid-state devices to provide extended service life and individual circuit protection. Ten percent of the total number of inputs and outputs, or at least one each for each voltage type utilized (0V, 12V, 24V), at each module location shall be designated as spares.

24.2 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.

24.3 I/O Signals

The input/output for the multiplex system may contain three types of electrical signals: discrete, analog or serial data.

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

25 DATA COMMUNICATIONS

25.1 General

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

- 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 levels 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.

25.2 Drivetrain Level

Drivetrain components, consisting of the engine, transmission, retarder, anti-lock braking system and all other related components, shall be integrated and communicate fully with respect to vehicle operation with data using SAE Recommended Communications Protocols such as J1939 and/or J1708/J1587 with forward and backward compatibilities or other open protocols.

At a minimum, drivetrain components consisting of engine, transmission and hybrid units or electric energy storage, motors, inverters/converters ASR, and anti-lock braking systems shall be powered by a dedicated and isolated ignition supply voltage to ensure data communication among components exists when the vehicle ignition is switched to the “on” position.

25.3 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.

25.4 Programmability (Software)

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

26 MULTIPLEX LEVEL

26.1 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 Purchaser. The communication port(s) shall be located as specified by the Purchaser.

26.2 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. The diagnostic data can be incorporated into the information level network or the central data access system.

26.3 Provide Mock-Up Board

An optional mock-up board, where key components of the multiplexing system are replicated on a functional model, shall be made available as a tool for diagnostic, design verification and training purposes. The mock-up board will be priced separately in the Pricing Schedule.

26.4 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 displays the most recent revision number

- a method of determining which version of the software is currently in use in the multiplex system

26.5 Electronic Noise Control

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

Electrical and electronic sub-systems 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.

27 DRIVER PROVISIONS, CONTROLS AND INSTRUMENTATION

27.1 Driver's Area Controls - 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 Recommended Practice J680, Revised 1988, "Location and Operation of Instruments and Controls in Motor Truck Cabs," and be essentially within the hand reach envelope described in SAE Recommended Practice J287, "Driver Hand Control Reach."

27.2 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.

27.3 Visors/Sun Shades Front and Side Sun Shade/Visor

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.

Optional sun visors in lieu of roller type sunscreens shall store out of the way and shall not obstruct airflow from the climate control system or interfere with other equipment, such as the radio handset or the destination control. Deployment of the visors shall not restrict vision of the rearview mirrors. Visor adjustments shall be made easily by hand with positive locking and releasing devices and shall not be subject to damage by over-tightening. Sun visor construction and materials shall be strong enough to resist breakage during adjustments.

27.4 Driver's Controls

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

All panel-mounted switches and controls shall be marked with easily read identifiers. Graphic symbols shall conform to SAE Recommended Practice J2402, "Road 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.

27.5 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.

On-board displays visible to the operator shall be limited to indicating the status of those functions described herein that are necessary for the operation of the bus. All other indicators needed for diagnostics and their related interface hardware shall be concealed and protected from unauthorized access. Table 3 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 Bus Instruments and Alarms, as appropriate to the bus's fuel type bid.

Device	Description	Location	Function	Visual/Audible
Master run switch	Rotary, four-position detent	Side console	Master control for bus, off, day run, night run and clearance ID lights	
Engine start, front	Approved momentary switch	Side console	Activates engine starter motor	

Engine start, rear	Approved momentary switch	Engine compartment	Activates engine starter motor	
Engine run, rear	Three-position toggle switch	Engine compartment	Permits running engine from rear start, normal front run position and off	Amber light
Drive selector	Touch panel switch	Side console	Provides selection of propulsion: forward, reverse and neutral	Gear selection
HVAC	Switch or switches to control HVAC	Side console	Permits selection of passenger ventilation: off, cool, heat, low fan, high fan or full auto with on/off only	
Driver's ventilation	Rotary, three-position detent	Side console or Dash left wing	Permits supplemental ventilation: fan off, low or high	
Defroster fan	Rotary, three-position detent	Side console or Dash left wing	Permits defroster: fan off, low, medium or high	
Defroster temperature	Variable position	Side console or Dash left wing	Adjusts defroster water flow and temperature	
Windshield wiper	One-variable rotary position operating both wipers	Dash left wing	Variable speed control of left and right windshield wipers	
Windshield washer	Push button	Dash left wing	Activates windshield washers	
Dash panel lights	Rotary rheostat or stepping switch	Side Console or Dash left wing	Provides adjustment for light intensity in night run position	
Interior lights	Three-position switch	Side console	Selects mode of passenger compartment lighting: off, on, normal	
Fast idle	Two-position switch	Side console	Selects high idle speed of engine	

WC ramp/ kneel enable	Two-position switch1	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 switch1	Front door remote or Dash right wing	Permits ramp and kneel activation from front door area, key required1	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. Ext alarm and Amber light
Rear door ramp/kneel enable if applicable	Two-position keyed switch1	Rear door remote	Permits ramp and kneel activation from rear door area, key required1	Red light
Rear door ramp if applicable	Three-position momentary switch	Rear door remote	Permits deploy and stow of rear ramp	
Rear kneel	Three-position momentary switch	Rear door remote	Permits kneeling activation and raise and normal at rear door remote location	
Silent alarm	Recessed push button NO and NC contacts momentary	Side console	Activates emergency radio alarm at dispatch and permits covert microphone and/or enables destination sign emergency message	
Video system event switch	Momentary on/off momentary switch with plastic guard	Side console	Triggers event equipment, triggers event light on dash	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	
Engine shutdown override	Momentary switch with operation protection	Side console	Permits driver to override auto engine shutdown	
Hazard flashers	Two-position switch	Side console or Dash right wing	Activates emergency flashers	Two green lights
Fire suppression	Red push button with protective cover	Dash left wing or dash center	Permits 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	Detented 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
Park brake release	Pneumatic PPV	Vertical side of the side console or dash center	Permits driver to push and hold to release brakes	
Hill holder	Two-position momentary switch	Side console	Applies brakes to prevent bus from rolling	
Remote engine speed	Rotary rheostat	Engine compartment	Permits technician to raise and lower engine RPM from engine compartment	
Master door/ interlock	Multi-pole toggle, detented	Out of operator's reach	Permits driver override to disable door and brake/throttle interlock	Red light

Warning interlocks deactivated	Red indicator light	Dash panel center	Illuminates to warn drive that interlocks have been deactivated	Red light
Retarder disable	Multi-pole switch detented	Within reach of Operator or approved location	Permits driver override to disable brake retardation/regeneration	Red light
Alarm acknowledge	Push button momentary	Approved location	Permits driver to acknowledge alarm condition	
Rear door passenger sensor disable	Multi-pole toggle, detented	In sign compartment or Driver's barrier compartment	Permits driver to override rear door passenger sensing system	
Indicator/ alarm test button	Momentary switch or programming 1	Dash center panel	Permits driver to activate test of sentry, indicators and audible alarms	All visuals and audibles
Auxiliary power	110-volt power receptacle	Approved location	Property to specify what function to supply Speedometer	
Speedometer	odometer, and diagnostic capability, 5-mile increments	Dash center panel	Visual indication of speed and distance traveled, accumulated vehicle mileage, fault condition display	Visual
Air pressure gauge	Primary and secondary, 5 psi increments	Dash center panel	Visual indication of primary and secondary air systems	Red light and buzzer
Fire detection	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	Sensing low primary and secondary air tank pressure	Dash center	Indication of low air system pressure	Buzzer and red light
Methane detection function	Detection of system integrity	Property specific or dash center	Detects system failure	No start condition, amber light
Methane detection	Indication of 20% LED emergency light (LEL)	Property specific or dash center	Detects levels of methane	Flashing red at 20% LEL
Methane detection	Indication of 50% LEL	Property specific or dash center	Detects levels of methane	Solid red at 50% LEL
Engine coolant indicator	Low coolant indicator may be supplied as audible alert and visual and/or text message	Within driver's sight	Detects low coolant condition	Amber light
Hot engine indicator	Coolant temperature indicator may be supplied as audible alert and visual and/or text message	Within driver's sight	Detects hot engine condition and initiates time delay shutdown	Red light
Engine oil pressure indicator	Low engine oil pressure indicator may be supplied as audible alert and visual and/or text message	Within driver's sight	Detects low engine oil pressure condition and initiates time-delayed shutdown	Red light

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

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

27.6 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.

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

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

27.7.1 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.

27.7.2 1 to 2 in. Between Brake and Accelerator Pedals

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.

27.8 Brake and Accelerator Pedals

27.8.1 Adjustable Brake and Accelerator Pedals (Optional)

Both pedals shall be adjustable forward and rearward a minimum of 3 in. The adjustment shall be made by use of a dash-mounted toggle or rocker switch. The switch shall be clearly labeled to identify it as pedal adjustment and shall be within easy reach of the driver. Pedal adjustment shall be enabled only when the bus is stationary and the parking brake engaged.

This option will be made available and priced separately.

27.9 Driver Foot Switches

27.9.1 Floor-Mounted Foot Control Platform

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

27.9.2 Turn Signal Controls

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

27.9.3 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 location.

The foot switches shall be UL-listed, heavy-duty type, of a rugged, corrosion-resistant metal construction.

The foot switches for the directionals shall be momentary type, while those for the PA system and the high beam shall be latching type. The spacing of the switches shall be such that inadvertent simultaneous deflection of switches is prevented.

27.9.4 Other Floor-Mounted Controls

The following may be floor mounted, momentary or latching, as identified by the Purchaser at the preproduction meeting.

- hazard
- silent alarm
- PA system

27.10 Driver's Amenities

27.10.1 Coat Hook

A suitable hanger shall be installed in a convenient, approved location for the driver coat. (Coat hook and loop is optional)

27.10.2 Drink Holder (Optional)

A device shall be provided to securely hold the driver's drink container, which may vary widely in diameter. It must be mounted within easy reach of the driver and must have sufficient vertical clearance for easy removal of the container. When the container is in the device, the driver's view of the road must not be obstructed, and leakage from the container must not fall on any switches, gauges or controls.

This is to be selected by the Purchaser at the pre-production meeting and priced separately.

27.11 Windshield Wipers

The bus shall be equipped with a windshield wiper for each half of the windshield. At 60 mph, no more than 10 percent of the wiped area shall be lost due to windshield wiper lift. For two- piece windshields, both wipers shall park along the center edges of the windshield glass. For single-piece windshields, wipers shall park along the bottom edge of the windshield. Windshield wiper motors and mechanisms shall be easily accessible for repairs or service. The fastener that secures the wiper arm to the drive mechanism shall be corrosion-resistant. Electric wipers will be used.

Intermittent Wiper with Variable Control

A variable-speed feature shall be provided to allow adjustment of wiper speed for each side of the windshield between approximately five (5) and twenty-five (25) cycles per minute.

Non-Synchronized Wipers

For non-synchronized wipers, separate controls for each side shall be supplied. A single control switch for non-synchronized wipers is optional.

27.12 Windshield Washers

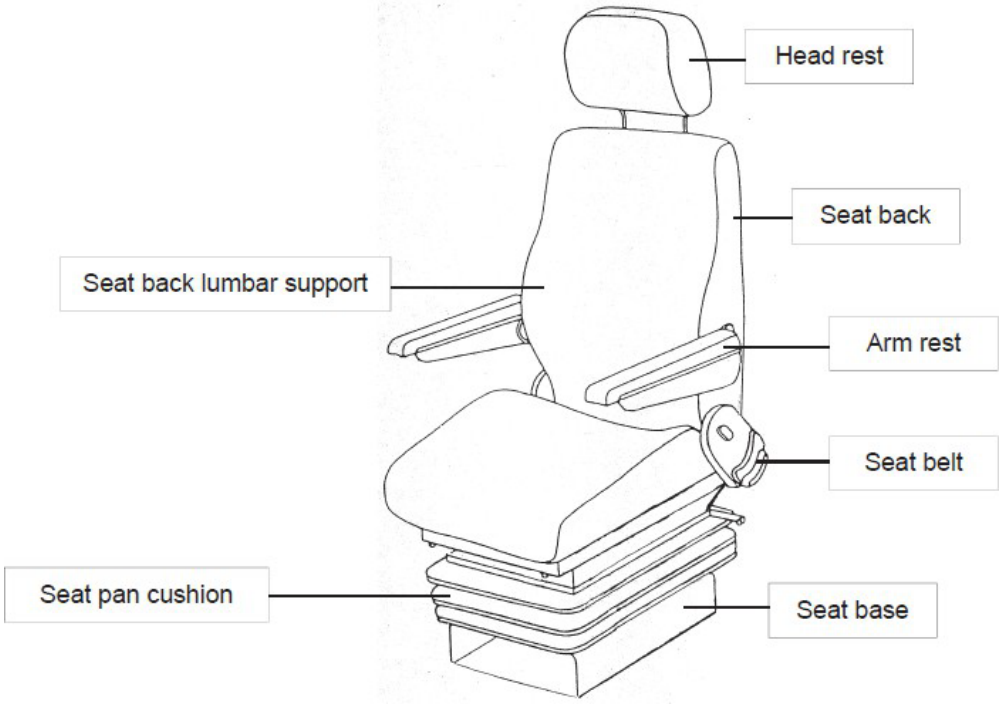
The windshield washer system, when used with the wipers, shall deposit washing fluid evenly and completely wet the entire wiped area. The windshield washer system shall have a minimum 2.5-gallon reservoir, located for easy refilling from outside of the bus.

Reservoir pumps, lines and fittings shall be corrosion-resistant and must include a means to determine fluid level.

28 DRIVER'S SEAT

FIGURE 6

Driver's Seat



28.1 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.

28.2 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.

28.3 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.

28.4 Seat Pan Cushion Slope

Measurement is the slope of the plane created by connecting the two high points of the seat, one at the rear of the seat at its intersection with the seat back and the other at the front of the seat just before it waterfalls downward at the edge. The slope can be measured using an inclinometer and shall be stated in degrees of incline relative to the

horizontal plane (0 degrees). The seat pan shall adjust in its slope from no less than plus 12 deg. (rearward “bucket seat” incline), to no less than minus 5 deg. (forward slope).

28.5 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.

28.6 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.

28.7 Seat Suspension

The driver’s seat shall be appropriately dampened to support a minimum weight of 380 lbs. The suspension shall be capable of dampening adjustment in both directions**.** Rubber snubbers shall be provided to prevent metal-to-metal contact.

28.8 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.

28.9 Height

Standard height seat back

28.10 Headrest

Adjustable headrest

28.11 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.

28.12 Seat Back Angle Adjustment

The seat back angle shall be measured relative to a level seat pan, where 90 degrees is the upright position and 90 degrees-plus represents the amount of recline.

The seat back shall adjust in angle from a minimum of no more than 90 degrees (upright) to at least 105 degrees (reclined), with infinite adjustment in between.

28.13 Seat Belt

The belt assembly should be an auto-locking retractor (ALR) lap seat belt only. All seat belts should be stored in automatic retractors. The belts shall be mounted to the seat frame so that the driver may adjust the seat without resetting the seat belt.

The seat and seat belt assemblies as installed in the bus shall withstand static horizontal forces as required in FMVSS 207 and 210. Seatbelt webbing shall be black in color.

28.14 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.

28.15 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.

28.16 Cushion Materials

All materials used on the seat assembly, passenger and driver's seat shall meet the flammability requirements of the FMVSS #302. Proof of Compliance must be submitted with bids.

28.17 Pedestal

Powder-coated steel.

Exposed portions of frame and hardware shall be stainless steel or chrome plated shall be listed as an option.

Bidders will make available and price separately a silicone cushion for the driver’s seat and a driver’s seat vacancy alarm system.

29 MIRRORS

29.1 Exterior Mirrors

All mirrors must conform to the current requirements of the state in which the bus is operating in. Exterior mirrors shall be remote controlled motorized with stainless steel arms that return to original position when moved.

Powder coated and heated mirrors shall be optional.

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.

Agencies will have the option of requesting a three inch convex mirror be mounted in the lower right corner of the right side flat mirror, at no charge. Mirrors must fold out of way of automatic washer. Metal mirror parts to be chrome plated or stainless steel. The backs of inside mirrors shall be painted flat black where necessary to comply with FMVSS.

An optional high mount street side mirror will be made available with selection made at the preproduction meeting. Exterior mirrors must utilize a “quick disconnect” for electrical wiring.

An optional set of manual 8" X 8" and 6” spot mirrors on stainless steel arms located on each side of the vehicle will be offered. A deduct will be issued for manual mirrors.

29.2 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, anywhere in the aisle, and in the rear seats.

A (min) 8 1/2” x 16” rear view mirror shall be provided on the front sign header. A 6" diameter adjustable convex mirror over and forward of the front door shall be provided. An adjustable convex mirror shall be provided over/above and to the rear of the rear exit door. (Convex mirrors described above are to be used in conjunction with each other.) The glass in this mirror shall be replaceable.

30 WINDOWS

30.1 General

A minimum of 6,000 sq. in. of window area, including operator and door windows, shall be required on each side of the standard 30-ft length configured bus.

A minimum of 8,000 sq. in. of window area, including operator and door windows, shall be required on each side of the standard 35-ft length configured bus.

A minimum of 10,000 sq. in. of window area, including operator and door windows, shall be required on each side of the standard 40-ft length configured bus.

A minimum of 12,000 sq. in. of window area, including operator and door windows, shall be required on each side of the standard 45-ft length configured bus.

A minimum of 16,000 sq. in. of window area, including operator and door windows, shall be required on each side of the standard 60-ft length configured bus.

30.2 Windshield

The windshield shall permit an operator's field of view as referenced in SAE Recommended Practice J1050. The vertically upward view shall be a minimum of 14 degrees, 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 degrees above the line of sight. Any binocular obscuration due to a center divider may be ignored when determining the 90- degree requirement, provided that the divider does not exceed a 3-degree angle in the operator's field of view. Windshield pillars shall not exceed 10 degrees of binocular obscuration. The windshield shall be designed and installed to minimize external glare as well as reflections from inside the bus.

The windshield shall be easily replaceable.

30.3 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 1A and the Recommended Practices defined in SAE J673.

Shaded windshield band shall be optional.

30.4 Driver's Side Window

The driver's side window shall be the sliding type, requiring only the rear half of sash to latch upon closing, and shall open sufficiently to permit the seated operator to easily adjust the street-side outside rearview mirror. When in an open position, the window shall not rattle or close during braking. This window section shall slide in tracks or channels designed to last the service life of the bus. The operator's side window shall not

be bonded in place and shall be easily replaceable. The glazing material shall have a single-density tint.

The driver's view, perpendicular through operator's side window glazing, should extend a minimum of 33 in. (840 mm) to the rear of the heel point on the accelerator, and in any case must accommodate a 95th percentile male operator. The view through the glazing at the front of the assembly should begin not more than 26 in. (560 mm) above the operator's floor to ensure visibility of an under-mounted convex mirror. Driver's window construction shall maximize ability for full opening of the window.

The driver's side window glazing material shall have a ¼ in. nominal thickness laminated safety glass conforming with the requirements of ANSI Z26.1-1996 Test Grouping 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.

30.5 Side Windows

The side windows shall be fixed framed transom. With the exception of the upper portion of first right-hand and /or left-hand window where the side destination sign shall be located, all other shall be glazed with tinted, flat panel, uniform sized, transit application approved laminated safety glass (ANSI 25.1). Glazing in the sash shall be easily replaced without removing the sash from the bus. Side window sliders shall be equipped with metal latches. Components known to meet these requirements include, but are not limited to, Excel full sliders, and the Transit Care 3 minute windows.

An option of fixed frame and/or full slider style windows will be made available and be priced separately. All windows shall be of 7/32" 28% gray tinted safety glass and frame windows will have black (dark) polyester powder coat aluminum frames inside and out. Glass shall be mounted in removable rubber retaining strips/seals.

Flush mounted windows will also be accepted as an approved equal. If flush mounted windows optional, price separately.

An option of all windows being equipped with liners attached will be made available and be priced separately.

An option for windows with no sliding partition.

All tempered glass must have liners attached.

Frame shall be assembled with anti-corrosion coated screws and fasteners to enable changing glass. A positive lock type emergency latch meeting the FMVSS-217 shall be furnished on each window frame.

Emergency egress window shall have a permanent decal describing emergency window operation procedures. Side windows shall be designed to prevent the entrance of air and

water when windows are closed. The window seal rubber must be installed so that passengers cannot remove it and rubber shall be of such quality to resist adhering to other sash sill.

Color of glazing material in all side windows, with the exception of the side destination sign window, shall be of Gray 28% or equivalent. The side destination sign windows shall be clear. Windows on the bus sides and in the rear door shall be tinted a neutral color, complementary to the bus exterior. The maximum solar energy transmittance shall not exceed 37 percent, as measured by ASTM E- 424, and the luminous transmittance shall be no less than 16 percent, as measured by ASTM D-1003.

Window at the destination/location sign shall not be tinted in the vicinity of the sign.

31 HEATING, VENTILATING, AND AIR CONDITIONING

31.1 Capacity and Performance

The interior heating system shall maintain the interior of the bus at a level suitable for all climate conditions found throughout the state of Washington. The heating, ventilation, and cooling system shall maintain an average passenger compartment temperature between 65 degrees and 80 degrees Fahrenheit with a relative humidity of 50 percent or less.

Interior climate control will be automated controls capable of maintaining the interior of the bus at a level suitable for all climate conditions found in the continental United States. The heating, ventilating, and cooling systems shall maintain an average passenger compartment temperature between 65 and 80 degrees F with a relative humidity of 70 percent or less. The system shall maintain these conditions in ambient temperatures of –10 to 110 degrees F with ambient humidity of 5 to 50 percent while the bus is running on the design operating profile with a full-seated load of passengers with door openings for 30 seconds or more every 3 minutes. In ambient temperatures of 10 to –10 degrees F, the average temperature shall not fall below 65 degrees F while the bus is running on design operating profile with no passengers. The temperature measured from a height of 6 inches below the ceiling shall be within +/- 5 degrees F of the average temperature at the top surface of the seat cushions. Temperatures measured more than 3 inches above the floor shall be within +/- 5 degrees F of the average temperature at the top surface of the seat cushions. The interior temperature, from front to rear of the bus, shall not vary more than a +/- 5 degrees F from the average. System shall be programmable by each technician.

The cooling mode shall be capable of reducing the passenger compartment temperature from 100 degrees F to 80 degrees F in less than 30 minutes after the engine start up under the following conditions. Engine temperature shall be within the normal operating range at the time of startup of the cool down test and the engine speed shall be limited to fast idle that may be activated by a driver controlled device. The bus shall be parked in direct sunlight with ambient temperature at 100 degrees F and humidity less than 60 percent.

There shall be no passengers onboard and the doors shall be closed. The cooling mode may operate independent of the propulsion system and outside air may be cut off during the cool down period.

Manually controlled shutoff valves in the refrigerant lines shall allow isolation of the compressor and receiver for service. To the extent practicable, self-sealing couplings shall be used to isolate the refrigerant lines during removal of major components such as refrigerant compressor or condenser. The condenser shall be located to efficiently transfer heat to the atmosphere, and shall not ingest air warmed by the bus mechanical

equivalent above the ambient temperature or 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.

Bidders shall supply Thermo King Screw design (Intelligent Air) or equivalent. The lower A/C compressor and upper condenser/evaporator package shall be of the same manufacturer.

The door opening average is approximately every 2 minutes; the A/C system must be capable of handling the heat load by maintaining a temperature of 20 degrees less than ambient and humidity level less than 40% at any point or time with 40 plus passengers at 100 degrees in direct sun light.

Note. Air conditioning requirements for hybrid drive batteries, if necessary, shall not activate or degrade the efficiency of the passenger HVAC system.

Bidder shall provide five sets of software, including diagnostic cables, with the first production bus in each order group.

For Electric Buses provide ThermoKing Electric A/C rear or roof mounted with Intelligaire III controls and CAN Based diagnostics or equivalent.

The HVAC system excluding the operator's heater/defroster shall be centrally controlled with an advanced electronic/diagnostic control system with provisions for extracting/reading data.

Driver's control shall be an IntelligAIRE III or approved equal standard four-key keypad. Settings will not be lost when the master switch is turned off.

The HVAC unit and controls known to meet the minimum requirements are the 'Thermo King' Intelligaire III, or equivalent with standard 4 key keypad driver control, utilizing a model S616 screw compressor for 60 foot buses and model S391 for less than 60 foot buses.

Manufacturers shall provide diagnostic software, including diagnostic cables, with the first production bus in each order group. Provide an additional data port in or near the driver's area. The HVAC system excluding the operator's heater/defroster shall be centrally controlled with an advanced electronic/diagnostic control system with provisions for extracting/reading data. Settings will not be lost when the master switch is turned off.

There shall be manual shut off valves to isolate the drier, receiver, and compressor.

Manually-controlled corrosion resistant shut-off valves in the refrigerant lines shall allow isolation of the compressor and receiver for service. To the extent practicable, self-sealing couplings shall be used to break and seal the refrigerant lines during removal of major components such as the refrigerant compressor or condenser. Suction and discharge lines shall be positioned and secured not to contact each other or any part of the body or frame of the bus.

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. The HVAC unit may utilize Refrigerant R134a, R407c, or R1234YF or equivalents.

System capacity shall have a minimum of 45,000 BTU's with 1,800 CFM at 0.5" water static in duct.

The condenser fans and evaporator blowers shall be brushless motors with 3 year warranty.

Suction and discharge ports shall be easily accessible through the main engine compartment door.

Manual shutoff valves in the refrigerant lines shall allow isolation of the compressor and dryer unit for service.

A safety lanyard on overhead HVAC filter/return air grilles shall be provided.

The Air Conditioning unit installation shall be certified in writing by the Contractor as being designed, manufactured, and installed in accordance with the manufacturer’s requirements before acceptance and delivery of vehicles.

An Air Purification System will be made available as an option and be priced separately.

31.2 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.

Hot engine coolant water, if applicable, shall be delivered to the HVAC system driver’s defroster/heater and other heater cores by means of an auxiliary coolant pump, sized for the required flow, which is brushless and seal-less having a minimum maintenance free service life for both the brushless motor and the pump of at least 40,000 hours at full power.

31.3 Manual Mode Selection of Climate Control System

After manual selection and/or activation of climate control system operation mode, all interior climate control system requirements for the selected mode shall be attained automatically to within ±2 °F of specified temperature control set-point.

31.4 Manually Adjustable Temperature Control Set Point

The climate control system shall have the provision to allow the driver to adjust the temperature control set-point at a minimum of between 68 and 72 °F. From then on, all interior climate control system requirements shall be attained automatically, unless re-adjusted by 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 the majority of the measured temperatures fall within the specified requirement.

31.5 Air Flow - 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 ft per minute (cfm) per passenger based on the standard configuration bus carrying a number of passengers equal to 150 percent of the seated load. Airflow shall be evenly distributed throughout the bus, with air velocity not exceeding 100 ft per minute on any passenger. The ventilating mode shall provide air at a minimum flow rate of 20 cfm per passenger.

Airflow may be reduced to 15 cfm per passenger (150 percent of seated load) when operating in the heating mode. The fans shall not activate until the heating element has warmed sufficiently to ensure at least 70 °F air outlet temperature. The heating air outlet temperature shall not exceed 120 °F under any normal operating conditions.

The climate control blower motors and fan shall be designed such that their operation complies with the interior noise level requirements.

31.6 Air Flow - Driver's Area

The bus interior climate control system shall deliver at least 100 cfm of air to the driver's area when operating in the ventilating and cooling modes. Adjustable nozzles shall permit variable distribution or shutdown of the airflow. Airflow in the heating mode shall be reduced proportionally to the reduction of airflow into the passenger area. The windshield defroster unit shall meet the requirements of SAE

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

31.7 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 Purchaser, 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, the cable length shall be kept to a minimum to reduce cable seizing. Heater water control valves shall be "positive" type, closed or open. The method of operating remote valves shall require the concurrence of the Purchaser project manager.

31.8 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 the 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 the driver's area. 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 if applicable.

The bus interior climate control system shall deliver at least 100 cubic feet per minute of air to the driver's area when operating in the ventilation, heating, and cooling modes without use of the driver's booster fan. The climate control system blower motors will

operate at the set speed during all operating modes. All return air ducts will be protected by guards constructed of a sturdy mesh which will resist damage.

Adjustable nozzles shall permit variable distribution or shut down of all air flow. The defroster and/or interior climate control system shall maintain visibility through the driver's side window. A booster fan with driver control shall be provided in the ductwork at the driver's area, forward of the operator's position, for increased air flow to the operator.

The windshield defroster unit shall meet or exceed all requirements of SAE Recommended Practice J382, Windshield Defrosting Systems Performance Requirements, and shall have the capability of diverting heated air to the driver's feet and legs.

31.9 Air Filtration

Air shall be filtered before discharge into the passenger compartment. The filter shall meet the ANSI/ASHRAE 52.1 requirement for 5 percent or better atmospheric dust spot efficiency, 50 percent weight arrestance, and a minimum dust holding capacity of 120 g per 1000 cfm cell. Air filters shall be easily removable for service. All air filters shall be easily accessible without the need to disassemble other parts to access the filter.

31.10 Cleanable Filters

Air filters shall be cleanable.

31.11 Roof Ventilators - One Roof Ventilators

A minimum of one (1) roof ventilators shall be provided in the roof of the bus. Additional manual or power-operated roof ventilator can be added as option.

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.

31.12 Three Roof Ventilators for Articulated Bus

Three roof ventilators shall be provided in the roof of the bus, one approximately over or just forward of the front axle and the second approximately over the rear axle and the third in the trailer compartment.

31.13 Maintainability

Manually controlled shut-off valves in the refrigerant lines shall allow isolation of the compressor and dehydrator filter for service. To the extent practicable, self-sealing couplings utilizing O-ring seals shall be used to break and seal the refrigerant lines during removal of major components, such as the refrigerant compressor. Shut-off valves may

be provided in lieu of self-sealing couplings. The condenser shall be located to efficiently transfer heat to the atmosphere and shall not ingest air warmed above the ambient temperature by the bus mechanical equipment, or to discharge air into any other system of the bus. The location of the condenser shall preclude its obstruction by wheel splash, road dirt or debris.

HVAC components located within 6 in. of floor level shall be constructed to resist damage and corrosion.

High and low refrigerant pressure analog gauges to be located in the return air area.

31.14 Entrance/Exit Area Heating

No requirements for entrance/exit area heating.

Optional Entrance/Exit Area Heating

Heat shall be supplied to the entrance and exit areas to maintain a tread surface temperature no less than 35 °F in an ambient of -10 °F to prevent accumulation of snow, ice or slush with the bus operating under design operating profile and corresponding door opening cycle.

31.15 Floor-Level Heating

31.15.1 Transit Coach

No requirements for floor-level heating.

Optional Floor-Level Heating

Sufficient floor-level heaters shall be provided to evenly supply heated forced air. Control of the floor-level heating shall be through the main heating system electronic control.

Optional Forced-Air Floor-Level Heating

Sufficient floor-level heaters shall be provided to evenly supply heated forced air through floor ducts across the length of the bus. Floor ducts may be discontinued at the upper level, but additional provisions to prevent cold floors and ensure temperature uniformity shall be included. Control of the floor-level heating shall be through the main heating system electronic control.

Optional Convector Air Floor-Level Heating

Sufficient floor-level heaters shall be provided that evenly supply convector air across the length of the bus. Control of the floor-level heating shall be through the main heating system's electronic control.

Optional Warm Wall Heating

Sufficient heaters shall be provided with ducting to blow warm air upward through a cavity in the wall and discharge the warm air at the base of the windows. Control of the warm wall heating shall be through the main heating system electronic control.

31.15.2 Commuter Coach

Sufficient heaters shall be provided with ducting to blow warm air upward through a cavity in the wall and discharge the warm air at the base of the windows. Control of the warm wall heating shall be through the main heating system electronic control shall be optional.

32 EXTERIOR PANELS, FINISHES AND EXTERIOR LIGHTING

32.1 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 anybody 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.

32.2 Materials

Body materials shall be selected by Contractor 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.

32.3 Roof-Mounted Equipment

A non-skid, clearly marked walkway or steps shall be incorporated on the roof to provide access to equipment without damaging any system or bus paneling.

32.4 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.

32.5 Repair and Replacement - Side Body Panels

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.

32.6 Easily Replaceable Lower Side Body Panels

The lower section (approximately 17.5 in.) of the side body panels (low-floor buses) or skirt panels (highfloor buses) shall be made of impact-resistant material and shall be easily and quickly replaceable. This does not apply to electric buses.

32.7 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.

32.8 License Plate Provisions

Provisions shall be made to mount standard-size U.S. license plates per SAE J686 on the front and rear of the bus.

These provisions shall direct-mount or recess the license plates so that they can be cleaned by automatic bus-washing equipment without being caught by the brushes. The rear license plate provision shall be illuminated per SAE J587.

32.9 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.

32.10 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 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. An approved method of grounding static electricity shall be provided on each bus such as a conductive nylon grounding strap.

32.11 Service Compartments and Access Doors - Access Doors

Conventional or pantograph hinged doors shall be used for the engine compartment and for all auxiliary equipment compartments including doors for checking the quantity and adding to the engine coolant, engine lubricant and transmission fluid. Access openings shall be sized for easy performance of tasks within the compartment, including tool

operating space. Access doors shall be of rugged construction and shall maintain mechanical integrity and function under normal operations throughout the service life of the bus. They shall close flush with the body surface. All doors shall be hinged at the top or on the forward edge and shall be prevented from coming loose or opening during transit service or in bus washing operations. All access doors shall be retained in the open position by props or counterbalancing with over-center or gas-filled springs with safety props and shall be easily operable by one person.

Springs and hinges shall be corrosion resistant. Latch handles shall be flush with, or recessed behind, the body contour and shall be sized to provide an adequate grip for opening. Access doors, when opened, shall not restrict access for servicing other components or systems. If precluded by design, the Contractor shall provide door design information specifying how the requirements are met. The following options will be made available and priced separately:

1. An engine oil pressure gauge and coolant temperature gauge with drag needle shall be provided in the engine compartment. These gauges shall be easily read during service and mounted in an area where they shall not be damaged during minor or major repairs.

   Electronic gauges shall be listed as an option and priced separately.

2. Engine compartment lighting shall be provided to adequately illuminate the area for night time service, emergency repairs, or adjustments. Sealed lamp assemblies shall be provided and shall be controlled by a switch located near the rear start controls in the engine compartment. The rear engine compartment lights shall have an on/off switch.
3. Protective sleeves (high temperature resistant material) shall be provided to all fire suppression system hoses, high pressure hydraulic lines for hydraulic pump and power steering.

32.12 Access Door Latch/Locks

The engine compartment, including the exhaust duct plenum, shall be completely sealed to prevent smoke or fumes from entering the bus interior. The engine bulkhead and exhaust duct plenum shall be insulated adequately to prevent discomfort to passengers due to heat, to minimize hazard in case of fire in the engine compartment, and to aid in controlling noise to meet required levels.

An engine air intake designed to minimize noise shall be provided. Insulation shall be provided as needed in the engine compartment area for sound suppression.

An adequate number of fire detectors shall be furnished in the engine compartment, as determined by the Contractor. The detectors shall activate an alarm (visual as well as audible) at the driver's station.

Access panels to the left and right side of the engine compartment shall be provided with expanded metal inserts to provide heat dissipation in the engine compartment. Panels

shall also be constructed so that maintenance personnel can easily reach all under the floor and engine compartment equipment requiring access from outside the bus body. Access panels will be hinged to swing up and out of the way and be secured with a 5/16" square latch.

Gas operated shocks with safety locks shall secure access doors in the open position during inspection and servicing. The engine compartment doors will be equipped with handles. Louvers shall be provided in the rear engine compartment door to optimize airflow. Access doors are not required in the engine door.

Forward edge hinges with positive action hold open springs shall be provided on the fuel connector and lay flat against the adjacent panel when fully opened. The battery access door shall have top or leading edge hinges with gas operated shocks with safety devises when the battery is being serviced. A small access door shall be provided to the battery disconnect switch, if it is not easily reached through the battery main box door.

Battery disconnect switch, fuel and air tank drain valve doors will be OEM standard doors and latch. A well type securing latch shall be optional.

The following options will be made available and priced separately:

1. An engine oil pressure gauge and coolant temperature gauge with drag needle shall be provided in the engine compartment. These gauges shall be easily read during service and mounted in an area where they shall not be damaged during minor or major repairs.
2. Engine compartment lighting shall be provided to adequately illuminate the area for night time service, emergency repairs, or adjustments. Sealed lamp assemblies shall be provided and shall be controlled by a switch located near the rear start controls in the engine compartment. When the rear engine compartment door is closed the compartment lights shall extinguish automatically.
3. Protective sleeves (high temperature resistant material) shall be provided to all fire suppression system hoses, high pressure hydraulic lines for hydraulic pump and power steering.

NOTE: option 1 is not applicable to battery electric buses.

32.13 Bumpers - 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.

32.14 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 lbs. parallel to the longitudinal centerline of the bus. It shall protect the bus from damage as a result of 5.5 mph impacts into the corners at a 30-degree angle to the longitudinal centerline of the bus. 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. Mounting provisions will be made for integrating bike rack if necessary.

32.15 Bicycle Racks - Optional

An optional bicycle rack will be made available to be installed and ready for use upon delivery of buses. Racks will be identical in style to the existing racks on current procuring agencies' fleets. Racks will be unpainted stainless steel, powder coated black, or standard black. A bike rack deployed indicator light will be provided on the driver's dash. Each rack will carry the manufacturer's warranty from time of bus acceptance, and will include parts and labor. Components known to meet these requirements include, but are not limited to, Sports Works NW, Inc and Mid-West BYK-RAK. Pricing for either rack will be provided to include operating instructions in both English and Spanish. Both two and three bike rack pricing will be made available.

32.16 Rear Bumper

No part of the bus, including the bumper, shall be damaged as a result of a 2 mph impact with a fixed, flat barrier perpendicular to the longitudinal centerline of the bus. The bumper shall return to its pre-impact shape within 10 minutes of the impact. When using a yard tug with a smooth, flat plate bumper 2 ft wide contacting the horizontal centerline of the rear bumper, the bumper shall provide protection at speeds up to 5 mph, over pavement discontinuities up to 1 in. high, and at accelerations up to 2 mph/sec. The rear bumper shall protect the bus, when impacted anywhere along its width by the common carriage with contoured impact surface defined in Figure 2 of FMVSS 301 loaded to 4000 lbs., at 4 mph parallel to or up to a 30-degree angle to, the longitudinal centerline of the bus. The rear bumper shall be shaped to preclude unauthorized riders standing on the bumper. The bumper shall not require service or maintenance in normal operation during the service life of the bus. The bumper may increase the overall bus length specified by no more than 7 in.

32.17 Bumper Material

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

33 FINISH AND COLOR

33.1 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 assure a proper bond between the basic surface and successive coats of original paint for the service life of the bus. Drilled holes and cutouts in exterior surfaces shall be made prior to cleaning, priming and painting, where possible, to prevent corrosion. The bus shall be completely 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.

Composite bus body may use gel coat as applicable.

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 patch due to incorrect mixing of paint activators
- buffing swirls
- orange peel surface

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 or ASTM D3359. Adhesion shall be a minimum 300 ft.-lbs.

The Contractor 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. Bus exteriors shall be painted and numbered to include numbers on the roof to the general design to be provided with each order. Minor variations to this color scheme may be required in order to accommodate the specific styling of the Contractor's buses. Within 30 days of execution of contract, the Contractor shall supply to Purchaser the detailed drawings of the front, rear, both sides, and roof of the bus that will be supplied.

Within 60 days of execution of the contract, the Purchaser will return these drawings to the Contractor with details of the color schemes included.

The bus exterior shall be primed as recommended by the manufacturer of the final finish and shall be finished with the color scheme specified in the order. Bidders should provide listings of available colors. Current color schemes used by the various Procuring Agencies will be provided for pricing.

There shall be no bare or exposed metal surfaces showing on the exterior of the bus, exclusive of ornamentation and accessories. The display of Contractor's name or insignia on the exterior of the bus will be as specified in the individual order.

33.2 Decals, Numbering and Signing

Monograms, numbers and other special signing shall be applied to the inside and outside of the bus as required. Signs shall be durable and fade-, chip- and peel-resistant. They may be painted signs, decals or pressure-sensitive appliqués. All decals shall be installed per the decal Supplier recommendations. Signs shall be provided in compliance with the ADA requirements defined in 49 CFR Part, Subpart B, 38.27.

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

On the roof of the bus the 18 to 24 inch high numbers shall be centered on the longitude axis of the bus so they can be read from an airplane approaching from the rear of the bus. Individual orders may specify no roof number be applied.

33.3 Passenger Information

ADA priority seating signs as required and defined by 49 CFR, Part 38.27 shall be provided to identify the seats designated for passengers with disabilities.

Requirements for a public information system in accordance with 49 CFR, Part 38.35 shall be provided.

Interior decals such as but not limited to the following, No Smoking, Exit door, Emergency Exit, Watch Your Step, Wheelchair instructions and "Reserved for Wheelchairs," etc. shall be provided . All decals shall be in English and Spanish. Optional Tri-Lingual decals will be made available, with the three languages being verified at the pre-production meeting. Decals containing identification of windows, hatches, etc., shall also be provided. All decals shall conform to Washington state law.

33.4 Exterior Lighting

Exterior lighting and reflectors shall comply, as applicable, with Part 393, Subpart B of the FMCSA and FMVSS 108.

All exterior lights shall be designed to prevent entry and accumulation of moisture or dust. Commercially available LED-type lamps shall be utilized at all exterior lamp locations

except headlights. Lamps, lenses and fixtures shall be interchangeable to the extent practicable. Two hazard lamps at the rear of the bus shall be visible from behind when the engine service doors are opened. Light lenses shall be designed and located to prevent damage when running the vehicle through an automatic bus washer. Front marker (clearance) lights along with lights located on the roof and sides of the bus shall have protective shields or be of the flush mount type to protect the lens against minor impacts.

Exterior lighting shall comply with all applicable State and Federal regulations. Replacement lamps shall be readily available from commercial sources; they shall not be a Contractor unique item. Those applications which will not accommodate an LED lamp shall have a replaceable bulb with access to the bulb by removing the lens from outside the bus. LED headlamps, if available, shall be offered as standard equipment.

If LED headlamps are not available, Halogen sealed beam headlights are required with high and low beams controlled from a sealed, moisture-protected foot switch located on the floor in the driver's station.

The sealed beam units shall be of the latest heavy-duty type and be ruggedly mounted to maintain adjustment under transit operating conditions. Headlights shall be wired to operate on reduced voltage in the run position.

All other lights shall be LED as allowed by applicable State Laws. The stop lights and tail light shall be four inches, with seven inches as an option. Rear turn indicator lights shall be separate from the stop-tail lights.

Components known to meet these requirements include, but are not limited to, the Dialight Corp. An optional all LED “STOP” light shall be made available to be installed on the centerline of the bus above the top of the rear engine door. The stop light flashes the word “STOP” when brakes are applied.

Components known to meet these requirements include, but are not limited to, the JKA Enterprises light sign and should be priced separately.

The LED marker lights at the front and rear upper corners of the bus shall be of flush mounted type to preclude breakage by tree limbs, bus washers, etc.

Each doorway shall have an outside light(s) which, when the door is open, provides at least one foot-candle of illumination of the street surface for a distance of three feet perpendicular to the bottom step tread outer edge. Light (s) shall be located below window level and shielded to protect the eyes of entering and exiting passengers.

An optional “Yield To Bus” sign shall be made available and should be priced separately.

33.5 Backup Light/Alarm

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

33.6 Doorway Lighting

Lamps at the front and rear passenger doorways shall comply with ADA requirements and shall activate only when the doors open. These lamps shall illuminate the street surface to a level of no less than 1 footcandle 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.

33.7 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.

An adequate number of LED lights located in convenient locations that fully illuminate the engine compartment shall be controlled by switches mounted near the rear start controls. All other service area lamps shall be controlled by switches mounted on or convenient to the lamp assemblies.

33.8 Deceleration Lights (Optional – If Allowed by FMVSS) (Exempt from scoring)

Four amber 4" LED deceleration lights shall be made available for installation as optional equipment. Two lights shall be at least 8 feet from ground level on the rear of the bus and two at the top of the tailgate. These lights will flash continuously as long as there is 0% throttle and the master switch is in the run position. Components known to meet these requirements include, but are not limited to, two 4".

Weldon flashing amber lights, brake activated mounted in rear of bus and 2 - Dialight 4" Brake, Stop and Turn signal. These items will be priced separately.

33.9 Transfer Beacon (Optional – If Allowed by FMVSS) (Exempt from scoring)

An optional Transfer light Beacon or Equal shall be made available to be mounted outside horizontally at the top center of each bus and within twelve (12) inches of the front of the bus. The beacon shall be a 1.5 million candle power white strobe light with 60-80 flashes per minute minimum. A 90 degree blanked out portion of the lens, on the strobe, shall be facing to the rear of the bus. The exact location of the strobe will be approved by frequency above 18,000 Hz. Interchangeability of LED lamps, lenses, fixtures, and power supplies shall be maximized.

34 INTERIOR PANELS AND FINISHES

34.1 General Requirements

Materials shall be selected on the basis of maintenance, durability, appearance, safety, flammability and tactile qualities. Materials shall be strong enough to resist everyday abuse and be vandalism and corrosion resistant. Trim and attachment details shall be kept simple and unobtrusive. Interior trim shall be secured to avoid resonant vibrations under normal operational conditions.

Interior surfaces more than 10 in. below the lower edge of the side windows or windshield shall be shaped so that objects placed on them fall to the floor when the 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.

34.2 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.

34.3 Driver Area Barrier

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 passenger 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 entire partition assembly for mounting of such equipment as flare kits, fire extinguishers (1.2 kg), microcomputer, public address amplifier, etc. Dark or black panels are preferred behind the driver's head. The panel should be isolated for noise control and attached with rubber grommets.

34.4 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.

34.5 Full-Height (Floor-to-Ceiling) Configuration of Driver's Barrier (optional)

The driver's barrier shall extend continually 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 limit passenger conversation.

34.6 Driver Security Enclosure Door

Bidders will make available and price separately a Driver Security Enclosure Door.

34.7 Modesty Panels

Sturdy divider panels constructed of durable, unpainted, corrosion-resistant material complementing the interior shall be provided to act as both a physical and visual barrier for seated passengers.

Design and installation of modesty panels located in front of forward-facing seats shall include a handhold or grab handle along its top edge. These dividers shall be mounted on the sidewall and shall project toward the aisle no farther than passenger knee projection in longitudinal seats or the aisle side of the transverse seats. Modesty panels shall extend from at least the window opening of the side windows, and those forward of transverse seats shall extend downward to 1 and 1½ in. above the floor. Panels forward of longitudinal seats shall extend to below the level of the seat cushion. Dividers positioned at the doorways 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 assist is not provided by other means.

The modesty panel and its mounting shall withstand a static force of 250 lbs. applied to a 4 × 4 in. area in the center of the panel without permanent visible deformation.

A deduct will be made available for those agencies not desiring a modesty panel at the front entry door.

34.8 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.

34.9 Rear Bulkhead

The rear bulkhead and rear interior surfaces shall be material suitable for exterior skin; painted and finished to exterior quality; or paneled with melamine-type material, composite, scratch-resistant plastic or carpeting and trimmed with stainless steel, aluminum or composite.

The rear bulkhead paneling shall be contoured to fit the ceiling, side walls and seat backs so that any litter or trash will tend to fall to the floor or seating surface when the bus is on a level surface. Any air vents in this area shall be louvered to reduce airflow noise and to reduce the probability of trash or liter being thrown or drawn through the grille. If it is necessary to remove the panel to service components located on the rear bulkhead, 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.

34.10 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.

34.11 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.

34.12 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. Insulation shall meet the requirements of FMVSS 302.

34.13 Floor Covering

The floor covering shall have a non-skid walking surface that remains effective in all weather conditions, such as Altro Meta/Chroma or equivalent.

The floor covering, as well as transitions of flooring material to the main floor and to the entrance and exit area, shall be, where possible, a one piece construction with no openings for water and dirt to enter below the floor. It must be smooth and present no tripping hazards. Seams shall be welded per Contractor's specifications. The standee line shall be a Minimum of 2 inches wide and shall extend across the bus aisle. This line and the edge of the steps shall be Yellow. The color and pattern shall be consistent throughout the floor covering. The color and quality of the flooring shall be provided after award.

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.

The main floor area will be one piece and if the floor is of a bi-level construction, then it shall be one piece at each level. The covering between the center strip and the wheel housings may be separate pieces but all seams must be welded or sealed per manufacturer's specifications to prevent water and dirt intrusion. At the rear door, 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 covering shall closely fit the sidewall in a fully sealed butt joint or extend to the top of the cove with no exposed edges. Flooring must meet ASTM E662, ASTM E648, ASTM D2047 and FMVSS 302.

34.14 Interior Lighting

In general, all interior lights are to be LED. 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.

Option: Colored covers on interior lights to reduce glare at night.

34.15 Passenger

The passenger interior lighting system shall be a LED lighting system. The interior lighting system shall provide a minimum 15 foot-candle illumination on a 1 square foot plane at an angle of 45 degree from horizontal, center 33 inches above the floor and 24 inches in front of the seat back at each seat position.

Allowable average light level for the rear bench seats shall be 7 foot-candles. Floor surface in the aisles shall be a minimum of 10 foot-candles, vestibule area a minimum of 4 foot-candles with the front doors open and minimum of 2 foot-candles with the from

doors closed. The front entrance area and curb lights shall illuminate when the front door is open and master run switch is in the "Lights" positions.

Rear exit area and curb lights shall illuminate when rear door is unlocked.

Step lighting for the intermediate platform between lower and upper floor levels shall be provided and shall illuminate in all engine run positions. The step lighting shall be low-profile to minimize tripping and snagging hazard for passengers and shall be shielded as necessary to protect passengers' eyes from glare.

The light source shall be located to minimize windshield glare with distribution of the light focused primarily on the passengers' reading plane while casting sufficient light onto the advertising display. The bus shall be equipped with interior advertising card tracks on each side of the interior passenger compartment, running the length of the bus, to hold 11" high ad cards. High power solid state LED strip shall be in one-foot section increment with high power LED manufactured by either Nichia or Philips or approved equal with expectation to maintain on average 60-70% of original brightness after 60,000 hours of operation. The brightness of each individual light fixture shall be software programmable to adjust the interior light level relative to ambient light for passenger comfort.

Lens material shall be clear polycarbonate. Lens shall be designed to effectively '`mask" all individual LED's to make them invisible and there shall be no "hot spot" or "dark spot". Lens shall be sealed to inhibit incursion of dust and insects yet are easily removable for service. If threaded fasteners are used they must be held captive in the lens. Access panels shall be provided to allow servicing of components located behind light panels.

Individual driver module shall be provided for each light fixture. Driver module shall have built-in self-protection of thermal shut-down and restart, PWM (Pulse Width Modulation) output to regulate light level, reverse polarity protect and re-buildable.

When the master switch is in the RUN or NITE/RUN mode, the first light module on each side of the coach shall slowly fades to darkness when the front door is in the closed position and light output shall gradually illuminate to reach maximum light level when the door is opened. Solid state LED lighting shall have unlimited on-off cycles.

Failure of any light fixture or driver module shall be broadcasted via telltale light panel or dashboard display. The system will look for supply current and lighting fixture temperature to be approximately the same for all of the driver modules, and will show which module(s) seem to have a problem.

The light system may be designed to form part of the entire air distribution duct.

Emergency backup system shall keep the light fixtures over the front and rear doors illuminated at minimum light output under a separated battery power for 10 to 15 minutes allowing passengers visibility and timely evacuation from the vehicle during emergency conditions.

34.16 Driver Area

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 foot-candles. This light shall be controlled by a toggle switch that is convenient to the driver. An optional light that illuminates the farebox will be made available as an option and priced separately. 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

34.17 Seating Areas

The interior lighting system shall provide a minimum 15 foot-candle illumination on a 1 sq. ft plane at an angle of 45 degrees 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 foot-candles.

34.18 Vestibules/Doors

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

34.19 Step Lighting

Step lighting for the intermediate steps between lower and upper floor levels shall be a minimum of 4 foot-candles and shall illuminate in all engine run positions. The step lighting shall be low-profile to minimize tripping and snagging hazards for passengers and shall be shielded as necessary to protect passengers' eyes from glare.

34.20 Ramp Lighting

Exterior and interior ramp lighting shall comply with CFR Part 49, Sections 19.29 and 19.31.

35 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 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 Recommended Practice 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.

Transfer mounting, cutting and punching equipment shall be located in a position convenient to the driver.

Contractor shall provide fare collection installation layout to the Purchaser for approval.

A Purchaser may provide or request a mounting plate, terminal strip, system alarm, etc. that is not usual.

Mounting of this equipment and power lead with amperage requirements will be determined at the preproduction meeting. Power shall be available with the master run switch in any position including off.

Wire for the fare box shall be pre-wired through the floor.

Bidders should separately price the fare box. Pre-wiring and mounting structure shall be included in the base bus bid.

36 Interior Access Panels and Doors

Access for maintenance and replacement of equipment shall be provided by panels and doors that appear to be an integral part of the interior. Access doors shall be hinged with gas props or over-center springs, where practical, to hold the doors out of the mechanic's way. Panels shall prevent entry of mechanism lubricant into the bus interior. All fasteners that retain access panels shall be captive in the cover. Access doors shall be secured with hand screws or latches. All fasteners that retain access panels shall be captive in the cover.

36.1 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 Purchaser to prevent the edges from coming loose. Access openings shall be asymmetrical so that reinstalled flooring shall be properly aligned.

Fasteners shall tighten flush with the floor.

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

37 PASSENGER ACCOMMODATIONS

37.1 Passenger Seating- Arrangements and Seat Style

The passenger seating arrangement in the bus shall be such that seating capacity is maximized and in compliance to the following requirements.

General seating requirements shall accommodate as many forward facing seats as possible. Hip-to-knee room shall be a minimum of 26.50”. Passenger seating shall be molded shell seats with padded vandal resistant fabric inserts. Installation shall be with cantilever mount and no closeout where possible.

Bidders shall indicate standard seating included with proposed bus. Passenger seats must meet APTA requirements.

Any exposed metal of the frame will be powder coated, color coordinated to match the seat inserts, or brushed aluminum, or brushed stainless steel.

NOTE: Bidders shall provide a proposed seating layout with their bid. The handholds shall be colored the same as the back panels of the passenger seats.

The top area of the seat back shell will wrap around the upper portion of the seat back (below the grab rail) in a "bubble" to form a crash pad on the rear of each seat. The crash pad will be of continuous construction with the back.

Rear seat platform shall be hinged or easily removable to gain access to engine compartment.

Bidders shall submit a certified test report as evidence of compliance with all testing activities, test diagrams, test equipment as well as test data related to loads, deflections and permanent deformation of the seat assembly as defined in the APTA Standard Bus Procurement Guidelines manual.

37.2 Hip-to-Knee Room

Hip-to-knee room measured from the center of the seating position, from the front of one seat back horizontally across the highest part of the seat to vertical surface immediately in front, shall be a minimum of 26 in. At all seating positions in paired transverse seats immediately behind other seating positions, hip-to-knee room shall be no less than 26.5 inches.

37.3 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.

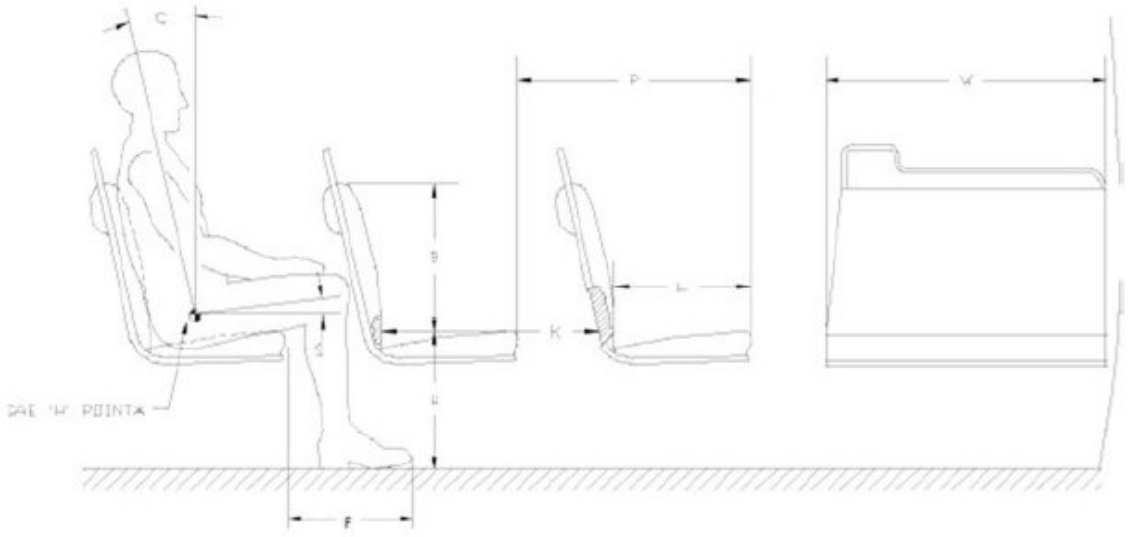
37.4 Aisles

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

37.5 Dimensions

FIGURE 7

Seating Dimensions and Standard Configuration



37.6 Structure and Design

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 lbs. 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 lbs. applied to the top of the seat cushion in each seating position with less than ¼-in. permanent deformation in the seat or its mountings. The seat assembly shall withstand static horizontal forces of 500 lbs. evenly distributed along the top of the seat back with less than ¼-in. permanent deformation in the seat or its mountings. The seat backs at the aisle position and at the window position shall withstand repeated impacts of two 40-lb sandbags without visible deterioration. One sandbag shall strike the front 40,000 times and the other sandbag shall strike the rear 40,000 times. Each sandbag shall be suspended on a 36-in. pendulum and shall strike the seat back 10,000 times each from distances of 6, 8, 10 and 12 in. Seats at both seating positions shall withstand 4000 vertical drops of a 40-lb sandbag without visible deterioration. The sandbag shall be dropped 1000 times each from heights of 6, 8, 10 and 12 in. Seat cushions shall withstand 100,000 randomly positioned 3½-in. drops of a squirming, 150-lb, smooth-surfaced, buttocks-shaped striker with only minimal wear on the seat covering and no failures to seat structure or cushion suspension components.

The back of each transverse seat shall incorporate a handhold no less than ⅞ in. in diameter for standees and seat access/egress. The handhold shall not be a safety hazard during severe decelerations. The handhold shall extend above the seat back near the aisle so that standees shall have a convenient vertical assist, no less than 4 in. long that may be grasped with the full hand. This handhold shall not cause a standee using this assist to interfere with a seated 50th-percentile male passenger. The handhold shall also be usable by a 5th-percentile female, as well as by larger passengers, to assist with seat access/egress for either transverse seating position. The upper rear portion of the seat back and the seat back handhold immediately forward of transverse seats shall be padded and/or constructed of energy absorbing materials.

During a 10g deceleration of the bus, the HIC number (as defined by SAE Standard J211a) shall not exceed 400 for passengers ranging in size from a 5th percentile female through a 95th percentile male.

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

Longitudinal seats shall be the same general design as transverse seats but without seat back handholds.

Longitudinal seats may be mounted on the wheelhouses. Armrests shall be included on the ends of each set of longitudinal seats except on the forward end of a seat set that is immediately to the rear of a transverse seat, the driver's barrier, or a modesty panel, when these fixtures perform the function of restraining passengers from sliding forward off the seat. Armrests are not required on longitudinal seats located in the wheelchair parking area that fold up when the armrest on the adjacent fixed longitudinal seat is within 3½ in. of the end of the seat cushion. Armrests shall be located from 7 to 9 in.

above the seat cushion surface. The area between the armrest and the seat cushion shall be closed by a barrier or panel. The top and sides of the armrests shall have a minimum width of 1 in. and shall be free from sharp protrusions that form a safety hazard.

Seat back handhold and armrests shall withstand static horizontal and vertical forces of 250 lbs. applied anywhere along their length with less than ¼-in. permanent deformation. Seat back handhold and armrests shall withstand 25,000 impacts in each direction of a horizontal force of 125 lbs. with less than ¼-in. permanent deformation and without visible deterioration.

37.7 Construction and Materials

Selected materials shall minimize damage from vandalism and shall reduce cleaning time. The seats shall be attached to the frame with tamper-resistant fasteners. Coloring shall be consistent throughout the seat material, with no visually exposed portion painted. Any exposed metal touching the sides or the floor of the bus shall be stainless steel. The seat, pads and cushions shall be contoured for individuality, lateral support and maximum comfort and shall fit the framework to reduce exposed edges.

The minimum radius of any part of the seat back, handhold or modesty panel in the head or chest impact zone shall be a nominal ¼-in. The seat back and seat back handhold immediately forward of transverse seats shall be constructed of energy-absorbing materials to provide passenger protection and, in a severe crash, allow the passenger to deform the seating materials in the impact areas. Complete seat assemblies shall be interchangeable to the extent practicable. Purchaser to select seat fabric.

37.8 Passenger Assists

Passenger assists in the form of full grip, vertical stanchions or handholds shall be provided for the safety of standees and for ingress/egress. Passenger assists shall be convenient in location, shape, and size for both the 95th-percentile male and the 5th-percentile female standee. Starting from the entrance door and moving anywhere in the bus and out the exit door, a vertical assist shall be provided either as the vertical portion of seat back assist or as a separate item so that a 5th-percentile female passenger may easily move from one assist to another using one hand and the other without losing support. All handholds and stanchions at front doorway, around 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: Stainless steel finish or Powder-coated yellow as option, priced separately.

37.9 Assists

Excluding those mounted on the seats and doors, the assists shall have a cross-sectional diameter between 1¼ and 1½ in. or shall provide an equivalent gripping surface with no corner radii less than ¼ in. All passenger assists shall permit a full hand grip with no less than 1½ in. of knuckle clearance around the assist. Passenger assists shall be designed to

minimize catching or snagging of clothes or personal items and shall be capable of passing the NHTSA Drawstring Test.

Any joints in the assist structure shall be underneath supporting brackets and securely clamped to prevent passengers from moving or twisting the assists. Seat handholds may be of the same construction and finish as the seat frame. Door mounted passenger assists shall be of anodized aluminum, stainless steel or powder-coated metal. Connecting tees and angles may be powder-coated metal castings. Assists shall withstand a force of 300 lbs. applied over a 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.

37.10 Front Doorway

Front doors, or the entry area, shall be fitted with ADA-compliant assists. Assists shall be as far outward as practicable, but shall be located no farther inboard than 6 in. from the outside edge of the entrance step and shall be easily grasped by a 5th-percentile female boarding from street level. Door assists shall be functionally continuous with the horizontal front passenger assist and the vertical assist and the assists on the wheel housing or on the front modesty panel.

37.11 Vestibule

The aisle side of the driver's barrier, the wheel housings, and when applicable the modesty panels shall be fitted with vertical passenger assists that are functionally continuous with the overhead assist and that extend to within 36 in. of the floor. These assists shall have sufficient clearance from the barrier to prevent inadvertent wedging of a passenger's arm.

A horizontal passenger assist shall be located across the front of the bus and shall prevent passengers from sustaining injuries on the fare collection device or windshield in the event of a sudden deceleration.

Without restricting the vestibule space, the assist shall provide support for a boarding passenger from the front door through the fare collection procedure. The assist shall be no less than 36 in. above the floor.

The assists at the front of the bus shall be arranged to permit a 5th-percentile female passenger to easily reach from the door assist, to the front assist, to vertical assists on the driver's barrier, wheel housings or front modesty panel. An optional Stainless steel molding to cover edges on entrance and rear riser will be made available and priced separately.

37.12 Rear Doorway(s)

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.

37.13 Overhead

Except forward of the front wheel well 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.

Vinyl coated nylon grab straps positioned throughout the bus interior mounted to the horizontal stanchions are optional and priced separately.

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

37.14 Longitudinal Seat Assists

Longitudinal seats shall have vertical assists located between every other designated seating position, except for seats that fold/flip up to accommodate wheelchair securement. Assists shall extend from near the leading edge of the seat and shall be functionally continuous with the overhead assist. Assists shall be staggered across the aisle from each other where practicable and shall be no more than 52 inches apart.

37.15 Wheel Housing Barriers/Assists

Unless passenger seating is provided on top of wheel housing, 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 housing.

37.16 Passenger Doors

The front door shall be a "slide glide" type inward opening, driver controlled, of corrosion-resistant construction. Minimum clear opening shall be 31.75” inches. The front door shall have a minimum height of 75” inches. The overhead clearance between the top of the door opening and the highest point of the ramp shall be a minimum of 68 inches. The step height shall not exceed 16.5 in. at either doorway without kneeling and shall not

exceed 15.5 in. at the step. A maximum of two steps is allowed to accommodate a raised aisle floor in the rear of the bus. Operation of, and power to, the front door shall be controlled by the driver. Door shall be opened completely in 1 to 3.5 seconds from the time of control actuation, and shall be subject to adjustment requirements of this specification. A control valve in the driver'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.

The rear or exit door shall be a two panel swing out type designed or slide glide, if applicable, to provide a minimum clear opening of 30” inches and a minimum height of 75 inches. Rear doors shall be operator opened and spring closed or equal. The closing of the door shall begin after the control has been moved to the closed position, and after the door has been fully opened. Door opening and closing speeds shall be adjustable. The rear door shall be equipped with a sensitive edge which will open the door automatically if an object is trapped between the doors. The doors shall have handrails (1.25 inches or equivalent surface area with a 1.50 inch knuckle clearance) mounted on the door panels and/or a modesty panel in the door well/step well. The clear opening dimension shall apply inside these handrails. Handrails whether on the door panel or in the body, shall be part of the systematic set of passenger assists.

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

Entrance and exit door motors and actuators shall be specified. At a minimum, both front and rear doors shall meet ADA requirements.

A system where rear doors shall be a passenger-controlled “Touch Bar Type” rear door will be made available as an option and be priced separately. The rear door control shall be limited to unlocking and enabling the opening mechanism, which shall be signaled by illumination of a green light near the door.

The door shall be opened by touching either of the rear door vertical passenger assists with a force of 5 to 10 pounds. The touch bars shall meet the general requirements of passenger assist size, strength and knuckle clearance, and shall not self-activate if the bus is stopped with the left side 10 inches higher than the right side. The touch bar assists shall be located near the opened edge of the door panels and extend from 36 inches above the floor surface to within 36 inches of the street surface. The doors shall close when the touch bar is released. Closing shall begin 2 seconds after the touch bar is released and the door shall close within 2 to 3 seconds from the fully opened position. A switch, convenient to the driver, shall convert the rear door to a power door with both opening and closing controlled by the driver.

An emergency door switch which is not in reach of a seated driver shall close the rear doors, deactivate the door control system, and permit only emergency operation of the doors.

A system where the rear/exit door of the vehicle shall be equipped with an acoustic sensing system such as the CLASS TM system manufactured by the Vapor Corporation will be made available as an option and be priced separately. This system shall sense passengers and other objects in the doorway and between the fully open or partially closed door panels. The system shall utilize ultrasonic acoustic waves and intelligent signal processing techniques to sense objects in selected spaces depending upon the phase of the door operating cycle. The system shall be capable of selectively requesting opening of exit doors enabled by the vehicle operator; sensing passengers approaching the door opening from the interior of the vehicle and providing a door HOLD OPEN request; and of sensing passengers or other objects that intrude within defined zones during door closing and providing a REOPEN or HOLD OPEN request. The detection zone dimensions shall be user-programmable.

The system shall be capable of resisting false detections due to environmental conditions, including rain.

The acoustic components shall be solid state devices and shall be packaged to withstand the transit bus environment.

Rear doors shall be passenger-controlled. The rear door control shall be limited to unlocking and enabling the opening mechanism, which shall be signaled by illumination of a green light near the door. The door shall be opened when a passenger attempts to touch the center edge of either door panel in the area of a decal displaying appropriate signage, optional per purchaser. This action by the passenger when the door is enabled will signal the door operator to open. The door system will be provided with passenger assists designed as to avoid interference with the detection zones of the sensors and shall meet the general requirements of passenger assist size, strength and knuckle clearance. Passenger assists shall be located near the opened edge of the door panels and extend from 36 inches above the floor surface to within 36 inches of the street surface.

The doors shall begin to close 2 seconds after the sensors cease to detect an object or passenger in the doorway. The door closing speed shall be adjustable and not exceed 12 inches per second for closing. A separate switch, convenient to the driver, shall convert the rear door to a power door with both opening and closing controlled by the driver. A master door switch which is not in reach of a seated driver shall close the rear doors, deactivate the door control system, and permit only emergency operation of the doors.

A system where the rear doors shall be passenger opened and spring closed w/ sensitive edge will be made available as an option and be priced separately.

For electric buses consideration should be given for electric powered front and rear door.

37.17 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.

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, 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.

Doors closed by a return spring or counterweight-type device shall be equipped with an obstruction sensing device that, at a minimum, alerts the driver if an obstruction is detected between the closing doors. Doors closed by a return spring or counterweight type device, when unlocked, shall be capable of being pushed to the point where the door starts to open with a force not to exceed 25 lbs. applied to the center edge of the forward door panel.

Whether or not the obstruction sensing system is present or functional, it shall be possible to withdraw a 1½ in. diameter cylinder from between the center edges of a closed and locked door with an outward force not greater than 35 lbs.

37.18 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.

A switch located within reach of the seated operator shall, when actuated, restore rear door function to complete operator control.

Doors that employ a “swing” or pantograph geometry and/or are closed by a return spring or counterweight-type device shall be equipped with a positive mechanical holding

device that automatically engages and prevents the actuation mechanism from being back-driven from the fully closed position.

The holding device shall be overcome only when the driver's door control is moved to an "Exit Door Enable" position and the 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 lbs. to open manually. When the locked doors are manually forced to open, damage shall be limited to the bending of minor door linkage with no resulting damage to the doors, actuators or complex mechanism.

37.19 Rear Door Interlocks

See "Hardware Mounting" for door system interlock requirements.

37.20 Emergency Operation

In the event of an emergency, it shall be possible to manually open doors designated as emergency exits from inside the bus using a force of no more than 25 lbs. after actuating an unlocking device. The unlocking device shall be clearly marked as an emergency-only device and shall require two distinct actions to actuate. The respective door emergency unlocking device shall be accessible from the doorway area. The unlocking device shall be easily reset by the operator without special tools or opening the door mechanism enclosure. Doors that are required to be classified as "Emergency Exits" shall meet the requirements of FMVSS 217.

37.21 Door Control

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

37.22 Door Controller - Five-Position or Two Momentary Push Buttons 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.
- For electric buses consideration should be given for electrically or pneumatically operated door controller

37.23 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 operator. After enabling, the rear doors shall be opened by the passenger, optional per purchaser selection. 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, deactivate the door control system, release the interlocks, and permit only manual operation of the rear/center doors.

38 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.

38.1 Loading Systems

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

Wheelchair tie-downs will be incorporated and located as close to the front door of the bus as practical to ensure maximum aisle width and wheelchair maneuverability the wheelchair ramp shall have a manual release, deploy, and stow mechanism. The components involved with manual operation shall be completely accessible. If ramp provides for a nylon strap, it must be located on the forward side of the ramp to preclude a trip hazard.

38.2 Dimensions and capabilities:

Ramp Length shall provide for a minimum 1:6 slope when the bus is kneeled and the ramp deployed to ground level.

- Ramp Width 30.5 min.
- Load Capacity Must meet current ADA regulations
- Cycle Speed not to exceed 12” per sec.

The ramp shall be controlled by toggle switches, master on-off, up-down and stow-deploy. The control switches shall be of the spring loaded to a safe position type so that constant manual pressure is required by the operator during ramp operation. All controls shall be clearly identified by function and present a reasonably foolproof and natural sequence of operation.

Visual and audible warning devices shall be located immediately to the rear of the front door. The audible warning device shall be activated only when the ramp is functioning. Interlocking and fast idle provisions shall be incorporated so the ramp cannot be extended unless the entrance door is in the full open position, the transmission in neutral, and the parking brake engaged. The entrance door cannot be closed unless the ramp is in the fully stowed position. The bus service brakes shall be automatically applied when the ramp is in any position other than the stowed and locked position. All ramp components mounted under the bus shall be protected from dirt, debris, and road splash through the use of appropriate enclosures, mud flaps, or sealed compartments, subject to approval by each Purchaser.

Weatherproof access panels/doors shall be provided to allow for servicing and troubleshooting both ramp and under-floor bus components. Lubing the ramp shall be accomplished without removing the belly pan.

The electrical interfacing connections between the bus and the ramp shall be of the quick disconnect type to facilitate ramp removal and installation.

Components known to meet these requirements include, but are not limited to equipment manufactured by Lift-U Inc., the Lift U LU-18 2 dual mode, and Ricon, Inc.

38.3 Wheelchair Accommodations

NOTE: Purchaser will approve acceptable securement system.

38.4 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.

38.5 Wheelchair Securing System

Bidder shall provide a telescope restraint system at each wheelchair position. At a minimum, all restraint systems must meet CFR 49, FMVSS, FTA and ADA standards. Components known to meet these requirements include, but are not limited to American Seating ARM, Q’Straint Q’Pod, and Q’Straint QRT systems. **If wheelchair securing strap systems are installed then the following applies:** Wheelchair securing strap assemblies and suitable compartment for storing straps for the installation on accessible transit

buses as required, to be in complete compliance with all ADA/FTA regulations in effect at time of manufacture. The securing system shall be provided by the individual seating manufacturer.

Each securing strap assembly shall include but not limited to the following: Each securing strap shall be equipped with a male and female connector. When fully extended, the strap shall be 51.5 inches long from the mounting hole to the end of the female buckle. The strap webbing shall be red in color and shall be equal to automobile seat belt webbing material.

An automotive type retractor for stowing webbing shall be provided. In the stowed position, no more than 11 inches of the securing straps shall be outside of the retractor assembly. The retractor assembly shall be black in color, or approved equal.

The securing strap assembly shall be used in a set of 2 units. A 2 unit set of securing straps shall hold a wheelchair and passenger up to the maximum load as specified by current ADA regulations.

38.6 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-degree turns of wheelchairs should have a clearance arc dimension no less than 45 in., and in the parking area where 180-degree 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 footrest.

39 SIGNAGE AND COMMUNICATION

Destination Signs

An LED automatic electronic destination sign system shall be furnished and installed in each bus by the manufacturer. The destination sign system shall consist of:

- One (1) Front sign 16 rows x 160 columns; display height minimum 7.9 inches, display width 63”, or a 24 rows x 200 columns sign.
- One (1) Side sign, on the curb side, 14 rows x 108 columns; display height minimum 4.2 inches, display width 42”.
- One (1) Rear sign 16 rows x 48 columns; display height minimum 6.1 inches, display width 17”.
- Operators Control Unit (OCU)

A colored LED light sign system will be made available and be priced separately.

39.1 Cables and Accessories

The Front Sign shall be mounted on the front of the Bus, near the top edge of the body, behind windshield protection, and in an enclosed but accessible compartment. The Side Sign shall be located on the right side (curb side) of the bus near the front door, mounted near the top of an existing window. The Rear Sign (external) shall be mounted on the rear of the vehicle on an appropriate sized cutout.

The entire display area of all signs shall be readable in direct sunlight, at night, and in all lighting conditions between those two lighting extremes, with evenly distributed illumination appearance to the un-aided eye.

The system shall be microprocessor-based, utilizing approved bi-directional serial communications, such as S.A.E J1708 or IBIS, E.I.A. RS-485, between system components, and shall utilize error detection techniques within the communication protocol.

The system shall be capable of communicating with additional information devices, such as interior information Signs, Voice Annunciation devices, fare box, etc. The system shall provide for destination and/or Public Relations (P/R) message entry.

Flash memory integrated circuits shall be capable of storing and displaying up to 10,000 message lines.

Message memory shall be changeable by the use of a PCMCIA Card or USB memory stick of not less than one (1) gigabyte memory capacity but sized according to the message listing noted herein.

Twin Vision standard is now programming via USB

The System shall have the ability to sequentially display multi-line destination messages, with the route number portion remaining in a constant “on” mode at all times, if so programmed. It shall also be capable of accepting manual entry of Route Alpha/Numeric information on any/all signs.

The various Signs shall be programmable to display independent messages or the same messages; up to two destination messages and one public relations message shall be pre-selectable. The operator shall be able to quickly change between the pre-selected messages without re-entering a message code. Public relations messages shall be capable of being displayed alternately with the regular text and route messages or displayed separately.

An emergency message shall be activated by a push button or toggle switch. The emergency message shall be displayed on signs facing outside the vehicle while signs inside the vehicle, including the OCU display, remain unchanged. The emergency message shall be canceled by entering a new destination code, or power cycling (after removal of the emergency signal).

The programming software shall provide means of adjusting the length of time messages are displayed in 0.1 second increments up to twenty-five seconds.

Power to the Sign system shall be controlled by the Master Bus Run Switch. The signs shall operate in all positions of this switch except off. The signs shall be internally protected against voltage transients and RFI interference to ensure proper operation in the local environment.

39.2 Display and Display Illumination

All Sign displays shall consist of pixels utilizing High Intensity Light Emitting Diodes ("LED"), for superior outdoor environmental performance, (of Amber illumination appearance of light wavelength of 590 NM). LED should be made of AllnGaP II, superior UV resistant Epoxy lens and superior resistance to the effects of moisture. Each pixel shall have a dedicated LED for illumination of that pixel in all lighting conditions. The sign system shall have multi-level intensity changes, which adjust automatically as a function of ambient lighting conditions. There shall be no requirement for any fan or any specialized cooling or air circulation.

This LED shall be mounted such as to be visible directly to the observer positioned in the viewing cone, allowing for full readability 65 degrees either side of the destination sign centerline. The LEDs shall be the only means of illumination of the sign system. The LED illumination source shall have an operating life M.T.B.F. of not less than 100,000 hours. Each LED shall not consume more than 0.02 Watts.

The characters formed by the System shall meet the requirements of the Americans with Disabilities Act (ADA) of 1990 Reference 49 CFR Section 38.39.

39.3 Sign Enclosures

All Signs shall be enclosed in a manner such as to inhibit entry of dirt, dust, water and other contaminants during normal operation or cleaning. Access shall be provided to clean the inside of the Bus window(s) associated with the Sign and to remove or replace the Sign components. Access panels and display boards shall be mounted for ease of maintenance/replacement. Any exterior Rear Sign enclosure used shall be made of

Polycarbonate material containing fiberglass reinforcement. The Contractor shall comply with the Sign manufacturer's recommended mounting, mounting configuration, and installation procedures to assure optimum visibility and service accessibility of the Sign System and System components.

39.4 Electronic System Requirements:

All electronic circuit boards used in the Sign System shall be conformal coated to meet the requirements of military specification MIL-I-46058C. All Sign System components shall be certified to have been subjected to a "burn-in" test of a minimum of twelve (12) hours operation in a temperature of 150 degrees F. prior to final inspection.

39.5 Operator Control Unit (OCU)

The OCU Unit shall be used to view and update display messages. It shall be recess mounted on the Bus vehicle front Sign compartment access cover or door. The OCU shall utilize a multi-key conductive rubber pad keyboard and be designed for transit operating conditions. Other mounting locations for the OCU shall be made available, with selection made at the pre-production meeting.

Only one switch is required to activate the 3 systems (radio, surveillance and sign.) Integration is required if the Twin Vision Sign and the Digital Recorders Talking Bus system are selected with a single OCU to control both systems.

The OCU Unit shall contain a display of at least two-lines of 20-character capability. The OCU Unit shall contain an audio annunciation that beeps indicating that a key is depressed. The OCU Unit shall continuously display the message associated with the selected destination readings (except the emergency message feature as noted above).

If the IBIS interface is required in the Destination Sign System, an auxiliary RS232 (DB9) port shall be made optionally available on the OCU under frame for inputs from any wireless technology that might be envisioned in the future. This auxiliary RS232 port shall operate at 9600 baud and accept commands from a wireless source (such as Spread Spectrum receivers) and will set destination sign addresses as if manually operated by the OCU operator.

If the J1708 interface is selected for the Destination Sign System, an auxiliary J1708 port shall be made available on the J1708 OCU so that auxiliary J1708 commands may be provided to the Destination Sign system from a wireless source that conforms to the J1708 command structure.

39.6 Programming

A programming software package consistent with what the Purchaser currently is using shall be supplied to generate message lists for the Sign system.

39.7 Message Memory Transfer and UPDATE

The Sign system shall be reprogrammable on the Bus vehicle with the use of a data transfer device. A data transfer device slot shall be provided on the OCU face for this purpose. (Data transfer is via USB for Twin Vision) The maximum reprogramming time for a 10,000 line listing shall be one minute. A data transfer device, of appropriate memory capacity based on requirements of the message listing noted below (but not less than 0.5 Megabyte) shall be supplied at the rate of one device for each 50 systems, or fraction thereof, but in any event not less than two such devices shall be supplied. Alternate: 1 device per vehicle.

39.8 Interconnecting Cabling

Data Communication Single twisted pair (two conductors) cable.

Power Cabling, three conductors connecting to the switched and unswitched (battery) power and a return (battery).

OCU Unit cable single twisted pair cable between the OCU and front

39.9 Dash Mounted Mechanical Sign

A mechanical Transign 4 character route sign shall be provided in the lower curb side windshield secured to the dash panel. The sign shall have three characters numerical 0-9 and 1 character Alfa A-Z.

Each character shall use black lettering on white background. Lettering shall be a minimum of 6” high with minimum of 1-1/2” between readings or 4” x 3” letters. Each column shall be operated individually.

The curtain material shall be made of Mylar.

(Note Transign does have backlit LED signs available)

39.10 Passenger Information and Advertising - 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.

39.11 Exterior Displays

Provisions shall be made to integrate advertising into the exterior design of the bus. Size and locations will be provided by the Purchaser. At a minimum, bidder shall provide pricing for driver side, curb side and read of the bus. Advertising media, frames or supporting structures shall not detract from the readability of destination signs and signal lights, and shall not compromise passenger visibility. Advertising provisions shall not cause pedestrian hazards or foul automatic bus washing equipment, and shall not cover

or interfere with doors, air passages, vehicle fittings, or in any other manner restrict the operation or serviceability of the bus

39.12 Passenger Stop Request/Exit Signal

The ambulatory passenger signal shall be the yellow pull cords, push button, or clear pull cords conveniently located so standing and seated passengers can easily reach it, this includes down the mullions. The pull cords shall be accessible from the exit door area, or a button to actuate the signal shall be placed on the door motor cover. There shall be a lighted display sign which indicates "STOP REQUESTED" when the signal is activated. The signal chime shall operate once, and the sign shall light and remain lit with the chime disabled until the next stop when the front doors or rear doors have been opened, resetting the system.

The chime shall be distinctive. The volume on the chime shall be adjustable between 90 and 55 Db. The lighted display shall be located on or near the ceiling at the front of the bus in view of the passengers. A light on the instrument panel shall be lit when the display sign is lit.

There shall be a second passenger signal of a different tone that meets the ADA requirements mounted to the bottom of the flip seat for the mobility aid users to alert the operator when a mobility aid user wishes to disembark. One such system that meets these minimum requirements are the Tape Switch Corp. 3.5”x7” yellow push pad. There shall be two lights on the operator’s front dash that indicate when an ambulatory or non-ambulatory passenger wishes to disembark.

39.13 Communications - Camera Surveillance System

There will be a requirement to furnish and install a complete video surveillance system or pre-wire as determined by the Purchaser. All items are to be priced separately and comply with the following: The CCTV Surveillance system shall be capable of handling 12 cameras (color, infrared, and B/W), 30 days on-board video storage, and be capable of recording at up to 240 frames per second for all connected cameras or approved equals.

Regulated 13.6 volts DC power shall be provided for the DVR system by the output of the dedicated electronics systems power supply. Tamperproof Torx screws shall be provided for all camera housings and access covers.

Loom for the facing forward camera wires located below the destination sign compartment near the top of the windshield shall be provided.

A system status indication shall be provided on the dashboard through the I/O Controls multiplex (or approved equal) warning indicator LED display. An impact sensor shall be optional.

If system is selected, the bus shall be equipped with cameras as follows:

A camera mounted below the destination sign compartment near the top of the windshield, forward facing. The camera shall be a color camera with the capability to

capture images in ambient lighting at night. If necessary, the camera may switch to black and white under very low lighting conditions. The field of view shall include the street in front of the bus, overhead traffic signal while stopped at an intersection and pedestrians on the sidewalk or at the curb approximately 8 feet in front of the bus. (4.0mm if practicable) The mounting shall be such as to prevent camera vibration, water intrusion, interference with the driver's visibility, and shall minimize color shift due to the tinting at the top of the windshield. A flexible rubber glare shield (hood) shall be provided on the camera. The housing window shall be glass or a material resistant to scratching, hazing, and cleaning chemicals. (Plastic dome housing is not acceptable.)

A color camera with infrared capability flush mounted in the panel above the driver facing the farebox and entry door. The camera shall be housed in an "angled down" box. The housing window shall be glass or a material resistant to scratching, hazing, and cleaning chemicals. The field of view shall wide angle (2.9mm if practicable) and include the driver, the farebox, and the entire entry door opening. The vestibule area shall be illuminated by an infrared emitter under low light conditions.

A color camera flush mounted in the panel above the front door facing the driver and farebox. The camera shall be housed in an "angled down" box. The housing window shall be glass or a material resistant to scratching, hazing, and cleaning chemicals. The field of view shall wide angle (2.9mm if practicable) and include the driver, driver compartment, and the farebox.

A color camera shall be flush mounted in the front destination sign compartment door facing rearward.

The camera shall be housed in a shallow, waterproof box that will not interfere with the destination sign.

The housing window shall be glass or a material resistant to scratching, hazing, and cleaning chemicals.

The field of view shall include the entire length of the front bus body section interior and the articulated joint area (6.0mm if practicable).

A color camera shall be surface mounted on the centerline of the bus ceiling at the center of the bus. The camera shall be front facing. The housing window shall be glass or a material resistant to scratching, hazing, and cleaning chemicals. The field of view shall include the entire length of the front bus body section interior (4.0mm if practicable).

A color camera shall be surface mounted on the centerline of the bus ceiling at the center of the bus. The camera shall be rear facing. The housing window shall be glass or a material resistant to scratching, hazing, and cleaning chemicals. The field of view shall include the entire length of the front bus body section interior (4.0mm if practicable).

A color camera shall be surface mounted on the bus ceiling facing the rear door. The housing window shall be glass or a material resistant to scratching, hazing, and cleaning chemicals. The field of view shall wide angle (2.9mm if practicable) and include the entire rear door opening.

A color camera shall be surface mounted on the bus exterior over the driver's window near the roofline.

The camera shall be facing rearward. The housing shall be waterproof and sealed from the exterior environment to prevent formation of condensation on the housing interior. The housing must be rugged to resist damage from tree limbs. The housing window shall be glass or a material resistant to scratching, hazing, and cleaning chemicals. The field of view shall include the entire length of the bus exterior and the traffic lane adjacent to the bus travel lane (6.0mm if practicable).

A color camera shall be surface mounted on the bus exterior over the front passenger door near the roofline. The camera shall be facing rearward. The housing shall be waterproof and sealed from the exterior environment to prevent formation of condensation on the housing interior. The housing must be rugged to resist damage from tree limbs. The housing window shall be glass or a material resistant to scratching, hazing, and cleaning chemicals. The field of view shall include the entire length of the bus exterior and the traffic lane adjacent to the bus travel lane (6.0mm if practicable).

A color camera shall be surface mounted on the bus exterior at the rear above the engine compartment. The camera shall be facing rearward. The housing shall be waterproof and sealed from the exterior environment to prevent formation of condensation on the housing interior. The housing window shall be glass or a material resistant to scratching, hazing, and cleaning chemicals. The field of view shall include the rear bumper and the ground behind the bus (2.9mm if practicable).

Cameras shall have sufficiently high resolution to allow recognition of faces and to read roadside signs.

A complete description of the CCTV Surveillance system, including installation, shall be presented to the appropriate municipality for approval prior to production of the pilot bus or first production bus.

Components known to meet these requirements include, but are not limited to, Seon TR4-OD "Trooper" with audio at driver's door and mid bus. The system will also include sensor inputs for speedometer, brakes, turn signals and a silent alarm switch that also connects to the radio system. Other optional systems include the Safety Vision Road Recorder™ 6000 MDVR product, the Transit Video Security Systems (TVSS) CLAIM SAFE product, Apollo Video Roadrunner, the March Networks 5/6000 Series MDVR product, and the Radio Engineering Industries, Inc. Bus-Watch product. Supplier shall provide schematic diagrams of the equipment with proposed camera locations.

39.14 Mobile Radio System

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

Each bus shall include a two-way voice communication system including radio and all other equipment necessary to regular operation of the radio. As a separately priced option, bidders should include installation of a radio system and other equipment necessary to regular operation of the radio as supplied by an individual Purchaser. When supplied, a system includes the following items; radio VLU, TCH, handset, cab speaker and cables.

39.15 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 (this requirement does not applicable to all electric bus). 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.

Plastic or ABS construction shall be list as options and priced separately.

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 Purchaser designated color.

39.16 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.

39.17 Radio Transmitter

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

39.18 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.

39.19 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.

39.20 Public Address System

Each bus shall have a public announcement system. The system shall be configured so it is completely independent from the bus radio system. The system shall incorporate provisions to allow a second handheld microphone to be plugged in and used. The hand-held microphone shall have a plug in on the right end of the primary driver’s panel, but shall not be installed, but shall be shipped with the bus.

Keying either microphone shall not cause the other to be activated. Six (6) speakers flush or semi-flush mounted, shall be installed to ensure adequate sound distribution. Additional speakers can be purchased and installed as an option. The system shall have a volume control knob located on the driver's panel, unless volume is incorporated with the individual units. There shall be a minimum of one (1) external speaker on the curb side of bus to permit announcements of route and line information. Additional external speaker can be added as an option.

Components known to meet these requirements include, but are not limited to, the Speak Easy II Public Announcement (PA) system, the Digital Recorders Talking Bus DR600C, Digital Recorders DR600C W/ GPS and Stealth mic from DR, P.A. and the Boom Mic GFI 15W-7255-66.

Bidders should include, as a separately priced option, a public address system, and/or incorporation of a system supplied by a Purchaser (to allow compatibility with other system-unique equipment).

39.21 Automatic Passenger Counting

An optional UTA Automatic Passenger Counting (APC) shall be made available and priced separately.

All equipment location, accessibility, and mounting, shall be approved by Purchaser prior to production.

40 Warranty, Repairs, and Quality Assurance Requirements

40.1 Warranty.

40.1.1 Contractor Warranty.

Warranties in this document are in addition to any statutory remedies or warranties imposed on Contractor. Consistent with this requirement, Contractor warrants and guarantees to Purchaser each complete bus and specific subsystems and components as follows.

Contractor warrants the buses are of good material and workmanship and agrees to promptly replace any part or parts, at no cost to the Purchaser, which by reason of defective materials or workmanship fail under normal use, free of negligence or accident during the applicable warranty period. Contractor warranties include the replacement of parts and services associated with the replacement and repair, including but not limited to any diagnostic, refurbishment, shipping, or travel costs.

Performance requirements based on design criteria will not be deemed a warranty item. Contractor shall insure in its procurement arrangements that the warranty requirements of this Master Contract are enforceable through and against the Contractor's suppliers, vendors, material men, and subcontractors. Any inconsistency or difference between the warranties extended to Purchasers by Contractor and those extended to Contractor by its suppliers, vendors, material men, and subcontractors, are at the risk and expense of Contractor. Such inconsistency or difference will not excuse Contractor's full compliance with its obligations under this Contract.

40.1.2 Warranty Information.

Upon Purchaser’s request, Contractor shall promptly provide complete copies of all written warranties or guarantees and documentation of any other arrangement relating to such warranties or guarantees extended by Contractor's suppliers, sub-suppliers, vendors, material men, and subcontractors covering parts, components, and systems utilized in the bus. Contractor shall ensure that such suppliers, sub-suppliers, vendors, material men, and subcontractors satisfactorily perform warranty related work when requested to do so by Purchaser.

40.1.3 Complete Bus.

The complete bus, propulsion system, components, major subsystems, and body and chassis structure are warranted to be free from Defects and Related Defects for at least two years or 100,000 miles, whichever comes first, beginning on the date of revenue service. The warranty is based on regular operation of the bus under the operating conditions prevailing in Purchaser’s locale.

40.1.4 Body and Chassis Structure.

Body, body structure, structural elements of the suspension and engine cradle are warranted to be free from Defects and Related Defects for at least three years or 150,000 miles, whichever comes first. Primary load-carrying members of the bus structure, including structural elements of the suspension, are warranted against corrosion failure and/or fatigue failure sufficient to cause a Class 1 or Class 2 Failure for a period of 12 years or 500,000 miles, whichever comes first.

40.1.5 Propulsion System (Diesel, CNG, Hybrid).

Propulsion system components, including the engine, transmission or drive motors, and generators (for hybrid technology) and drive and non-drive axles are warranted to be free from defects and related defects for at least two years or 100,000 miles, whichever comes first. An extended warranty may be purchased at an additional cost.

40.1.6 Propulsion System (Electric).

Electric propulsion system components, including the traction motors, traction motor controllers, transmission, drive motors, drive and non-drive axles, and any other propulsion system-related replacement component, are warranted to be free from defects and related defects for at least six years or 300,000 miles, whichever comes first. An extended warranty may be purchased at an additional cost.

40.1.7 Energy Storage System (Electric or Hybrid).

The Energy Storage System (ESS), including the traction battery, Battery Management System, and any other ESS-related replacement component, are warranted to be free from defects and related defects for at least six years and unlimited mileage beginning on the date of bus acceptance. The ESS is warranted to remain within warrantable end of life during the warranty period. The ESS original specified energy storage capacity and warrantable end of life, as a percentage of the original specified energy capacity, must be clearly defined by the Contractor. Acceptable methods for measuring or obtaining ESS storage capacity with respect to its original specified capacity must be clearly identified by the Contractor. The Contractor will propose the test method, and certify the results are true and accurate. The test will be performed according to a documented test procedure. Purchaser may engage third-parties for capacity testing.

40.1.8 Emission Control System (ECS).

Contractor warrants the emission control system to be free from defects and related defects for at least five years or 100,000 miles, whichever comes first. The ECS includes, but is not limited to, the following components:

- complete exhaust system, including catalytic converter (if required)
- after treatment device
- components identified as emission control devices

40.1.9 Subsystems Warranty.

The Contractor warrants the following subsystems to be free from defects and related defects for at least two years or 100,000 miles, whichever comes first.

- Brake system: Foundation brake components, including advancing mechanisms, as supplied with the axles, excluding friction surfaces.
- Destination signs: All destination sign equipment for the front, side and rear signs, power modules and operator control.
- Heating, ventilating: Roof and/or rear main unit only, excluding floor heaters and front defroster.
- AC unit and compressor: Roof and/or rear main unit only, excluding floor heaters and front defroster.
- Door systems: Door operating actuators and linkages.
- Air compressor.
- Air dryer.
- Wheelchair lift and ramp system: Lift and/or ramp parts and mechanical only.
- Starter.
- Alternator: Alternator only. Does not include the drive system.
- Charge air cooler: Charge air cooler including core, tanks and including related surrounding framework and fittings.
- Fire suppression: Fire suppression system including tank and extinguishing agent dispensing system.
- Hydraulic systems: Including radiator fan drive and power steering as applicable.
- Propulsion cooling systems: Radiator including core, tanks and related framework, including surge tank. Transmission cooler.
- Power electronics: DC/DC converters, inverters, if supplied
- Passenger seating excluding upholstery.
- Fuel storage and delivery system.
- Surveillance system including cameras and video recorders.

The Contractor warrants the following subsystems to be free from defects and related defects for at least twelve years or 600,000 miles, whichever comes first:

- Low voltage and high voltage electrical wiring and harnesses

40.1.10 Serial Numbers.

Upon delivery of each bus, Contractor shall provide a complete electronic list of serialized units installed on each bus to facilitate warranty tracking. The list will include, but is not limited to the following:

- Engine
- Transmission
- Alternator
- Starter
- Destination/Luminator (Major components)
- Drive axle and non-drive axle(s)
- DVR unit, supporting electronics (Monitors)
- Driver's seat
- Battery equalizer
- Radiator package
- Exhaust emission components
- A/C compressor and condenser/evaporator unit
- Power steering unit
- Fuel cylinders (if applicable)
- Air compressor
- Wheelchair ramp (if applicable)

Contractor shall provide updated serial numbers resulting from warranty campaigns. The format of the list will be approved by Purchaser prior to delivery of the first production bus.

40.1.11 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.

40.1.12 Voiding of Warranty.

The warranty will not apply to the failure of any part or component of the bus that directly results from misuse, negligence, accident, or repairs not conducted in accordance with the Contractor-provided maintenance manuals and with workmanship performed by adequately trained personnel in accordance with recognized standards of the industry. The warranty will be void if Purchaser fails to conduct normal inspections and scheduled preventive maintenance procedures as recommended in the

Contractor's maintenance manuals and if that omission caused the part or component failure. Purchaser should maintain documentation, auditable by Contractor, verifying service activities in conformance with the Contractor's maintenance manuals.

40.1.13 Exceptions and Additions to Warranty.

Warranties will not apply to the following items:

- scheduled maintenance items
- normal wear-out items, such as brake linings, filters, belts, and wiper blades
- items furnished by Purchaser

Should Purchaser require the use of a specific product and has rejected Contractor's request for an alternate product, then the standard supplier warranty for that product will be the only warranty provided to Purchaser. This product will not be eligible under "Fleet Defects," below.

40.1.14 Pass-Through Warranty.

Contractor shall request a waiver by the Purchaser, if Contractor elects to not administer warranty claims on certain components and wishes to transfer this responsibility to the sub-suppliers, or to others. The waiver of Contractor's warranty responsibility is at Purchaser's discretion.

Contractor shall state in writing that Purchaser's warranty reimbursements will not be impacted. Contractor also shall state in writing any exceptions and reimbursement including all costs incurred in transport of vehicles and/or components. At any time during the warranty period, Contractor may request approval from Purchaser to assign its warranty obligations to others, but only on a case-by-case basis approved in writing by Purchaser. Otherwise, Contractor shall be solely responsible for the administration of the warranty as specified. Warranty administration by others does not eliminate the warranty liability and responsibility of Contractor.

If any vendor to the Contractor offers, at no additional cost, a warranty on a component that is longer or more comprehensive than the required warranties on this Contract, Contractor shall inform Purchaser of the additional warranty and pass it through to Purchaser at no additional cost.

40.1.15 Superior Warranty.

Contractor shall pass on to Purchaser any warranty offered by a component supplier that is superior to the warranty required in the relevant section. Contractor shall provide a list to Purchaser noting the conditions and limitations of the superior warranty no later than the start of production. Contractor will not administer the superior warranty.

40.1.16 Fleet Defects.

"Fleet Defect" means cumulative failures of twenty (20) percent of the same components in the same or similar application in a minimum fleet size of twelve (12) or more buses

where such items are covered by warranty. A Fleet Defect applies only to the base warranty period in sections 12.3 Complete Bus, 12.X Propulsion System, and 12.X Subsystems Warranty. When a Fleet Defect is declared, the remaining warranty period on that item/component stops. The warranty period does not restart until the Fleet Defect is corrected.

For the purpose of Fleet Defects, each order shall be treated as a separate bus fleet. In addition, if there is a change in a major component within the order, the buses containing the new major component will become a separate bus fleet for the purposes of determining Fleet Defects.

Contractor shall correct a Fleet Defect under the warranty provisions defined in Section 13 Repair Procedure. After correcting the Fleet Defect, Purchaser and Contractor shall mutually agree to and Contractor shall promptly undertake and complete a work program reasonably designed to prevent the occurrence of the same Fleet Defect in all other buses and spare parts purchased under the order. Where the specific Fleet Defect is solely attributed to particular identifiable parts, the work program will include redesign and/or replacement of only the defectively designed and/or manufactured parts. In all other cases, the work program will include inspection and/or correction of all the buses in the fleet via a mutually agreed-to arrangement. Contractor shall update, as necessary, technical support information (parts, service and operator's manuals) due to changes resulting from warranty repairs. Purchaser may immediately declare a defect in design resulting in a safety hazard to be a Fleet Defect. Contractor shall be responsible to furnish, install and replace all defective units.

The Fleet Defect warranty provisions do not apply to Purchaser-supplied items, such as radios, fare collection equipment, communication systems, and tires. In addition, Fleet Defects do not apply to interior and exterior finishes, hoses, fittings, and fabric.

40.2 Repair Procedure.

40.2.1 Repair Performance.

Contractor is responsible for all warranty-covered repair work, including diagnostics of warranty covered parts. To the extent practicable, Purchaser will allow Contractor or its designated representative to perform repair work. At its discretion, Purchaser may perform such repair work if it determines it needs to do so based on transit service or other requirements. Contractor shall reimburse Purchaser for any warranty-covered repair work it performs.

40.2.2 Repairs by the Contractor.

Purchaser shall notify Contractor's designated representative within thirty (30) days if Purchaser detects a defect within the warranty periods defined in this Master Contract or the applicable Purchaser Order. Contractor or its designated representative shall, if requested, begin repair work on warranty-covered repairs or have an agreed action plan with the Purchaser within five (5) calendar days after receiving notification of a defect

from Purchaser. Purchaser will make the bus available to complete repairs timely with the Contractor's repair schedule.

Contractor shall provide at its own expense all spare parts, tools, and space required to complete repairs. At Purchaser's option, Contractor may be required to remove the bus from Purchaser's property while repairs are made. If the bus is removed from Purchaser's property, then repair procedures must be diligently pursued by Contractor's representative.

40.2.3 Repairs by Purchaser: Parts Used.

If Purchaser performs the warranty-covered repairs, then it must correct or repair the defect and any related defects utilizing parts supplied by Contractor specifically for this repair. At its discretion, Purchaser may use Contractor-specified parts available from its own stock if deemed in its best interests.

40.2.4 Repairs by Purchaser: Contractor-Supplied Parts.

Purchaser may require that Contractor supply parts for warranty-covered repairs being performed by Purchaser. Those parts may be remanufactured but must have the same form, fit and function, and warranty. The parts will be shipped prepaid to Purchaser from any source selected by Contractor within fourteen (14) days of receipt of the request for said parts and shall not be subject to a handling charge.

40.2.5 Defective Component Return.

Contractor may request that parts covered by the warranty be returned to the manufacturing plant. Contractor will pay the freight costs for this action. Materials should be returned in accordance with the procedures outlined in "Warranty Processing Procedures."

40.2.6 Failure Analysis.

Upon specific request of Purchaser, Contractor will provide a failure analysis of Fleet Defect or safety-related parts, or major components, removed from buses under the terms of the warranty that could affect fleet operation. Such reports will be delivered within 60 days of the receipt of failed parts.

40.2.7 Reimbursement for Labor and Other Related Costs.

Contractor shall reimburse Purchaser for repair labor. The amount is determined by Purchaser for a qualified mechanic at a straight time wage rate per hour, which includes fringe benefits and overhead adjusted for Purchaser's most recently published rate in effect at the time the repair work is performed, plus the cost of towing the bus if such action was necessary and if the bus was in the normal service area. These wage and fringe benefit rates shall not exceed the rates in effect in Purchaser's service garage at the time the defect correction is made.

40.2.8 Reimbursement for Parts.

Contractor shall reimburse Purchaser for defective parts and for parts that must be replaced to correct the defect. The reimbursement will be at the current price at the

time of repair and include taxes where applicable, plus fifteen (15) percent handling costs. Handling costs will not be paid if parts are supplied by Contractor and shipped to Purchaser.

40.2.9 Reimbursement Requirements.

Contractor shall respond to the warranty claim with an accept/reject decision including necessary failure analysis no later than sixty (60) days after Purchaser submits the claim and defective part(s), when requested. Reimbursement for all accepted claims shall occur no later than sixty (60) days from the date of acceptance of a valid claim. Purchaser may dispute rejected claims or claims for which Contractor did not reimburse the full amount. Contractor and Purchaser will review disputed warranty claims during the following quarter to reach an equitable decision to permit the disputed claim to be resolved and closed. Contractor and Purchaser will review all claims at least once per quarter throughout the entire warranty period to ensure that open claims are being tracked and properly dispositioned.

40.2.10 Warranty after Replacement/Repairs.

If any component, unit, or subsystem is repaired, rebuilt, or replaced by Contractor or by Purchaser with the concurrence of Contractor, then the component, unit, or subsystem will have the unexpired warranty period of the original. Repairs will not be warranted if Contractor-provided or authorized parts are not used for the repair, unless Contractor has failed to respond within five days, in accordance with Section 13.2 Repairs by the Contractor.

If an item is declared to be a Fleet Defect, then the warranty stops with the declaration of the Fleet Defect. Once the Fleet Defect is corrected, the items shall have three (3) months or the remaining time and/or miles of the original warranty, whichever is greater. This remaining warranty period will begin on the repair/replacement date for corrected items on each bus if the repairs are completed by Contractor or on the date Contractor provides all parts to Purchaser if repairs are completed by Purchaser.

40.2.11 Warranty Processing Procedures.

The following list represents information required by Contractor from the Purchaser for processing warranty claims. One failure per bus per claim is allowed.

- bus number and VIN
- total vehicle life mileage at time of repair
- date of failure/repair
- acceptance/in-service date
- Contractor part number and description
- component serial number
- description of failure

- all costs associated with each failure/repair (invoices may be required for third-party costs):
  - towing
  - road calls
  - labor
  - materials
  - parts
  - handling
  - troubleshooting time

The Purchaser's forms will be accepted by Contractor if all of the above information is included. Electronic submittal may be used if available between Contractor and Purchaser.

40.2.12 Return of Parts.

When returning defective parts to Contractor, Purchaser will tag each part with the following:

- bus number and VIN
- claim number
- part number
- serial number (if available)

40.2.13 Timeframe.

Each claim must be submitted no more than thirty (30) days from the date of failure and/or repair, whichever is later. All defective parts must be returned to the Contractor, when requested, no more than forty-five (45) days from the date of repair.

40.3 Quality Assurance

40.3.1 Quality Assurance Organization Establishment.

Contractor shall establish and maintain an effective in-plant quality assurance organization.

40.3.2 Quality Control.

The quality assurance organization shall exercise quality control over all phases of production, from initiation of design through manufacture and preparation for delivery. The organization shall also control the quality of supplied articles.

40.3.3 Authority and Responsibility.

The quality assurance organization shall have the authority and responsibility for reliability, quality control, inspection planning, establishment of the quality control

system, and acceptance/rejection of materials and manufactured articles in the production of the transit buses.

40.3.4 Minimum Functions.

The quality assurance organization shall include the following minimum functions:

- Work instructions: The quality assurance organization shall verify inspection operation instructions to ascertain that the manufactured product meets all prescribed requirements.
- Records maintenance: The quality assurance organization shall maintain and use records and data essential to the effective operation of its program. These records and data shall be available for review by the resident inspectors. Inspection and test records for this procurement shall be available for a minimum of one year after inspections and tests are completed.
- Corrective action: The quality assurance organization shall detect and promptly ensure correction of any conditions that may result in the production of defective transit buses. These conditions may occur in designs, purchases, manufacture, tests or operations that culminate in defective supplies, services, facilities, technical data or standards.

40.3.5 Basic Standards and Facilities.

The following standards and facilities shall be basic in the quality assurance process:

- Configuration control: Contractor shall maintain drawings, assembly procedures and other documentation that completely describe a qualified bus that meets all of the options and special requirements of each Purchase Order. The quality assurance organization shall verify that each transit bus is manufactured in accordance with these controlled drawings, procedures and documentation.
- Measuring and testing facilities: Contractor shall provide and maintain the necessary gauges and other measuring and testing devices for use by the quality assurance organization to verify that the buses conform to all specification requirements. These devices shall be calibrated at established periods against certified measurement standards that have known, valid relationships to national standards.
- Production tooling as media of inspection: When production jigs, fixtures, tooling masters, templates, patterns and other devices are used as media of inspection, they shall be proved for accuracy at formally established intervals and adjusted, replaced or repaired as required to maintain quality.
- Equipment use by resident inspectors: Contractor's gauges and other measuring and testing devices shall be made available for use by the resident inspectors to verify that the buses conform to all specification requirements. If necessary, the

Contractor's personnel shall be made available to operate the devices and to verify their condition and accuracy.

40.3.6 Maintenance of Control.

Contractor shall maintain quality control of purchases:

- Supplier control: Contractor shall require each supplier to maintain a quality control program for the services and supplies that it provides. Contractor's quality assurance organization shall inspect and test materials provided by suppliers for conformance to specification requirements. Materials that have been inspected, tested and approved shall be identified as acceptable to the point of use in the manufacturing or assembly processes. Controls shall be established to prevent inadvertent use of nonconforming materials.
- Purchasing data: Contractor shall verify that all applicable specification requirements are properly included or referenced in purchase orders of articles to be used on transit buses.

40.3.7 Manufacturing Control.

Contractor shall maintain quality control of production:

- Controlled conditions: Contractor shall ensure that all basic production operations, as well as all other processing and fabricating, are performed under controlled conditions. Establishment of these controlled conditions shall be based on the documented work instructions, adequate production equipment and special working environments if necessary.
- Completed items: A system for final inspection and test of completed transit buses shall be provided by the quality assurance organization. It shall measure the overall quality of each completed bus.
- Nonconforming materials: The quality assurance organization shall monitor the Contractor's system for controlling nonconforming materials. The system shall include procedures for identification, segregation and disposition.
- Statistical techniques: Statistical analysis, tests and other quality control procedures may be used when appropriate in the quality assurance processes.
- Inspection status: A system shall be maintained by the quality assurance organization for identifying the inspection status of components and completed transit buses. Identification may include cards, tags or other normal quality control devices.

40.3.8 Inspection System.

The quality assurance organization shall establish, maintain and periodically audit a fully documented inspection system. The system shall prescribe inspection and test of

materials, Work in process and completed articles. As a minimum, it shall include the following controls:

- Inspection personnel: Sufficient trained inspectors shall be used to ensure that all materials, components and assemblies are inspected for conformance with the qualified bus design.

- Inspection records: Acceptance, rework or rejection identification shall be attached to inspected articles. Articles that have been accepted as a result of approved materials review actions shall be identified. Articles that have been reworked to specified drawing configurations shall not require special identification. Articles rejected as unsuitable or scrap shall be plainly marked and controlled to prevent installation on the bus. Articles that become obsolete as a result of engineering changes or other actions shall be controlled to prevent unauthorized assembly or installation. Unusable articles shall be isolated and then scrapped. Discrepancies noted by the Contractor or resident inspectors during assembly shall be entered by the inspection personnel on a record that accompanies the major component, subassembly, assembly or bus from start of assembly through final inspection. Actions shall be taken to correct discrepancies or deficiencies in the manufacturing processes, procedures or other conditions that cause articles to be in nonconformity with the requirements of the Contract specifications. The inspection personnel shall verify the corrective actions and mark the discrepancy record. If discrepancies cannot be corrected by replacing the nonconforming materials, then the Purchaser shall approve the modification, repair or method of correction to the extent that the Contract specifications are affected.

- Quality assurance audits: The quality assurance organization shall establish and maintain a quality control audit program. Records of this program shall be subject to review by the Purchaser.

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Agreement

Appendix A, Item A3

Price Sheet Effective 07/19/24

Heavy Pricing by Sub-Category

note: does not include the software and diagnostic cables from specification 31.1 (diagnotic software is included in the option sheets)

Length	Propulsion	Base Price	6/1/22 Price Change	4/1/23 Price Change	7/19/24 Price Change	Initial Training	Prompt Payment Discount	w/n X days
30 ft	Diesel	N/A		$ -		N/A	N/A	N/A
30 ft	CNG	N/A		$ -		N/A	N/A	N/A
30 ft	Hybrid	N/A		$ -		N/A	N/A	N/A
30 ft	Electric	N/A		$ -		N/A	N/A	N/A
30 ft	Fuel Cell	N/A		$ -		N/A	N/A	N/A
				$ -				
35 ft	Diesel	$ 429,990.00	$ 480,642.82	$ 552,739.25	$ 592,260.10	Refer Training Pricin	$ (1,728.00)	10
35 ft	CNG	$ 484,990.00	$ 542,121.82	$ 623,440.10	$ 668,016.06	Refer Training Pricin	$ (1,912.00)	10
35 ft	Hybrid (Allison)	$ 588,990.00	$ 658,373.02	$ 757,128.98	$ 811,263.70	Refer Training Pricin	$ (2,384.00)	10
35 ft	Electric (430kWh)	$ 794,990.00	$ 888,639.82	$ 1,021,935.80	$ 1,021,935.80	Refer Training Pricin	$ (3,219.00)	10
35 ft	Fuel Cell	N/A		$ -	$ -	N/A	N/A	N/A
35 ft	Hybrid (BAE)	$ 591,990.00	$ 661,726.42	$ 760,985.39	$ 815,395.84	Refer Training Pricin	$ (2,384.00)	10
40 ft	Diesel	$ 434,990.00	$ 486,231.82	$ 559,166.60	$ 599,147.01	Refer Training Pricin	$ (1,749.00)	10
40 ft	CNG	$ 489,990.00	$ 547,710.82	$ 629,867.45	$ 674,902.97	Refer Training Pricin	$ (1,933.00)	10
40 ft	Hybrid (Allison)	$ 593,990.00	$ 663,962.02	$ 763,556.33	$ 818,150.60	Refer Training Pricin	$ (2,405.00)	10
40 ft	Electric (430kWh)	$ 804,990.00	$ 899,817.82	$ 1,034,790.50	$ 1,034,790.50	Refer Training Pricin	$ (3,260.00)	10
40 ft	Fuel Cell	$ 1,086,990.00	$ 1,215,037.42	$ 1,397,293.04	$ 1,397,293.04	Refer Training Pricin	$ (4,233.00)	10
40 ft	Hybrid (BAE)	$ 596,990.00	$ 667,315.42	$ 767,412.74	$ 822,282.75	Refer Training Pricin	$ (2,405.00)	10
45 ft	Diesel	N/A		$ -	$ -	N/A	N/A	N/A
45 ft	CNG	N/A		$ -	$ -	N/A	N/A	N/A
45 ft	Hybrid	N/A		$ -	$ -	N/A	N/A	N/A
45 ft	Electric	N/A		$ -	$ -	N/A	N/A	N/A
45 ft	Fuel Cell	N/A		$ -	$ -	N/A	N/A	N/A
				$ -	$ -			
60 ft	Diesel	$ 669,990.00	$ 748,914.82	$ 861,252.05	$ 922,831.57	Refer Training Pricin	$ (2,719.00)	10
60 ft	CNG	$ 811,990.00	$ 907,642.42	$ 1,043,788.79	$ 1,118,420	Refer Training Pricin	$ (2,927.00)	10
60 ft	Hybrid (Allison)	$ 894,990.00	$ 1,000,419.82	$ 1,150,482.80	-	Refer Training Pricin	$ (3,613.00)	10
60 ft	Electric (520kWh)	$ 1,224,990.00	$ 1,369,293.82	$ 1,574,687.90	$ 1,687,278.08	Refer Training Pricin	$ (4,969.00)	10
60 ft	Fuel Cell	$ 1,499,990.00	$ 1,676,688.82	$ 1,928,192.15	$ 2,066,057.88	Refer Training Pricin	$ (5,843.00)	10
60 ft	Hybrid (BAE)	$ 914,990.00	$ 1,022,775.82	$ 1,176,192.20	-	Refer Training Pricin	$ (3,613.00)	10

Delivery Costs by Sub-Category

Delivery/Freight Charge	One-Way delivery cost (per mile)	Example Cost to Olympia, WA
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
Included	Included	Included
Included	Included	Included
Included	Included	Included
Included	Included	Included
N/A	N/A	N/A
Included	Included	Included
Included	Included	Included
Included	Included	Included
Included	Included	Included
Included	Included	Included
Included	Included	Included
Included	Included	Included
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
Included	Included	Included
Included	Included	Included
Included	Included	Included
Included	Included	Included
Included	Included	Included

Parts

General Parts List
Engine
Transmission
Electrical
HVAC
etc
etc

NFI Parts will provide a first-bus Recommended Stocking List (RSL) during customer's first-bus delivery.
This RSL parts listing will include part number, item description, stocking status, lead time and 30-day pricing information
which will assist the customer in stocking parts that will support both the customer's regular and preventive bus maintenance programs.
This abbreviated list is compiled using the actual bus build information that is available in the customers bus production Bill of Material (BOM)
NFI Parts will also provide the customer with a more inclusive Parts Provisioning List following last-bus delivery.
This listing will be compiled using further part assembly breakdown information identified in the customers
Parts manual and will assist in stocking additional parts that further support new bus operations and maintenance over the next 2-3 years.

Volume Discount

# of buses ordered	Discount offered
1-4 each	0
5-9 each	-1500
>10 each	-3000

Heavy Duty - 40 Foot
Options Price Sheet

Category	Item #	Description	Diesel	CNG	Hybrid	Electric	Fuel Cell	Price	6/1/122 Price Change	4/1/23 Price	June 2023 Revised Price	7/19/24 Price
Body BRT STYLING										$ -		$ -
Body – BRT STYLING	1	Standard Styling Package 40 35 passenger seats	Inc In Base	Inc In Base	Inc In Base	Inc In Base	Inc In Base	$ -		$ -	$ -	$ -
Body – BRT STYLING	2	BRT Exterior Styling Package (Front & Rear) with One Piece Windshield	N/A	N/A	N/A	N/A	N/A			$ -	N/A	N/A
Body – BRT STYLING	3	BRT Roof Fairings Front and Rear	Option	Inc In Base	Inc In Base	Inc In Base	Inc In Base	$ 2,035.00	$ 2,274.72	$ 2,615.93	$ 2,615.63	$ 2,802.65
Body – BRT STYLING	4	Curbside A Post Skid Plate	Inc in Base	Inc in Base	Inc in Base	Inc in Base	Inc in Base	$ -	$ -	$ -	$ -	$ -
BODY - PASSENGER SEATS									$ -	$ -	$ -	$ -
BODY - PASSENGER SEATS	1	35 Passenger Seating	Inc In Base	Inc In Base	Inc In Base	Inc In Base	Inc In Base	$ 650.00	$ 726.5700	$ 835.56	$ -	$ -
BODY - PASSENGER SEATS	2	ADD additional double flip seat in lieu of fixed seat	Option	Option	Option	Option	Option	$ 1,749.00	$ 1,955.03	$ 2,248.29	$ 2,248.29	$ 2,409.04
BODY - PASSENGER SEATS	3	Delete one set of fixed seats	Option	Option	Option	Option	Option	$ (624.00)	$ (697.5072)	$ (802.13)	$ (785.00)	$ (785.00)
BODY - PASSENGER SEATS	4	remove individual seat	N/A	N/A	N/A	N/A	N/A		$ -	$ -	N/A	N/A
Engine												
Engine	1	Cummins ISL-G 320 HP	N/A	N/A	N/A	N/A	N/A		$ -	$ -	N/A	N/A
Engine	2	Cummins ISX-G 12 400 HP	N/A	N/A	N/A	N/A	N/A		$ -	$ -	N/A	N/A
Engine	3	Cummins ISL 9 280 HP	Inc in Base	N/A	N/A	N/A	N/A		$ -	$ -	N/A	N/A
Engine	4	Cummins ISL 9 330 HP	N/A	N/A	N/A	N/A	N/A		$ -	$ -	N/A	N/A
Engine	5	Cummins ISB 6.7 280 HP	N/A	N/A	Inc in Base	N/A	N/A		$ -	$ -	N/A	N/A
Exhaust												$ -
Exhaust	1	none							$ -	$ -		$ -
Exhaust	2	Diesel Particulate Filter (Active)	Inc in Base	Inc in Base	Inc in Base	N/A	N/A	0	$ -	$ -	$ -	$ -
Exhaust	3	none							$ -	$ -		$ -
Exhaust	4	Diesel Particulate Filter (Active)	Inc in Base	Inc in Base	Inc in Base	N/A	N/A	0	$ -	$ -	$ -	$ -
Exhaust	5	none							$ -	$ -		$ -
Exhaust	6	Electric	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Exhaust	7	Not Available							$ -	$ -		$ -
Fuel												$ -
Fuel	1	Fuel Gauge on Dash	Inc in Base	Inc in Base	Inc in Base	Inc in Base	Option	$ 2,102.00	$ 2,349.62	$ 2,702.06	$ 2,702.06	$ 2,895.26
Fuel	2	NGV2-3 Type 3 Complete CNG Cylinder (Vendor will list GGE)	Not Available	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fuel	3	NGV 2-4 Type 4 Complete CNG Cylinder (Vendor will list GGE)	Not Available	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fuel	4	Hexagon Lincoln's TUFFSHELL Roof Mount Package	Inc in Base	Inc in Base	N/A	N/A	Inc in Base	N/A	N/A	N/A	$ -	$ -
Fuel	5	EMCO - WHEATON Posi/Lock 105 (Flip Cap ~~and Twist Cap~~)	Inc in Base	N/A	Inc in Base	N/A	N/A	$ -	$ -	$ -	$ -	$ -
Fuel	6	EMCO - Posi/Lock Blue Urea Dispensing System	Option	N/A	Option	N/A	N/A	$ -	$ -	$ -	$ 410.21	$ 439.54
Fuel	7	Standard Gravity Fill	Option	N/A	Option	N/A	N/A	$ -	$ -	$ -	$ -	$ -
Fuel	8	Fuel Gauge on Dash	Inc in Base	Inc in Base	Inc in Base	Inc in Base	Option	$ -	$ -	$ -	$ 2,702.06	$ 2,895.26
Fuel	9	Dual Fill (Curbside and Streetside) w/Standard Gravity Fill	Not Available	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fuel	10	80 Gallon Net Useable Split Fuel Tanks	Not Available	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fuel	11	EMCO - WHEATON Posi/Lock 105 (~~Flip Cap and~~ Twist Cap)	Option	N/A	Option	N/A	N/A	$ -	$ -	$ -	$ 90.75	$ 97.24
Fuel	12	EMCO - Posi/Lock Blue Urea Dispensing System	Option	N/A	Option	N/A	N/A	$ 711.86	$ 795.7171	$ 915.07	$ 410.21	$ 439.54
Fuel	13	Standard Gravity Fill	Option	N/A	Option	N/A	N/A	$ 10.00	$ 11.18	$ 12.85	$ -	$ -
Fuel	14	Fuel Gauge on Dash	Inc in Base	Inc in Base	Inc in Base	Inc in Base	Option	$ -	$ -	$ -	$ 2,702.06	$ 2,895.26
Fuel	15	Dual Fill (Curbside and Streetside) w/Standard Gravity Fill	Not Available	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fuel	16	80 Gallon Net Useable Split Fuel Tanks for ADA Each Side	Not Available	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fuel Filter												$ -
Fuel Filter	1	Low Fuel Alarm	rogramming On	rogramming On	Programming Only	Programming Only	rogramming On	$ -	$ -	$ -	$ -	$ -
Fuel Filter	2	Low Fuel Alarm	rogramming On	rogramming On	Programming Only	Programming Only	rogramming On	$ -	$ -	$ -	$ -	$ -
Fuel Filter	3	Spin on Primary and Secondary Fuel Filters	Inc in Base	N/A	Inc in Base	N/A	N/A	$ -	$ -	$ -	$ -	$ -
Fuel Filter	4	Davco Fuel Pro 384, Heated	Option	N/A	Option	N/A	N/A	$ 419.21	$ 468.59	$ 538.88	$ 561.33	$ 601.47
Fuel Filter	5	Racor 490R30 Filter W/Thumbpump	N/A	N/A	N/A	N/A	N/A	$ 338.54	$ 378.4200	$ 435.18	N/A	N/A
Fuel Filter	6	Low Fuel Alarm	rogramming On	rogramming On	Programming Only	Programming Only	rogramming On	$ -	$ -	$ -	$ -	$ -
Fuel Filter	7	Spin on Primary and Secondary Fuel Filters	Inc in Base	N/A	Inc in Base	N/A	N/A	$ -	$ -	$ -	$ -	$ -
Fuel Filter	8	Davco Fuel Pro 384, Heated	Option	N/A	Option	N/A	N/A	$ 419.21	$ 468.59	$ 538.88	$ 561.33	$ 601.47
Fuel Filter	9	Racor 490R30 Filter W/Thumbpump	Option	N/A	Option	N/A	N/A	$ 338.54	$ 378.4200	$ 435.18	N/A	N/A
Hybrid												$ -
Hybrid	1	none							$ -	$ -		$ -
Hybrid	2	none							$ -	$ -		$ -
Hybrid	3	Auxiliary Coolant Heater	Inc in Base	Inc in Base	Inc in Base	Inc in Base	Inc in Base	$ -	$ -	$ -	$ -	$ -
Hybrid	4	Allison EP40 Electric Drive System	Inc in Base	N/A	Obsolete	N/A	N/A	$ -	$ -	$ -	$ -	$ -
Hybrid	5	Allison EP50 Electric Drive System	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hybrid	6	BAE Hybrid System HDS 200 - APS1-01K (1Kwh Battery w/Ultracaps)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hybrid	7	BAE Hybrid System HDS200 - APS3-32K (32KwH Battery)	N/A	N/A	Obsolete	N/A	N/A	$ 19,250.00	$ 21,517.6500	$ 24,745.30	N/A	N/A
Hybrid	8	BAE Hybrid System HDS300 - APS1-01K (1Kwh Battery w/Ultracaps)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hybrid	9	BAE Hybrid System HDS300 - APS3-32K (32KwH Battery)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hybrid	10	BAE HDS200 - MAPS-SDM3A	N/A	N/A	Inc in Base	N/A	N/A	N/A		$ -	$ -	$ -
Hybrid	10	Mandatory Option for BAE Hybrid Purchases: EPA and Electric Accessories Change	N/A	N/A	REQUIRED for BAE Hybrid	N/A	N/A	N/A	N/A	N/A	$ 67,143.35	$ 71,944.10
Hybrid	11	Allison eGen Flex 40	N/A	N/A	Inc in Base	N/A	N/A	N/A		$ -	$ -	$ -
Hybrid	11	Mandatory Option for Allison Hybrid Purchases: EPA and Electric Accessories Change	N/A	N/A	REQUIRED for Allison Hybrid	N/A	N/A	N/A	N/A	N/A	$ 78,273.64	$ 83,870.21
Passenger Seat Options												$ -
Passenger Seat Options	1	35 Passenger Seating - Citiseat	Option	Option	Option	Option	Option	$ (1,639.00)	$ (1,832.0742)	$ (2,106.89)	Quote	Quote
Passenger Seat Options	2	AMSECO - 6468	N/A	N/A	N/A	N/A	N/A	Discontinued	N/A	N/A	N/A	N/A
Passenger Seat Options	3	AMSECO - Insight	Inc in Base	Inc in Base	Inc in Base	Inc in Base	Inc in Base	$ -	$ -	$ -	$ -	$ -
Passenger Seat Options	4	AMSECO - Metropolitan	N/A	N/A	N/A	N/A	N/A	Discontinued	N/A	N/A	N/A	N/A
Passenger Seat Options	5	AMSECO - 6466	Option	Option	Option	Option	Option	$7,611.50	$ 8,508.1347	$ 9,784.35	Quote	Quote
Passenger Seat Options	6	AMSECO - 6566	Option	Option	Option	Option	Option	$15,417.65	$ 17,233.85	$ 19,818.93	Quote	Quote
Passenger Seat Options	7	AMSECO - 2005/6466 Suburbans	Option	Option	Option	Option	Option	$8,688.05	$ 9,711.5023	$ 11,168.23	Quote	Quote
Passenger Seat Options	8	AMSECO Vision	Option	Option	Option	Option	Option	$4,533.26	$ 5,067.28	$ 5,827.37	Quote	Quote
Passenger Seat Options	9	AMSECO - Innovator 850	N/A	N/A	N/A	N/A	N/A	Discontinued	N/A	N/A	N/A	N/A
Passenger Seat Options	10	AMSECO - Premier	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Passenger Seat Options	11	AMSECO - 2000 Series Recliners	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Passenger Seat Options	12	AMSECO - VRS0 Seat Inserts	Inc in Base	Inc in Base	Inc in Base	Inc in Base	Inc in Base	$ -	$ -	$ -	$ -	$ -
Passenger Seat Options	13	AMSECO - CRS0 Seat Inserts	Option	Option	Option	Option	Option	$2,380.17	$ 2,660.5540	$ 3,059.64	Quote	Quote
Passenger Seat Options	14	4 One - Angel	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Passenger Seat Options	15	4 One Aries	Option	Option	Option	Option	Option	$ 4,709.11	$ 5,263.8443	$ 6,053.42	Quote	Quote
Passenger Seat Options	16	4 One Brasil	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Passenger Seat Options	17	4 One - Citiseat	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Passenger Seat Options	18	4 One - Citipro	Option	Option	Option	Option	Option	$ 2,676.47	$ 2,991.76	$ 3,440.53	Quote	Quote
Passenger Seat Options	19	4 One - Diablo	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Passenger Seat Options	20	4 One - Patriot	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Passenger Seat Options	21	4 One Gemini Seating	Option	Option	Option	Option	Option	$ (2,109.19)	$ (2,357.6548)	$ (2,711.30)	Quote	Quote
Passenger Seat Options	22	4 One Torino G	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Passenger Seat Options	23	Kiel Ideo	Option	Option	Option	Option	Option	$ 464.41	$ 519.1139	$ 596.98	Quote	Quote
Passenger Seat Options	24	Kiel Esos	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Passenger Seat Options	25	Add (3) Passenger Seats to Curbside Wheelwell (Insight)	Option	Option	Option	Option	Option	$ 1,168.75	$ 1,306.4288	$ 1,502.39	$ 1,502.39	$ 1,609.81
Passenger Seat Options	26	Add (2) Passenger Seats to Curbside Wheelwell (Insight)	Option	Option	Option	Option	Option	$ 829.13	$ 926.80	$ 1,065.82	$ 1,065.82	$ 1,142.03
Passenger Seat Options	27	Hinged Rear Settee	Option	Option	Option	Option	Option	$ 420.75	$ 470.3144	$ 540.86	$ 540.86	$ 579.53
Passenger Seat Options	28	110 v outlets with USB charging throughout seating layout	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Passenger Seat Options	29	Dual USB charging station throughout seating layout	Option	Option	Option	Option	Option	$ 2,250.88	$ 2,516.0281	$ 2,893.43	Quote	Quote
Passenger Seat Options	30	Cup holders for each seat	N/A	N/A	N/A	N/A	N/A	$ -		$ -	N/A	N/A
Passenger Seat Options	31	Self-storing footrests for each seat	N/A	N/A	N/A	N/A	N/A	$ -		$ -	N/A	N/A
Passenger Seat Options	32	Expanding mesh magazine holder on seat back	N/A	N/A	N/A	N/A	N/A	$ -		$ -	N/A	N/A
Passenger Seat Options	33	Three (3) point passenger restraint belts for each seat	N/A	N/A	N/A	N/A	N/A	N/A		$ -	N/A	N/A
Trolley Styling Package										$ -		
Trolley Styling Package	1	Classic San Francisco	N/A	N/A	N/A	N/A	N/A			$ -	N/A	N/A
Trolley Styling Package	1.1	Wood Seats	N/A	N/A	N/A	N/A	N/A			$ -	N/A	N/A
Trolley Styling Package	1.2	Wood Trimmed Drivers Barrier	N/A	N/A	N/A	N/A	N/A			$ -	N/A	N/A
Trolley Styling Package	1.3	Wood Trimmed Electrical Box	N/A	N/A	N/A	N/A	N/A			$ -	N/A	N/A
Trolley Styling Package	1.4	Brass Powder coated Stanchions & Grab Rails	N/A	N/A	N/A	N/A	N/A			$ -	N/A	N/A
Trolley Styling Package	2	Add Vinyl Seat Cushions	N/A	N/A	N/A	N/A	N/A			$ -	N/A	N/A
Trolley Styling Package	3	Add Cow Catcher	N/A	N/A	N/A	N/A	N/A			$ -	N/A	N/A
Trolley Styling Package	4	Add Rope lights	N/A	N/A	N/A	N/A	N/A			$ -	N/A	N/A
Trolley Styling Package	5	Add Vintage Style Graphics Package	N/A	N/A	N/A	N/A	N/A			$ -	N/A	N/A
Trolley Styling Package	6	Add for Hybrid Roof Compatibility	N/A	N/A	N/A	N/A	N/A			$ -	N/A	N/A
Trolley Styling Package	7	2 Color Custom Paint for Trolley	N/A	N/A	N/A	N/A	N/A			$ -	N/A	N/A
Trolley Styling Package	8	Brown Leather Overhead Grab Straps - Each	N/A	N/A	N/A	N/A	N/A			$ -	N/A	N/A

All options listed below are the same for each bus length worksheet.

Category	Item #	Description	Designation	Propulsion (if applicable)	Price	6/1/22 Price Change	4/1/23 Price Change	June 2023 Revised Price	7/19/24 Price
Air							$ -		$ -
Air	1	Shop Air Connection (Milton 5790)	Option		$ 5.33	$ 5.96	$ 6.85	$ 48.74	$ 52.22
Air	2	Bendix AD9, (300 ci Purge)	Option		$ 36.10	$ 40.35	$ 46.41	$ 61.91	$ 66.34
Air	3	Bendix Adip, Heated	Option		$ 441.00	$ 492.95	$ 566.89	$ 566.89	$ 607.42
Air	4	Bendix Puraguard Air/Oil Separator	Option		N/A	N/A	N/A	N/A	N/A
Air	5	Wabco SS 1800 Air Dryer, Heated	Option		N/A	N/A	N/A	N/A	N/A
Air	6	Chicago Rawhide T2000	Option		N/A	N/A	N/A	N/A	N/A
Air	7	Chicago Rawhide Dual Turbo 2000	Option		N/A	N/A	N/A	N/A	N/A
Air	8	Graham White QBA 15 "Sludge Buster", Heated	Option				$ -	N/A	N/A
Air	8	Graham white sludgebreaker QBA 15NX5 with 24 v heater	Option		$ 418.71	$ 468.03	$ 538.24	$ 538.24	$ 576.72
Air	9	Kingston Auto Drain Valve At Ping Tank	Discontinued		$ 198.37	$ 221.74	$ 255.00	N/A	N/A
Air	10	Terminate Kneeling Operation Sensor	Inc In Base		N/A	N/A	N/A	$ -	$ -
Air	11	Wabco 37.4 cfm twin cylinder air compressor (ISB 6.7 engine only)	Not Available		N/A	N/A	N/A	N/A	N/A
		Other Option - Specify			N/A	N/A	N/A	N/A	N/A

Category	Item #	Description	Designation	Propulsion (if applicable)	Price	6/1/22 Price Change	4/1/23 Price Change	June 2023 Revised Price	7/19/24 Price
Body- Bike Rack						$ -	$ -		$ -
Body – Bike Rack	1	Sportworks Apex 3 - 3 Position Bike, Stainless Steel	Option		$ 1,937.88	$ 2,166.16	$ 2,491.09	$ 2,491.09	$ 2,669.20
Body – Bike Rack	2	Sportworks - 2 Position Bike, Black Powder Coated (DL2-NP)	Option		$ 1,214.89	$ 1,358.00	$ 1,561.70	$ 1,561.70	$ 1,673.36
Body – Bike Rack	3	Sportworks - 2 Position Bike, Stainless Steel (DL2-NP)	Option		$ 1,491.54	$ 1,667.24	$ 1,917.33	$ 1,677.00	$ 1,796.91
Body – Bike Rack	4	Sportworks - 3 Position Bike, Black Powder Coated	Option		$ 2,590.79	$ 2,895.99	$ 3,330.38	$ 2,580.56	$ 2,765.07
Body – Bike Rack	5	Sportworks - Trilogy 3 Position Bike, Stainless Steel	Option		$ 2,427.26	$ 2,713.19	$ 3,120.17	$ 2,517.95	$ 2,697.98
Body – Bike Rack	6	Midwest Bus - BYK RYK (Stainless Steel)	Option		N/A	N/A	N/A	N/A	N/A
Body – Bike Rack	7	Bike Rack Deployed Lamp on Dash	Option		$ -	$ -	$ -	$ -	$ -
Body – Bike Rack	8	Bike Rack ~~5"~~ 6" Spot Mirror	Option		$ 70.03	$ 78.28	$ 90.02	$ 48.36	$ 51.82
Body – Bike Rack	9	Bike Rack Mounted Advertising Frame, 14"X 44"	Option		N/A	N/A	N/A	$ 332.89	$ 356.69
Body – Bike Rack	10	Velo Porter - 2 Position Bike, Stainless Steel	Option				$ -	$ 1,500.18	$ 1,607.44
Body – Bike Rack	11	Velo Porter - 3 Position Bike, Stainless Steel	Option				$ -	$ 2,335.91	$ 2,502.93
Body – Bike Rack	12	Mounting Brackets Only	Option				$ -	$ 543.22	$ 582.06
Body – Bike Rack	13	Byk Rak - 2 Position Bike, Stainless Steel, Front Mounted	Option				$ -	$ 1,964.48	$ 2,104.94
Body – Bike Rack	14	Byk Rak - 3 Position Bike, Stainless Steel, Front Mounted	Option				$ -	$ 2,003.69	$ 2,146.95
Body – Bike Rack	15	Sportworks DL2 (DL2-WP, Black Powdercoated)	Option				$ -	$ 1,628.14	$ 1,744.55
Body – Bike Rack	16	Sportworks DL2 (DL2-WP, SST)	Option				$ -	$ 1,624.05	$ 1,740.17
		Other Option - Specify			N/A	N/A	N/A		$ -
Body - Driver's Barrier						$ -	$ -		$ -
Body – Driver's Barrier	1	Wrap Around Fiberglass with Schedule Rack Cutouts	Inc In Base		$ -	$ -	$ -	$ -	$ -
Body – Driver's Barrier	2	Wrap Around Fiberglass W/O Schedule Rack Cutouts	Option		$ (138.47)	$ (154.78)	$ (178.00)	$ (178.00)	$ (178.00)
Body – Driver's Barrier	3	Plexiglass Drivers Security Enclosure (Arow Global Driver Protection System)	Option		$ 3,568.81	$ 3,989.22	$ 4,587.60	$ 8,443.04	$ 9,046.72
Body – Driver's Barrier	4	Flat Melamine, Two Piece	Not Available		N/A	N/A	N/A	N/A	N/A
Body – Driver's Barrier	5	Flat Melamine, Two Piece, w/(4) Schedule Holders	Not Available		N/A	N/A	N/A	N/A	N/A
Body – Driver's Barrier	6	Plexiglass Drivers Security Enclosure, two pieces	Option		$ 3,851.06	$ 4,304.71	$ 4,950.42	$ 7,274.58	$ 7,794.71
Body – Driver's Barrier	7	Other Option - Specify (Arow Global Enclousure) MV308 Slide/Stow door components w/ Extended glass	Option		$ 8,033.85	$ 8,980.24	$ 10,327.27	$ 12,262.80	$ 13,139.59
Body – Driver's Barrier	8	Other Option - Specify (Vapor Enclousure) vShield Driver's Barrier	Option		$ 6,744.48	$ 7,538.98	$ 8,669.83	$ 1,836.00	$ 1,967.27
Body - Driver'Seat						$ -	$ -		$ -
Body – Driver Seat	1	Recaro Ergo Metro w/Fabric Seat and Back w/Gray Fabric Boxing	Option		$ 350.63	$ 391.93	$ 450.72	$ 450.72	$ 482.95
Body – Driver Seat	2	Recaro MCII	Option		$ 1,093.13	$ 1,221.90	$ 1,405.19	$ 1,134.38	$ 1,215.49
Body – Driver Seat	3	USSC 9100 ALX w/Fabric Seat and Back w/Gray Fabric Boxing	Option		$ (52.00)	$ (58.13)	$ (66.84)	$ 261.59	$ 280.29
Body – Driver Seat	4	USSC 9100 ALX - 3 w/Fabric Seat and Back w/Gray Fabric Boxing	Option		$ 231.00	$ 258.21	$ 296.94	$ 551.99	$ 591.46
Body – Driver Seat	5	Add Headrest (Recaro Driver Seat)	Option		$ -	$ -	$ -	$ -	$ -
Body – Driver Seat	6	Add Armrest (Right Side only) (USSC)	Option		$ 185.63	$ 207.50	$ 238.62	$ 60.50	$ 64.83
Body – Driver Seat	7	Add Shoulder Belt (USSC)	Option		$ 288.75	$ 322.76	$ 371.18	$ 181.50	$ 194.48
Body – Driver Seat	8	Add 3 -Point, Horizontally Adjustable D - Loop (USSC)	Option		$ 563.75	$ 630.16	$ 724.68	$ 240.63	$ 257.84
Body – Driver Seat	9	Driver's Seat Vacancy Alarm (USSC)	Option		$ 147.13	$ 164.46	$ 189.13	$ 110.00	$ 117.87
Body – Driver Seat	10	Safety Orange Shoulder Belt (USSC ALX)	Option		$ 93.50	$ 104.51	$ 120.19	$ -	$ -
Body – Driver Seat	11	Silicon Foam At Lower Seat Cushion (USSC)	Option		$ 1,457.50	$ 1,629.19	$ 1,873.57	$ 1,113.74	$ 1,193.37
Body – Driver Seat	12	Holdsworth Fabric (USSC)	Option		$ 515.63	$ 576.37	$ 662.83	$ 206.25	$ 221.00
Body – Driver Seat	13	FR Treated Foam (Recaro)	Inc In Base		$ -	$ -	$ -	$ -	$ -
Body – Driver Seat	14	USSC Q90 ALX	Option		$ 343.75	$ 384.24	$ 441.88	$ 551.99	$ 591.46
Body – Driver Seat	15	USSC G2A -2pt Drivers Seat	Option		$ 467.50	$ 522.57	$ 600.96	$ 1,610.74	$ 1,725.91
Body – Driver Seat	16	USSC - Add Headrest	Option		N/A		$ -	$ 52.94	$ 56.73
		Other Option - Specify			N/A	N/A	N/A		$ -
Body - Exit Door						$ -	$ -		$ -
Body – Exit Door	1	Standard Melamine Panels on Lower Section Both Sides of Rear Exit Door	Inc In Base		$ 833.64	$ 931.84	$ 1,071.62	$ -	$ -
Body – Exit Door	2	Upper Clear Plexiglas Modesty Panels Both Sides of Rear Exit Door	Option		$ 1,928.74	$ 2,155.95	$ 2,479.34	$ 630.08	$ 675.13
Body - Exit Door	3	Accelerator Interlock when doors are open	Option		$ -	$ -	$ -	$ -	$ -
	4	Other Option - Road side Exit door			$ 25,000.00	$ 27,945.00	$ 32,136.75	Quote	Quote
Body - Floor Covering						$ -	$ -		
Body – Floor Covering	1	Greenwood ACQ Plywood W/RCA Rubber	Not Available		N/A	N/A	N/A	N/A	N/A
Body – Floor Covering	2	Altro Meta/Chroma Transfloor ~~GH Gerflor Terabus Sirius/Helios~~	Inc In Base		N/A	N/A	N/A	$ -	$ -
	2	Gerflor Terabus Sirius/Helios	Option		N/A		$ -	$ -	$ -
Body – Floor Covering	3	Altro wood safety (vinyl simulated woodgrain)	Option		N/A	N/A	N/A	$ -	$ -
Body – Floor Covering	4	Gerflor Tarabus Gaya Wood (vinyl simulated woodgrain)	Option		$ 379.94	$ 424.70	$ 488.40	Quote	Quote
Body – Floor Covering	5	Composite Sub Floor	Option		$ 3,468.00	$ 3,876.53	$ 4,458.01	$ 2,223.55	$ 2,382.53
Body – Floor Covering	6	Rear Seat Riser for Forward Facing Seats	Inc In Base		$ -	$ -	$ -	$ -	$ -
Body – Floor Covering	7	Front Seat Risersor for Forward Facing Seats (Each Side)	Inc In Base		$ -	$ -	$ -	$ -	$ -
Body – Floor Covering	8	Pressure-preservative treated plywood	Inc In Base		$ -	$ -	$ -	$ -	$ -
Body – Floor Covering	9	Gerflor Tarabus Sirius 6801	Option				$ -	Quote	Quote
		Other Option - Specify			N/A	N/A	N/A		$ -
Body - Mirror, Exterior						$ -	$ -		$ -
Body – Mirror, Exterior	1	~~Safe Fleet~~ B&R One Piece 8" x 8" Flat Glazing W/Stainless Steel Arms, Remote Both Sides	Option		$ (56.65)	$ (63.32)	$ (72.82)	$ 21.80	$ 23.36
Body – Mirror, Exterior	2	~~Safe Fleet~~ B&R One Piece 8" x 8" Flat Glazing W/S.S. Arms, Manual W/6" Spot Mirror	Option		$ 268.91	$ 300.59	$ 345.68	$ 127.81	$ 136.95
Body – Mirror, Exterior	3	~~Safe Fleet~~ B&R 8" x 15" 2 Piece, Heated, Remote Both Sides	Option		$ 52.57	$ 58.76	$ 67.58	$ 67.58	$ 72.41
Body – Mirror, Exterior	4	~~Safe Fleet~~ B&R 9" x 11" 2 Piece, Heated, Remote Both Sides	Discontinued		$ (375.34)	$ (419.56)	$ (482.49)	N/A	N/A
Body – Mirror, Exterior	5	~~Safe Fleet~~ B&R 9" x 13" Class "A" 2 Piece, Heated, Remote Both Sides	Option		$ 112.05	$ 125.25	$ 144.04	$ 75.15	$ 80.52
Body – Mirror, Exterior	6	~~Safe Fleet~~ B&R 10" x 13:", 2 Piece (Flat & Convex), Heated, Remote Both Sides	Option		$ 567.41	$ 634.25	$ 729.39	$ 729.39	$ 781.54
Body – Mirror, Exterior	7	~~Safe Fleet~~ B&R 10" x 11 " 1 Piece, Heated, Remote Both Sides	Option		N/A	N/A	N/A	$ 154.91	$ 165.99
Body – Mirror, Exterior	8	Rosco 8" x 15" 1 Piece, Heated Remote Both Sides	Not Available		N/A	N/A	N/A	N/A	N/A
Body – Mirror, Exterior	9	Lucerix Metagal 7" x 15" 2 Piece, Heated Remote Both Sides	Not Available		N/A	N/A	N/A	N/A	N/A
Body – Mirror, Exterior	10	Velvac View-All System (Camera Mounted in Exterior Mirror W/LCD Screen in Driver Area)	Not Available		N/A	N/A	N/A	N/A	N/A
Body – Mirror, Exterior	11	Velvac Hyperion Lane Change Guardian	Not Available		N/A	N/A	N/A	N/A	N/A
Body – Mirror, Exterior	12	Hadley 8" x 15", 2 Piece (Flat Upper/Convex Lower), Heated, Remote Upper Mirror Driver Side	Option		N/A		$ -	$ 44.70	$ 47.90
Body – Mirror, Exterior	13	Add LED Turn Signal to Side Mirror - Side Mount	Option		$ -		$ -	$ 328.15	$ 351.61
Body – Mirror, Exterior	14	Add LED Turn Signal to Side Mirror - Within Glass	Option		$ 29.63		$ -	$ 365.31	$ 391.43
		Other Option - Specify			N/A	N/A	N/A		$ -
Body - Mirror, Interior						$ -	$ -		$ -
Body – Mirror, Interior	1	Mirror - 8 1/2 " X 16"	Discontinued		$ 29.63	$ 33.12	$ 38.09	N/A	N/A
Body – Mirror, Interior	2	Mirror - 4.75" X 15"	Not Available		N/A	N/A	N/A	N/A	N/A
Body – Mirror, Interior	3	Mirror - Front Door 6" Round on Header Door	Option		$ 24.78	$ 27.70	$ 31.85	$ 31.85	$ 34.13
Body – Mirror, Interior	4	Mirror - Rear Exit Door/Step Well 12" Convex	Inc In Base		$ -	$ -	$ -	$ -	$ -
Body – Mirror, Interior	5	Mirror - 8 1/2 " X 1" center	Not Available		N/A	N/A	N/A	N/A	N/A
Body – Mirror, Interior	6	Mirror - 5" flat	Not Available		N/A	N/A	N/A	N/A	N/A
Body – Mirror, Interior	7	Mirror - 8 1/2 " X 15" Flat	Option		$ -	$ -	$ -	31.26	$ 33.50
		Other Option - Specify				$ -	$ -		$ -
Body - Paint & Decal						$ -	$ -		$ -
Body – Paint & Decal	1	One Color w/Roof Numbers	Inc In Base		Standard	N/A	N/A	$ -	$ -
Body – Paint & Decal	2	(2) Colors, with and without Black Mask At Windows	Option		$ 1,290.00	$ 1,441.96	$ 1,658.26	Quote	Quote
Body – Paint & Decal	3	(3) Colors, with and without Black Mask At Windows	Option		$ 1,640.00	$ 1,833.19	$ 2,108.17	Quote	Quote
Body – Paint & Decal	4	Basic Decal Package (Up to Three Strips and Equivalent Design)	Option		QUOTE	N/A	N/A	Quote	Quote
Body – Paint & Decal	5	Custom Paint/Decal Design (Per Purchasers' Spec)	Option		QUOTE	N/A	N/A	Quote	Quote
Body – Paint & Decal	6	Clear Coat Complete Bus	Option		$ 1,290.00	$ 1,441.96	$ 1,658.26	Quote	Quote
Body – Paint & Decal	7	Remove Roof Numbers	Option		$ 175.00	$ 195.62	$ 224.96	Quote	Quote
		Other Option - Specify			N/A	N/A	N/A		$ -
Body - Passenger Signal						$ -	$ -		$ -
Body – Passenger Signal	1	Pullcords - Above Windows (Neutral Or Yellow) w/Touch Pad At W/C Positions (Pullcords in Base, option is for adding touch pads)	Option		$ 46.75	$ 52.26	$ 60.10	$ 172.03	$ 184.33
Body – Passenger Signal	2	Touch Tape (At Window Mullions)	Option		$ 1,051.35	$ 1,175.20	$ 1,351.48	$ 511.68	$ 548.27
Body – Passenger Signal	3	Button at Exit Door Vertical Stanchion	Inc In Base		$ -	$ -	$ -	$ -	$ -
Body – Passenger Signal	4	Additional Amber Stop Request Lamp Mounted on Driver's Dash	Option		$ 50.27	$ 56.19	$ 64.62	$ 85.25	$ 91.35
Body – Passenger Signal	5	Button in the Parcel Rack	Option		$ 15.79	$ 17.65	$ 20.30	$ 20.30	$ 21.75
		Other Option - Specify				$ -	$ -		$ -
Body - Rear Door						$ -	$ -		$ -
Body – Rear Door	1	34" Wide Rear Door w/Full Driver Control (Air Open/Spring Close)	Inc In Base		N/A	N/A	N/A	$ -	$ -
Body – Rear Door	2	48" Wide Rear Door w/Full Driver Control (Air Open/Spring Close)	Not Available		N/A	N/A	N/A	N/A	N/A
Body – Rear Door	3	56" Wide Rear Door w/Full Driver Control (Air Open/Air Close)	Not Available		N/A	N/A	N/A	N/A	N/A
Body – Rear Door	4	Electric Operated Front/Rear Door Motor and Control	Option		$ 4,628.84	$ 5,174.12	$ 5,950.23	Quote	Quote
Body – Rear Door	5	Passenger Open (Push Open/Spring Close)	Option		N/A	N/A	N/A	Quote	Quote
Body – Rear Door	6	Touch Bars (Air Open/Spring Close)	Option		$ 1,111.00	$ 1,241.88	$ 1,428.16	Quote	Quote
Body – Rear Door	7	Touch Bars w/Driver Override	Option		$ 227.66	$ 254.48	$ 292.65	Quote	Quote
Body – Rear Door	8	Touch Tape in Place of Touch Bars	Option		$ 364.08	$ 406.97	$ 468.01	Quote	Quote
Body – Rear Door	9	Vapor Class Acoustic (Photo Sensor)	Option		$ 2,414.00	$ 2,698.37	$ 3,103.12	Quote	Quote
Body – Rear Door	10	Vapor V Touch (Electronic Touch Bar)	Option		$ 344.81	$ 385.43	$ 443.24	Quote	Quote
Body – Rear Door	11	Vapor Electric Transit Operator	Option		N/A	N/A	N/A	Quote	Quote
Body – Rear Door	12	Vapor Electric Door Control / 1939 Interface	Option		N/A	N/A	N/A	Quote	Quote
Body – Rear Door	13	Vapor Optical Pressure Wave Switch	Option		$ 2,319.68	$ 2,592.94	$ 2,981.88	Quote	Quote
Body – Rear Door	14	Exterior Air Release (Front Door Control Valve)	Option		$ 101.32	$ 113.26	$ 130.24	Quote	Quote
Body – Rear Door	15	Driver Push Button Door Controls	Option		$ 91.88	$ 102.70	$ 118.11	Quote	Quote
Body – Rear Door	16	Bode CADS All electric doors	Not Available		N/A	N/A	N/A	N/A	N/A
Body – Rear Door	17	Remove Rear Door, Add Two Seats	Option		$ (2,700.00)	$ (3,018.06)	$ (3,470.77)	Quote	Quote
Body – Rear Door	18	Ventura electric rear door	Option		$ 16,442.00	$ 18,378.87	$ 21,135.70	Quote	Quote
Body – Rear Door	19	Add Center Door (Articulated bus only)	Not Available		N/A	N/A	N/A	N/A	N/A
		Other Option - Specify			N/A	N/A	N/A	N/A	N/A

Category	Item #	Description	Designation	Propulsion (if applicable)	Price	6/1/22 Price Change	4/1/23 Price Change	June 2023 Revised Price	7/19/24 Price
Body - Roof Hatch						$ -	$ -		$ -
Body – Roof Hatch	1	Manual Hatch At Front and Rear Positions	Option		$ -	$ -	$ -	$ 345.55	$ 370.26
Body – Roof Hatch	2	One (1) Roof Hatch Position - Rear	Inc In Base		$ (507.70)	$ (567.51)	$ (652.63)	$ -	$ -
Body – Roof Hatch	3	Change Manual Hatch to Electric Hatch with Driver Control (per Position)	Option		$ 349.00	$ 390.11	$ 448.63	$ 343.14	$ 367.67
Body – Roof Hatch	4	Change Manual Hatch to Glass Hatch in Lieu of Standard (per Position)	Option		$ 928.38	$ 1,037.74	$ 1,193.40	$ 147.59	$ 158.14
Body – Roof Hatch	5	Additional Roof Hatch Position	See Option 1		N/A	N/A	N/A	N/A	N/A
		Other Option - Specify			N/A	N/A	N/A	N/A	N/A
Body - Schedule Rack						$ -	$ -		$ -
Body – Schedule Rack	1	none	Inc In Base			$ -	$ -	$ -	$ -
Body – Schedule Rack	2	Innocom Schedule Racks 3.75" x 7" x 1.5"	Option		$ 21.43	$ 23.95	$ 27.55	$ 17.40	$ 18.64
Body – Schedule Rack	3	Innocom Schedule Racks 8.62" x 1 1" x 1"	Option		$ 27.69	$ 30.95	$ 35.59	$ 35.59	$ 38.13
Body – Schedule Rack	4	22" x 21" Black, RH Load Open Back	Option		$ 34.78	$ 38.88	$ 44.71	$ 202.78	$ 217.28
Body – Schedule Rack	5	Transit Information Products - 19" x 21" OBIC ~~19/21 4P 1L TRMC~~ 19/21 4P 2L	Option		$ 343.97	$ 384.49	$ 442.16	$ 420.48	$ 450.54
Body – Schedule Rack	6	Transit Information Products - 19" x 21" OBICT10P2LTRMC	Discontinued		$ 501.38	$ 560.44	$ 644.51	N/A	N/A
Body – Schedule Rack	7	Transit Information Products - OBIC 19/21 4P 1T	Option		Included in base		$ -	$ 414.43	$ 444.06
Body – Schedule Rack	8	Transit Information Products - OBIC 19/21 4PW 2L	Option		See Option 2		$ -	$ 420.48	$ 450.54
Body – Schedule Rack	9	Transit Information Products - OBIC 19/21 4PW 1T	Option		See Option 2		$ -	$ 414.43	$ 444.06
		Other Option - Specify			N/A	N/A	N/A		$ -
Body - Stanchions/Grab Rails						$ -	$ -		$ -
Body – Stanchions/Grab Rails	1	Stainless Steel Stanchions and Grab Rails and Modesty Panel Tubes	Mix of Stainless Steel and Powder Coated Stanchions in Base		$ -	$ -	$ -	$ -	$ -
Body – Stanchions/Grab Rails	2	Powder Coated Vertical Stanchions, Grab Rails and Modesty Panel Tubes	Mix of Stainless Steel and Powder Coated Stanchions in Base		$ -	$ -	$ -	$ -	$ -
Body – Stanchions/Grab Rails	3	Powder Coated Vertical Stanchions only	Option		$ (153.24)	$ (171.29)	$ (196.99)	$ -	$ -
Body – Stanchions/Grab Rails	4	Farebox Guard Rail	Option		$ 252.61	$ 282.37	$ 324.72	$ 290.62	$ 311.40
Body – Stanchions/Grab Rails	5	Grab Rail Forward Wheel Housing	Inc In Base		$ -	$ -	$ -	$ -	$ -
Body – Stanchions/Grab Rails	6	Luggage Rack 68", Two -Tier with Fixed Shelf's	Option		$ 3,739.33	$ 4,179.82	$ 4,806.80	$ 4,574.04	$ 4,901.08
Body – Stanchions/Grab Rails	7	Vinyl Coated Nylon Grab Straps (Cost per Handle)	Option		$ 50.01	$ 55.90	$ 64.29	$ 29.73	$ 31.86
Body – Stanchions/Grab Rails	8	SSTL Spring Loaded Grab Handle (Cost per Handle)	Option		$ 35.28	$ 39.43	$ 45.35	$ 72.90	$ 78.11
Body – Stanchions/Grab Rails	9	non-vinyl-coated nylon grab straps (per handle, color to be chosen by agency)	Option		$ 48.60	$ 54.32	$ 62.47	$ 17.24	$ 18.47
		Other Option - Specify			N/A	N/A	N/A		$ -
Cooling System						$ -	$ -		$ -
Cooling System	1	Modine Side By Side By Side Plate Fin Radiator	Not Available		N/A	N/A	N/A	N/A	N/A
Cooling System	2	Modine Electric Cooling Fan System (8 x 12" Fans)	Option	Diesel/CNG	$ 350.00	$ 391.23	$ 449.91	$ -	$ -
Cooling System	2	Modine Electric Cooling Fan System (9 x 12" Fans)	Option	Hybrid	Included in base		$ -	$ -	$ -
Cooling System	3	EMP Electric Cooling Fan System	Inc In Base		Included in base	N/A	N/A	$ -	$ -
Cooling System	4	Electric Fan Cooling System (Non EMP - Specify OEM)	Not Available		See Option 2	N/A	N/A	N/A	N/A
Cooling System	5	Grayson Electric Cooling Fan System	Not Available		N/A	N/A	N/A	N/A	N/A
Cooling System	6	Hydraulic Cooling Fan	Not Available		N/A	N/A	N/A	N/A	N/A
Cooling System	7	L&M Radiator	Not Available		N/A	N/A	N/A	N/A	N/A
Cooling System	8	Masabi Radiator	Not Available		N/A	N/A	N/A	N/A	N/A
Cooling System	9	E - Coat Radiator, CAC & Hydraulic Cooler	Option	Diesel, CNG	$ 16.37	$ 18.30	$ 21.04	$ 908.78	$ 973.76
Cooling System	9	E - Coat Radiator, CAC & Hydraulic Cooler	Option	Diesel-Hybrid (Allison and BAE)			$ -	$ 1,074.85	$ 1,151.70
Cooling System	10	Radiator Tank Guard	Option	Diesel, Diesel-Hybrid, and CNG only	$ 130.25	$ 145.59	$ 167.43	$ 167.43	$ 179.40
Cooling System	11	Double Breeze Constant Tension Clamps	Not Available		N/A	N/A	N/A	N/A	N/A
Cooling System	12	Oetiker Constant Torque Clamps	Not Available		N/A	N/A	N/A	N/A	N/A
Cooling System	13	Gates - Greenstripe Hose	Inc In Base		N/A	N/A	N/A	$ -	$ -
Cooling System	14	Valeo ~~Webasto~~ Model Thermo 300 (104,000 btu) Coolant Heater	Inc In Base		N/A	N/A	N/A	N/A	N/A
Cooling System	15	Valeo ~~Webasto~~ Model Thermo 230 (80,000 btu) Coolant Heater	Inc In Base		N/A	N/A	N/A	N/A	N/A
Cooling System	16	Proheat Model X120 (120,000 btu) Coolant Heater	Not Available		N/A	N/A	N/A	N/A	N/A
Cooling System	17	Proheat Model X80 (80,000 btu) Coolant Heater	Not Available		N/A	N/A	N/A	N/A	N/A
Cooling System	18	Proheat Model X50 (50,000 btu) Coolant Heater	Discontinued		$ (300.00)	$ (335.34)	$ (385.64)	N/A	N/A
Cooling System	19	Proheat Model X45 (45,000 btu) Coolant Heater	Discontinued		$ (85.00)	$ (95.01)	$ (109.26)	N/A	N/A
Cooling System	20	Electric Coolant Auxiliary Heater (LV Half Kettle Heater)	Option	Diesel/CNG	$ (170.00)	$ (190.03)	$ (218.53)	$ (218.53)	$ (234.15)
Cooling System	21	Espar Model Hydronic #4	Not Available		N/A	N/A	N/A	N/A	N/A
Cooling System	22	Espar Model Hydronic #5	Not Available		N/A	N/A	N/A	N/A	N/A
Cooling System	23	Articulated Only?	Not Available		N/A	N/A	N/A	N/A	N/A
Cooling System	24	EMP Electric Cooling Fan System	Inc In Base		N/A	N/A	N/A	$ -	$ -
Cooling System	25	Electric Fan Cooling System (Non EMP - Specify OEM)	Not Available		N/A	N/A	N/A	N/A	N/A
Cooling System	26	Double Breeze Constant Tension Clamps	Not Available		N/A	N/A	N/A	N/A	N/A
Cooling System	27	Oetiker Constant Torque Clamps	Not Available		N/A	N/A	N/A	N/A	N/A
Cooling System	28	Grayson Electric Cooling Fan System	Not Available		N/A	N/A	N/A	N/A	N/A
		Other Option - Specify				$ -	$ -		
Electrical						$ -	$ -		
Electrical	1	Voltage Spike Arrestor, S.K.I. Products SKI241 -101445, or Approved Equal	Discontinued		N/A	N/A	N/A	N/A	N/A
Electrical	2	24 Volt to 13.6 Volt DC - DC Converter, 30 Ampere Output, Model 1645 - 24 - 12 - 30, Manufactured By Wilmore Electronics Co., Inc. or Equivalent	Option		$ 904.87	$ 1,011.46	$ 1,163.18	$ 533.53	$ 571.68
Electrical	3	Battery Voltage Equalizer	Inc In Base		$ -	$ -	$ -	$ -	$ -
Electrical	4	24V battery isolation system (keeps house batteries from being drained by cameras, recorders, etc.) (Vanner)	Option	Diesel, Diesel-Hybrid, and CNG	N/A	N/A	N/A	$ 317.61	$ 340.32
		Other Option - Specify				$ -	$ -		$ -
Electrical - Accessories						$ -	$ -		$ -
Electrical – Accessories	1	12 V Cigarette-Style Light Adaptor for PC Auxiliary Power - Drivers Area	Option		$ 6.71	$ 7.50	$ 8.63	$ 22.10	$ 23.68
Electrical – Accessories	2	12 V Cigarette-Style Light Adaptor for PC Auxiliary Power - Rear Air Return Grille Area	Discontinued		N/A	N/A	N/A	N/A	N/A
Electrical – Accessories	3	USB Power Source - Driver's Area	Option		$ -		$ -	$ 107.09	$ 114.75
		Other Option - Specify				$ -	$ -		$ -
Electrical - Alternator						$ -	$ -		$ -
		Not for Electric			N/A	N/A	N/A	N/A	N/A
Electrical – Alternator	1	Delco 50 DN (270 AMP)			N/A	N/A	N/A	N/A	N/A
Electrical – Alternator	3	Penntex Px833 Alternator			N/A	N/A	N/A	N/A	N/A
Electrical – Alternator	4	Neihoff C - 701 (300 AMP)			N/A	N/A	N/A	N/A	N/A
Electrical – Alternator	5	Neihoff C - 703 (330 AMP)			N/A	N/A	N/A	N/A	N/A
Electrical – Alternator	6	Neihoff C - 803 (500 AMP) Air Cooled		Diesel, CNG	N/A	N/A	N/A	$ 796.65	$ 853.61
Electrical – Alternator	7	EMP POWER 450 AMP Brushless Alternator			N/A	N/A	N/A	$ -	$ -
Electrical – Alternator	8	KA500 HIPRO (KHP 500-000) (475 AMP)			N/A	N/A	N/A	N/A	N/A
Electrical – Alternator	9	Marine Cabling for Charging System			N/A	N/A	N/A	N/A	N/A
		Other Option - Specify			N/A	N/A	N/A		$ -
Electrical - Automatic Passenger Counter						$ -	$ -		$ -
Electrical – Automatic Passenger Counter	1	none	Inc In Base			$ -	$ -	$ -	$ -
Electrical – Automatic Passenger Counter	2	UTA Automatic Passenger Counter System with GPS, WLAN Capabilities (Two-Door Configuration Only)	Option		$ 17,529.39	$ 19,594.35	$ 22,533.50	$ 5,207.13	$ 5,579.44
Electrical – Automatic Passenger Counter	2	UTA APC Per Order Application Approvals and Miscellaneous Fees, Required for UTA Automatic Passenger Counter System	Option		$ 2,830.99		$ -	Quote	Quote
Electrical – Automatic Passenger Counter	3	UTA APC Sensors, Cabling ~~CPU only~~	Option		$ 2,830.99	$ 3,164.48	$ 3,639.15	$ 345.97	$ 370.71
Electrical – Automatic Passenger Counter	4	Wiring provisions IAW APC manufacture (Fishwire and Conduit)	Option		$ 2,830.99	$ 3,164.48	$ 3,639.15	$ 142.95	$ 153.17
Electrical – Automatic Passenger Counter	5	Strategic Mapping APC system (Two-Door Configuration Only)	Option		$ 9,473.75	$ 10,589.76	$ 12,178.22	$ 8,937.50	$ 9,576.53
Electrical – Automatic Passenger Counter	5	Strategic Mapping APC Per Order Application Approvals and Miscellaneous Fees, Required for Strategic Mapping Automatic Passenger Counter System	Option				$ -	Quote	Quote
		Other Option - Specify			N/A	N/A	N/A		$ -

Category	Item #	Description	Designation	Propulsion (if applicable)	Price	6/1/22 Price Change	4/1/23 Price Change	June 2023 Revised Price	7/19/24 Price
Electrical - Auxiliary Lights						$ -	$ -		$ -
Electrical – Auxiliary Lights	1	Four (4) 4" Diameter LED Auxiliary Brake Lights	Option		$ -	$ -	$ -	$ -	$ -
Electrical – Auxiliary Lights	2	Two (2) 4" Diameter LED Auxiliary Brake Lights	Inc In Base		$ -	$ -	$ -	$ -	$ -
Electrical – Auxiliary Lights	3	Two (2) Dialight 7" Diameter LED Auxiliary Brake Lights	Option		$ 79.29	$ 88.63	$ 101.92	$ 41.14	$ 44.08
Electrical – Auxiliary Lights	4	4 LED Brake Strip Lamps	Discontinued		$ 115.50	$ 129.11	$ 148.47	N/A	N/A
Electrical – Auxiliary Lights	5	JKA Enterprises LED "Stop" Light	Discontinued		N/A	N/A	N/A	N/A	N/A
Electrical – Auxiliary Lights	5	Edison Displays LED "Stop" Light	Option				$ -	$ 450.77	$ 483.00
Electrical – Auxiliary Lights	6	Exterior Curb Lamps, Front & Rear - Dialight	Option		$ (79.52)	$ (88.89)	$ (102.22)	$ 448.40	$ 480.46
Electrical – Auxiliary Lights	7	Triangle Amber LED Yield Sign - Dialight	Discontinued		$ 314.73	$ 351.81	$ 404.58	N/A	N/A
Electrical – Auxiliary Lights	7	Triangle Amber LED Yield Sign - Dataled	Option				$ -	$ 811.27	$ 869.28
Electrical – Auxiliary Lights	8	Two (2) Red LED Brake Strip Lamps	Option		$ 57.46	$ 64.23	$ 73.86	$ 73.86	$ 79.14
Electrical – Auxiliary Lights	9	Remove LED Auxiliary Brake Lights (DEDUCT)	Option		$ (39.42)	$ (44.06)	$ (50.67)	$ (39.48)	$ (39.48)
Electrical – Auxiliary Lights	10	Overhead Farebox LED - Light W/Night - Day Switch (on Drivers Side Panel) - Light Illuminates W/Frt. Door Open and Switch in the Night Position	Inc In Base		$ -	$ -	$ -	$ -	$ -
Electrical – Auxiliary Lights	11	Service Compartment (SDS) Lights - LED	Inc In Base		$ -	$ -	$ -	$ -	$ -
Electrical – Auxiliary Lights	11	Side Console and Destination Sign Service Compartment Lights - LED	Option				$ -	$ 125.10	$ 134.04
Electrical – Auxiliary Lights	12	LED Beacon Light	Option		$ 251.35	$ 280.96	$ 323.10	$ 405.98	$ 435.01
Electrical – Auxiliary Lights	13	LED Decal Lights (2) - Non - Flashing only (Per NHTSA)	Not Available		N/A	N/A	N/A	N/A	N/A
Electrical – Auxiliary Lights	14	3 LED Brake Strip Lamps	Option				$ -	$ 120.04	$ 128.62
		Other Option - Specify			N/A	N/A	N/A		$ -
Electrical - Battery & Battery Chargers						$ -	$ -		$ -
Electrical - Battery & Battery Chargers	1	Polyethylene battery tray and enclosure	Inc In Base		Inc In Base	N/A	N/A	$ -	$ -
Electrical – Battery & Battery Chargers	2	(2) DEKA 8D Side and Top Post Connections (Standard for Diesel Bus)	Inc In Base		Inc In Base	N/A	N/A	$ -	$ -
Electrical – Battery & Battery Chargers	3	(4) DEKA Group 31 Top Post	Option		$ (73.68)	$ (82.36)	$ (94.71)	$ 126.87	$ 135.94
Electrical – Battery & Battery Chargers	4	DEKA AGM Type 8D/Group 31	Option		$ 296.59	$ 331.53	$ 381.26	$ 685.19	$ 734.18
Electrical – Battery & Battery Chargers	5	(4) Odyssey Group 31	Option		$ 98.05	$ 109.60	$ 126.04	$ 1,367.42	$ 1,465.19
Electrical – Battery & Battery Chargers	6	(4) Trojan Group 32	Discontinued		Discontinued	N/A	N/A	N/A	N/A
Electrical – Battery & Battery Chargers	7	Ultra Capacitors - KBI KAPower	Option		$ 3,598.59	$ 4,022.50	$ 4,625.88	$ 4,270.26	$ 4,575.58
Electrical – Battery & Battery Chargers	8	Anderson 350 Jump Start Connector (Each)	Inc In Base		Inc In Base	N/A	N/A	$ -	$ -
Electrical – Battery & Battery Chargers	9	Remove Anderson 350 Jump Start	Option		$ (94.06)	$ (105.14)	$ (120.91)	$ (71.00)	$ (71.00)
Electrical – Battery & Battery Chargers	10	En-route Battery Charging system (please specify)	See Below	(electric only)	Se Below	N/A	N/A	See Below	See Below
Electrical – Battery & Battery Chargers	31	Add Charge rails for En-Route Charging - 300kW	Option	(electric only)			$ -	$ 36,251.85	#REF!
Electrical – Battery & Battery Chargers	31	Add Charge rails for En-Route Rapid Charging - 450kW (requires rapid charge batteries below)	Option	(electric only)			$ -	$ 39,421.48	#REF!
Electrical – Battery & Battery Chargers	10	ABB- HVC 150P UL – 150kW opportunity Charger	Not Available	(electric only)	$ 233,771.05	$ 261,309.28	$ 300,505.67	N/A	N/A
Electrical – Battery & Battery Chargers	10	ABB HVC-PD 150kW Overhead Charger with Mast-mounted or Structure-mounted Pantograph; Onsite Commissioning; Standard Warranty (2 years); Charger Wireless Connection - Year 1; Charger Monitoring Software (Operator Pro) - Year 1; Freight; Buy America Compliant	Option	(electric only)					$ 304,933.83
Electrical – Battery & Battery Chargers	10	ABB HVC-PD 300kW Overhead Charger with Mast-mounted or Structure-mounted Pantograph; Onsite Commissioning; Standard Warranty (2 years); Charger Wireless Connection - Year 1; Charger Monitoring Software (Operator Pro) - Year 1; Freight; Buy America Compliant	Option	(electric only)	$320,005.11	$ 357,701.71	$ 411,356.97	$ 356,257.12	$ 385,632.96
Electrical – Battery & Battery Chargers	10	ABB HVC-PD 450kW Overhead Charger with Mast-mounted or Structure-mounted Pantograph; Power cabinet metal frame; Onsite Commissioning; Standard Warranty (2 years); Charger Wireless Connection - Year 1; Charger Monitoring Software (Operator Pro) - Year 1; Freight; Buy America Compliant	Option	(electric only)	$385,638.25	$ 431,066.44	$ 495,726.40	$ 459,036.60	$ 473,686.24
Electrical – Battery & Battery Chargers	10	SIEMENS HPCC 300kW On-Route Charger	Not Available	(electric only)	$ 465,626.91	$ 520,477.76	$ 598,549.42	N/A	N/A
Electrical – Battery & Battery Chargers	11	Inductive charging system for depot charging	Not Available	(electric only)	N/A	N/A	N/A	N/A	N/A
Electrical – Battery & Battery Chargers	12	Cable "Pigtail" Chargers	Not Available	(electric only)	N/A	N/A	N/A	N/A	N/A
Electrical - Battery & Battery Chargers	38	Heliox Flex DC 180kW Depot Charger with Pantograph (250A) for Structure Mount; Dynamic Charging; Onsite Commissioning; Standard Warranty (2 years); Charger Wireless Connection - Year 1; Charger Monitoring Software - Year 1; Freight; Buy America Compliant	Option	(electric only)			$ -	$ 152,312.89	$ 153,809.41
Electrical - Battery & Battery Chargers	38	Heliox Flex DC 180kW Depot Charger with 2 Pantographs (250A) for Structure Mount; Dynamic Charging; Onsite Commissioning; Standard Warranty (2 years); Charger Wireless Connection - Year 1; Charger Monitoring Software - Year 1; Freight; Buy America Compliant	Option	(electric only)			$ -	$ 210,219.36	$ 218,018.37
Electrical - Battery & Battery Chargers	38	Heliox Flex DC 180kW Depot Charger with 3 Pantographs (250A) for Structure Mount; Dynamic Charging; Onsite Commissioning; Standard Warranty (2 years); Charger Wireless Connection - Year 1; Charger Monitoring Software - Year 1; Freight; Buy America Compliant	Option	(electric only)			$ -	$ 268,362.96	$ 282,158.47
Electrical - Battery & Battery Chargers	39	Heliox Ultra Fast 360kW Depot Charger with Pantograph (600A) for Structure Mount; Onsite Commissioning; Standard Warranty (2 years); Charger Wireless Connection - Year 1; Charger Monitoring Software - Year 1; Freight; Buy America Compliant	Option	(electric only)			$ -	$ 265,857.94	$ 280,234.73
Electrical - Battery & Battery Chargers	40	Heliox Ultra Fast 360kW Depot Charger with Mast and Pantograph (600A); Onsite Commissioning; Standard Warranty (2 years); Charger Wireless Connection - Year 1; Charger Monitoring Software - Year 1; Freight; Buy America Compliant	Option	(electric only)			$ -	$ 412,144.28	$ 421,902.38
Electrical - Battery & Battery Chargers	55	Heliox Ultra Fast 540kW Depot Charger with Pantograph (600A) for Structure Mount; Onsite Commissioning; Standard Warranty (2 years); Charger Wireless Connection - Year 1; Charger Monitoring Software - Year 1; Freight; Buy America Compliant	Option	(electric only)					$ 431,490.28
Electrical - Battery & Battery Chargers	56	Heliox Ultra Fast 540kW Depot Charger with Mast and Pantograph (600A); Onsite Commissioning; Standard Warranty (2 years); Charger Wireless Connection - Year 1; Charger Monitoring Software - Year 1; Freight; Buy America Compliant	Option	(electric only)					$ 573,157.93
Electrical – Battery & Battery Chargers	18	250 kW Inductive Charging In Route Pad	Not Available	(electric only)	N/A	N/A	N/A	N/A	N/A
Electrical – Battery & Battery Chargers	19	250 kW Inductive Charging On-Board Receiver	Not Available	(electric only)	N/A	N/A	N/A	N/A	N/A
Electrical – Battery & Battery Chargers	20	350 kW on-route Charger	Not Available	(electric only)	N/A	N/A	N/A	N/A	N/A
Electrical - Battery & Battery Chargers	21	Wave Wireless Inductive chargin Equipment In Route Pad	Not Available	(electric only)	N/A	N/A	N/A	N/A	N/A
Electrical - Battery & Battery Chargers	22	Wave Wireless Inductive Charging Equipment Depot Level Pad	Not Available	(electric only)	N/A	N/A	N/A	N/A	N/A
Electrical – Battery & Battery Chargers	23	Momentum Dynamics Wireless Inductive Charging Equipment In Route Pad	Not Available	(electric only)	N/A	N/A	N/A	N/A	N/A
Electrical – Battery & Battery Chargers	24	Momentum Dynamics Wireless Inductive Charging Equipment Depot Level Pad	Not Available	(electric only)	N/A	N/A	N/A	N/A	N/A
Electrical – Battery & Battery Chargers	25	Momentum Dynamics Wireless Inductive Charging Equipment On Bus Receiver	Not Available	(electric only)	N/A	N/A	N/A	N/A	N/A
Electrical – Battery & Battery Chargers	26	Momentum Dynamics/Princeton power Wayside Battery storage-one megawatt with optional 500 kW	Not Available	(electric only)	N/A	N/A	N/A	N/A	N/A
Electrical – Battery & Battery Chargers	13	Battery Chargers	See Below	(electric only)	See Below	N/A	N/A	See Below	See Below
Electrical – Battery & Battery Chargers	14	60 kW Charger and Dispenser	Not Available	(electric only)	$ 62,912.52	$ 70,323.61	$ 80,872.15	N/A	N/A
Electrical – Battery & Battery Chargers	15	80 kW Charger and Dispenser	Not Available	(electric only)	$ 119,920.09	$ 134,046.67	$ 154,153.67	N/A	N/A
Electrical – Battery & Battery Chargers	16	100 kW Charger and Dispenser	Not Available	(electric only)	$ 127,530.39	$ 142,553.47	$ 163,936.49	N/A	N/A
Electrical – Battery & Battery Chargers	17	125 kW Charger and Dispenser	Not Available	(electric only)	$ 93,753.82	$ 104,798.02	$ 120,517.72	N/A	N/A
Electrical – Battery & Battery Chargers	17	125 kW Charger and Dispenser	Not Available	(electric only)	$ 136,417.88	$ 152,487.91	$ 175,361.10	N/A	N/A
Electrical - Battery & Battery Chargers	41	ABB HVC-C150kW Depot Charger with 1 Dispenser/Charge Box with single 7m CCS1 cable; Sequential Charging; Onsite Commissioning; Standard Warranty (2 years); Charger Wireless Connection - Year 1; Charger Monitoring Software (Operator Pro) - Year 1; Freight, Buy America Compliant. See Miscellaneous Items below for accessories.	Option	(electric only)			$ -	$ 117,489.52	$ 119,671.23
Electrical - Battery & Battery Chargers	41	ABB HVC-C150kW Depot Charger with 2 Dispenser/Charge Box with single 7m CCS1 cable each; Sequential Charging; Onsite Commissioning; Standard Warranty (2 years); Charger Wireless Connection - Year 1; Charger Monitoring Software (Operator Pro) - Year 1; Freight; Buy America Compliant. See Miscellaneous Items below for accessories.	Option	(electric only)			$ -	$ 134,286.82	$ 137,219.02
Electrical - Battery & Battery Chargers	42	ABB HVC-C150kW Depot Charger with 3 Dispenser/Charge Box with single 7m CCS1 cable each; Sequential Charging; Onsite Commissioning; Standard Warranty (2 years); Charger Wireless Connection - Year 1; Charger Monitoring Software (Operator Pro) - Year 1; Freight; Buy America Compliant. See Miscellaneous Items below for accessories.	Option	(electric only)			$ -	$ 147,048.66	$ 150,315.71

Category	Item #	Description	Designation	Propulsion (if applicable)	Price	6/1/22 Price Change	4/1/23 Price Change	June 2023 Revised Price	7/19/24 Price
Electrical - Battery & Battery Chargers	43	Heliox Flex DC 180kW Depot Charger with 1 dispenser (Column) with single 7m CCS1 cable; Dynamic Charging; column pedestal; Onsite Commissioning; Standard Warranty (2 years); Charger Wireless Connection - Year 1;Charger Monitoring Software - Year 1 ; Freight; Buy America Compliant. See Miscellaneous items below for accessories.	Option	(electric only)			$ -	$ 112,094.58	$ 108,411.83
Electrical - Battery & Battery Chargers	44	Heliox Flex DC 180kW Depot Charger with 2 dispensers (Column) with single 7m CCS1 cable each; Dynamic Charging; column pedestal; Onsite Commissioning; Standard Warranty (2 years); Charger Wireless Connection - Year 1; Charger Monitoring Software - Year 1; Freight; Buy America Compliant. See Miscellaneous items below for accessories.	Option	(electric only)			$ -	$ 132,416.64	$ 131,542.49
Electrical - Battery & Battery Chargers	45	Heliox Flex DC 180kW Depot Charger with 3 dispensers (Column) with single 7m CCS1 cable each; Dynamic Charging; column pedestal; Onsite Commissioning; Standard Warranty (2 years); Charger Wireless Connection - Year 1; Charger Monitoring Software - Year 1; Freight; Buy America Compliant. See Miscellaneous items below for accessories.	Option	(electric only)			$ -	$ 152,965.95	$ 154,607.16
Electrical - Battery & Battery Chargers	47	Borg Warner (Rhombus) 60kW Unidirectional Smart Inverter, Unidirectional Inverter: 60kW; EV Charging Unidirectional Dispenser; Standard Warranty (2 years); Onsite Commissioning, Freight; Buy America Compliant	Option	(electric only)			$ -	$ 59,804.70	$ 62,674.32
Electrical - Battery & Battery Chargers	46	ABB Terra 124 CC UL with single 6m CCS1 cable each; Dynamic Charging; 7" high-brightness color touchscreen display; RFID; support for OCPP 1.6 integrations and cellular modem. Remote Commissioning; Standard Warranty (2 years); Charger Wireless Connection - Year 1; Charger Monitoring Software (Operator Pro) - Year 1; Freight	Option	(electric only)			$ -	$ 71,550.24	$ 77,265.89
Electrical - Battery & Battery Chargers	49	Borg Warner (Rhombus) 120kW Smart Inverter, EV Charging Unidirectional Dispenser;Dynamic Charging ; Standard Warranty (2 years); On-site Commissioning; Freight; Buy America Compliant	Option	(electric only)			$ -	$ 92,812.83	$ 94,123.60
Electrical - Battery & Battery Chargers	48	ABB Terra 184 CC UL with single 6m CCS1 cable each; Dynamic Charging; 7" high-brightness color touchscreen display; RFID; support for OCPP 1.6 integrations and cellular modem. Remote Commissioning; Standard Warranty (2 years); Charger Wireless Connection - Year 1; Charger Monitoring Software (Operator Pro) - Year 1; Freight	Option	(electric only)			$ -	$ 79,841.74	$ 85,993.49
Electrical - Battery & Battery Chargers	50	Borg Warner (Rhombus) 125kw Bidirectional - 125kW Smart Inverter; EV Charging Bidirectional Dispenser; Standard Warranty (2 years); On-Site Commissioning; Freight; Buy America Compliant	Option	(electric only)			$ -	$ 100,028.84	N/A
Electrical - Battery & Battery Chargers	51	Heliox Fast DC 50 kW Mobile Charger with single 3m CCS1 cable; Onsite Commissioning; Standard Warranty (1 year); Charger Wireless Connection - Year 1; Freight; Buy America Compliant	Option	(electric only)			$	$ 55,860.21	$ 51,689.51
Electrical - Battery & Battery Chargers	59	120kW Smart Inverter, EV Charging Unidirectional with 2 Dispensers;Dynamic Charging ; Standard Warranty (2 years); On-site Commissioning; Freight; Buy America Compliant	Option	(electric only)					$ 106,368.66
Electrical - Battery & Battery Chargers	60	125kW Smart Inverter, EV Charging Unidirectional with 1 Dispenser; Sequential Charging , Standard Warranty (2 years); On-site Commissioning; Freight; Buy America Compliant	Option	(electric only)					$ 97,460.04
Electrical - Battery & Battery Chargers	61	125kW Smart Inverter, EV Charging Unidirectional with 2 Dispensers;Sequential Charging , Standard Warranty (2 years); On-site Commissioning; Freight; Buy America Compliant	Option	(electric only)					$ 109,705.09
Electrical - Battery & Battery Chargers	62	Siemens Sicharge 150kW Depot Charger with 1 Dispenser/Charge Box with single 7m CCS1 cable; Sequential Charging; Onsite Commissioning; Standard Warranty (2 years); Charger Wireless Connection - Year 1; Charger Monitoring Software (- Year 1; Freight, Buy America Compliant. See Miscellaneous Items below for accessories.	Option	(electric only)					$ 113,307.46
Electrical - Battery & Battery Chargers	63	Siemens Sicharge 150kW Depot Charger with 2 Dispensers/Charge Box with single 7m CCS1 cable each; Sequential Charging; Onsite Commissioning; Standard Warranty (2 years); Charger Wireless Connection - Year 1; Charger Monitoring Software - Year 1; Freight; Buy America Compliant. See Miscellaneous Items below for accessories.	Option	(electric only)					$ 133,499.30
Electrical - Battery & Battery Chargers	64	Siemens Sicharge 150kW Depot Charger with 3 Dispensers/Charge Box with single 7m CCS1 cable each; Sequential Charging; Onsite Commissioning; Standard Warranty (2 years); Charger Wireless Connection - Year 1; Charger Monitoring Software - Year 1; Freight; Buy America Compliant. See Miscellaneous Items below for accessories.	Option	(electric only)					$ 153,619.40
Electrical - Battery & Battery Chargers		The Mobility House Charge Management System	See Below	(electric only)			$ -	See below	See below
Electrical - Battery & Battery Chargers	52	The Mobility House (TMH) - Base Equipment cost per site - ChargePilot Starter Kit ; Connectivity Router; ChargePilot Mobile Data - per site. Total cost is a combination of the three TMH line items.	Option	(electric only)			$ -	$ 13,272.00	$ 13,506.00
Electrical - Battery & Battery Chargers	53	The Mobility House (TMH) - Commissioning per dispenser - CMS Commissioning with all relevant parameters in the system - per dispenser. Total cost is a combination of the three TMH line items.	Option	(electric only)			$ -	$ 923.10	$ 979.20
Electrical - Battery & Battery Chargers	54	The Mobility House (TMH) - Annual licensing per dispenser - ChargePilot Fleet Charging and Energy Management License - annual per dispenser. Total cost is a combination of the three TMH line items.	Option	(electric only)			$ -	$ 1,611.60	$ 1,713.60
Electrical – Battery & Battery Chargers	27	Electrical Management Software from Viriciti	Not Available	(electric only)	N/A	N/A	N/A	N/A	N/A
Electrical – Battery & Battery Chargers		Charger Miscellaneous Items	See Below	(electric only)				See below	See below
Electrical – Battery & Battery Chargers	55	ABB Dispenser Option - Depot Charge box pedestal, Cable Management System	Option	(electric only)				$ 5,847.90	$ 5,900.00
Electrical – Battery & Battery Chargers	56	Heliox Dispenser Option - Cable Management Post	Option	(electric only)				$ 3,680.78	$ 3,668.40
Electrical – Battery & Battery Chargers	57	New Flyer Infrastructure Solutions staff - Engineering, project management, coordination and consulting services (Hourly Rate)	Option	(electric only)				$ 157.50	$ 157.50
Electrical – Battery & Battery Chargers	58	ABB Metal frame	Option	(electric only)					$ 2,959.18
Electrical – Battery & Battery Chargers	28	Energy Storage System = Battery Packs	See Below		See Below	N/A	N/A	See Below	See Below
Electrical – Battery & Battery Chargers	29	Change base 435 kWh to long range 440 ~~311~~KWh ~~35~~ 40FT	Not Available	(electric only)	$ -	$ -	$ -	N/A	N/A
Electrical – Battery & Battery Chargers	30	Change base 435 kWh to Rapid charge 267 KWh-40FT	Not Available	(electric only)	$ 9,174.21	$ 10,254.93	$ 11,793.17	N/A	N/A
Electrical – Battery & Battery Chargers	31	Change base 435 kWh to Rapid charge ~~267~~ 320 KWh-40FT	Not Available	(electric only)	$ 55,000.00	$ 61,479.00	$ 70,700.85	N/A	N/A
Electrical – Battery & Battery Chargers	32	Charge per kWh Increase from available packages (Depot Charge)	Option	(electric only)	$ 52,545.00	$ 58,734.80	$ 67,545.02	$ 67,545.02	$ 570.00
Electrical – Battery & Battery Chargers	33	540 - 700 kWh Long Range ESS	Option		N/A	N/A	N/A	Quote	Quote
Electrical – Battery & Battery Chargers	34	800 kWh Long Range ESS	Not Available		N/A	N/A	N/A	N/A	N/A
Electrical - Battery & Battery Chargers	52	Change from 435kWh Long Range to 335 kWh 5 String Rapid Charge (Must Select Charge Rails to be Eligible for this Option)	Option	(electric only)			$ -	$ 41,023.78	$ 43,956.98
Electrical - Battery & Battery Chargers	53	Change from Long Range ESS to Rapid Charge ESS (Must Select Charge Rails to be Eligible for this Option)	Option	(electric only)			$ -	Quote	Quote
Electrical - Battery & Battery Chargers	35	Electric Trolley Bus Package	Not Available		N/A	N/A	N/A	N/A	N/A
Electrical - Battery & Battery Chargers	54	Other Option - Specify			N/A	N/A	N/A		$ -
						$ -	$ -		$ -
Electrical - Communication/Radio					N/A	N/A	N/A		$ -
Electrical – Communication/Radio	1	Pre - Wire:12V/40A Direct Battery & 12V/10A Ignition (Route to RH Dash & Ele. Equip. Box) and Install Roof Mount RF/GPS/Cellular Antenna	Option		N/A	N/A	N/A	Quote	Quote
Electrical – Communication/Radio	2	Motorola XLT 2500, 10- 35 W, 800MHZ W/DEC Box and Silent Alarm Switch	Not Available		Obsolete	N/A	N/A	N/A	N/A
Electrical – Communication/Radio	3	Motorola XLT 5000	Not Available		Obsolete	N/A	N/A	N/A	N/A
Electrical – Communication/Radio	4	Motorola APX4500	Option		$ 9,017.26	$ 10,079.49	$ 11,591.42	Quote	Quote
Electrical – Communication/Radio	5	Motorola CM200 and CM300, 45W, 439 - 470- MHZ	Option		$ 3,328.93	$ 3,721.08	$ 4,279.24	Quote	Quote
Electrical – Communication/Radio	6	Motorola CDM 1250	Not Available		Obsolete	N/A	N/A	N/A	N/A
Electrical – Communication/Radio	7	Harris Radio	Option		$ 10,173.38	$ 11,371.80	$ 13,077.57	Quote	Quote
Electrical – Communication/Radio	8	DC Power Filter for Radio Wiring	Option		$ 465.55	$ 520.39	$ 598.45	$ 598.45	$ 641.24
Electrical – Communication/Radio	9	Hand - Held Microphone	Option		N/A	N/A	N/A	$ -	$ -
Electrical – Communication/Radio	10	Public Address System with Boom Mic	Option		$ -	$ -	$ -	$ -	$ -
Electrical – Communication/Radio	11	Additional Flush Mounted Speakers (per Pair)	Option		$ 55.41	$ 61.94	$ 71.23	$ 71.23	$ 76.32
Electrical – Communication/Radio	12	~~ASP930T~~ ASP931 Radio Antenna with RG58 Coax Cable and TNC Connector	Option		$ 77.77	$ 86.93	$ 99.97	$ 99.97	$ 107.12
Electrical – Communication/Radio	13	Antenna Specialist ASP- 572	Option		$ 87.03	$ 97.28	$ 111.87	$ 111.87	$ 119.87
Electrical – Communication/Radio	14	Customer Specified Two Way Radio and Installation	Option		$ 9,017.26	$ 10,079.49	$ 11,591.42	Quote	Quote
Electrical – Communication/Radio	15	GPS Antenna W/Gasket (Trimble 502 Model 18334 and Approved Equal) with RG58 Coax Cable and F Type Male Connector to the VLU	Option		N/A	N/A	N/A	$ 98.31	$ 105.34
Electrical – Communication/Radio	16	customer specific antenna, ground plane, and cable runs installation	Option		$ 22.72	$ 25.40	$ 29.21	$ 84.66	$ 90.71
		Other Option - Specify				$ -	$ -		$ -

Category	Item #	Description	Designation	Propulsion (if applicable)	Price	6/1/22 Price Change	4/1/23 Price Change	June 2023 Revised Price	7/19/24 Price
Electrical - Destination Sign						$ -	$ -		$ -
Electrical – Destination Sign	1	Twin Vision Silver Series Sign (16 X160) Route, Rear, Front & Side (SSIII White)	Option		$ 355.00	$ 396.82	$ 456.34	$ 3,282.02	$ 3,516.68
Electrical – Destination Sign	2	Twin Vision ~~Silver Series Sign~~ Titan (24 X 200) Route, Rear, Front & Side (Titan White)	Option		$ 2,888.77	$ 3,229.07	$ 3,713.43	$ 2,759.52	$ 2,956.83
Electrical – Destination Sign	3	Twin Vision Smart Series II (16 X160) Route, Rear, Front & Side (SSIII Amber)	Option		$ 127.83	$ 142.89	$ 164.33	$ 664.02	$ 711.50
Electrical – Destination Sign	4	Twin Vision ~~Smart Series II~~ Titan (24 X 200) Route, Rear, Front & Side (Titan Amber)	Option		$ 114.32	$ 127.79	$ 146.95	$ 1,946.89	$ 2,086.09
Electrical – Destination Sign	5	Twin Vision 100% Amber LED, Front, Curb Side, Route, Rear (SSIII Amber)	Option		$ (190.33)	$ (212.75)	$ (244.66)	$ 527.89	$ 565.63
Electrical – Destination Sign	6	Twin Vision 100% Amber LED, Rear (SSIII Amber), Rear Sign Change Only	Option		$ 141.79	$ 158.50	$ 182.27	$ 246.43	$ 264.05
Electrical – Destination Sign	7	Twin Vision Chroma I Color LED Front	Not Available		N/A	N/A	N/A	N/A	N/A
Electrical – Destination Sign	8	Twin Vision Chroma IV 100% Color LED	Not Available		N/A	N/A	N/A	N/A	N/A
Electrical – Destination Sign	9	Twin Vision 24 X 200 Front, Side, Route, & Rear Amber LED Sign	Option		$ 2,124.21	$ 2,374.44	$ 2,730.61	$ -	$ -
Electrical – Destination Sign	10	Luminator SMT Horizon 100% Amber LED Front, Curbside, Rear	Inc In Base		$ -	$ -	$ -	Inc In Base	Inc In Base
Electrical – Destination Sign	11	AXION with WI FI and Time and Date Time Stamp	Not Available		N/A	N/A	N/A	N/A	N/A
Electrical – Destination Sign	12	Luminator Spectrum 100% ~~Amber~~ Full Color LED Front ,Curbside, Rear & Route (Spectrum FF Sign)	Option		$ 12,004.58	$ 13,418.72	$ 15,431.53	$ 17,399.45	$ 18,643.51
Electrical – Destination Sign	13	Luminator White LED Front, Curb-side, Route, and Rear (GTI White Sign)	Option		$ 620.54	$ 693.64	$ 797.69	$ 2,587.95	$ 2,772.99
Electrical – Destination Sign	14	Add Twin Vision Smart Series II w/ rear camera, Rear Sign (Twin Vision SSIII Amber Front, Side, Route, and Rear Signs)	Option		$ 575.18	$ 642.94	$ 739.38	$ 1,081.92	$ 1,159.28
Electrical – Destination Sign	15	Add Street Side Sign (Twin Vision Amber LED) (SSIII Amber Sign)	Option		$ 1,198.69	$ 1,339.90	$ 1,540.88	$ 1,694.00	$ 1,815.12
Electrical – Destination Sign	16	Add Street Side Sign (Twin Silver Series LED) (SSIII White Sign)	Option		$ 1,812.50	$ 2,026.01	$ 2,329.91	$ 2,711.50	$ 2,905.37
Electrical – Destination Sign	17	Remove Rear Sign (DEDUCT)	Option		$ (600.57)	$ (671.32)	$ (772.02)	$ (604.77)	$ (604.77)
Electrical – Destination Sign	18	Program Software (Twin Vision): DS17 Programming Software MIE (SSIII/FF)	Option		N/A	N/A	N/A	$ -	$ -
Electrical – Destination Sign	18	Program Software (Twin Vision): DS18 Programming Software IPS (GTI)	Option				$ -	$ -	$ -
Electrical – Destination Sign	18	Program Software (Twin Vision): DS18A Wireless programming Software (Remote Access Software)	Option				$ -	$ 1,232.00	$ 1,320.09
Electrical – Destination Sign	18	Program Software (Twin Vision): Programming Software IPS (GTI)	Option				$ -	$ -	$ -
Electrical – Destination Sign	18	Program Software (Twin Vision): Programming Software MIE (SSIII/FF)	Option				$ -	$ -	$ -
Electrical – Destination Sign	19	Luminator Programming Software USB Wireless	Option		N/A	N/A	N/A	$ -	$ -
Electrical – Destination Sign	20	Transign Curtain Front and Side Sign	Option		N/A	N/A	N/A	$ 5,699.37	$ 6,106.87
Electrical – Destination Sign	21	Heated Front Sign Glazing	Option		$ 101.86	$ 113.86	$ 130.94	$ 130.94	$ 140.30
Electrical – Destination Sign	22	Transign, (4) Character, Metal Housing, DS591-LED	Option		N/A	N/A	N/A	$ 341.82	$ 366.26
Electrical – Destination Sign	23	Transign, (3) Character, Metal Housing (Front Route Sign Change)	Option		$ (35.38)	$ (39.55)	$ (45.48)	$ 222.88	$ 238.82
Electrical – Destination Sign	24	Transign, (2) Character, D - 1 853, Metal Housing (Front Route Sign Change)	Option		N/A	N/A	N/A	$ 26.53	$ 28.43
Electrical – Destination Sign	25	Twin Vision Electronic Front Dash Sign (Front Route Sign Change)	Option		$ (130.39)	$ (145.75)	$ (167.61)	$ (167.61)	$ (167.61)
Electrical – Destination Sign	26	Hanover Display LED Amber Destination Signs (model# OL028, OL054 & OL64J)	Option		$ (496.11)	$ (554.55)	$ (637.73)	$ 288.95	$ 309.61
Electrical – Destination Sign	27	Luminator Electronic Front Dash Sign	Option		$ -	$ -	$ -	$ 209.68	$ 224.67
Electrical – Destination Sign	28	I/O controls Destination sign all Models	Not Available		N/A	N/A	N/A	N/A	N/A
Electrical – Destination Sign	29	Add One Additional Full Color Spectrum FF Twin Vision Silver Series LED, Street Side Sign (Must Purchase Option 12 to be Eligible for this Option)	Option		$ -		$ -	$ 5,852.00	$ 6,270.42
Electrical – Destination Sign	30	Remove Front Route Sign (DEDUCT)	Option		N/A		$ -	$ (725.00)	$ (725.00)
		Other Option - Specify			N/A	N/A	N/A		$ -
Electrical - Destination Sign Programming									$ -
Electrical – Destination Sign Programming	1	Luminator USB & Integrated Programing Software	Option		$ 499.92	$ 558.81	$ 642.63	$ -	$ -
Electrical – Destination Sign Programming	2	Twin Vision-~~Elyse 2~~ USB	Option		$ 58.30	$ 65.17	$ 74.94	$ 74.25	$ 79.56
Electrical – Destination Sign Programming	3	Twin Vision Software Package	Option		$ 441.62	$ 493.64	$ 567.69	$ -	$ -
		Other Option - Specify			N/A	N/A	N/A		$ -
Electrical - Diagnostics									$ -
Electrical – Diagnostics	1	Set of Multiplexing Diagnostics (Includes the 7 Following Items)	Option		See Section 10 for bus model specific diagnostics	N/A	N/A	Quote	Quote
Electrical – Diagnostics	2	Incl w/set - Circuit Tester	Option		See Section 10 for bus model specific diagnostics	N/A	N/A	Quote	Quote
Electrical – Diagnostics	3	Incl w/set - Program Loader	Option		See Section 10 for bus model specific diagnostics	N/A	N/A	Quote	Quote
Electrical – Diagnostics	4	Incl w/set - Program	Option		See Section 10 for bus model specific diagnostics	N/A	N/A	Quote	Quote
Electrical – Diagnostics	5	Incl w/set - ID Writer/Verification	Option		See Section 10 for bus model specific diagnostics	N/A	N/A	Quote	Quote
Electrical – Diagnostics	6	Incl w/set - RS232/RS485 Converter	Option		See Section 10 for bus model specific diagnostics	N/A	N/A	Quote	Quote
Electrical – Diagnostics	7	Incl w/set - Software, Real Time Ladder Logic	Option		See Section 10 for bus model specific diagnostics	N/A	N/A	Quote	Quote
Electrical – Diagnostics	8	Incl w/set - Hand - Held Computer	Option		See Section 10 for bus model specific diagnostics	N/A	N/A	Quote	Quote
		Other Option - Specify			N/A	N/A	N/A		
Electrical - Equipment Storage Box						$ -	$ -		
Electrical – Equipment Storage Box	1	none			$ -	$ -	$ -	N/A	N/A
Electrical – Equipment Storage Box	2	UTA APC Sensors, Cabling ~~CPU only~~			$ 15,728.63	$ 17,581.46	$ 20,218.68	$ 345.97	$ 370.71
Electrical – Equipment Storage Box	3	33"H X 20"D X 22.5"W, 13 - 42920F006	Inc In Base		$ -	$ -	$ -	$ -	$ -
Electrical – Equipment Storage Box	4	33"H X 20"D X 22.5"W, 13 - 42920F006, w/2 - Doors	Not Available		$ -	$ -	$ -	N/A	N/A
Electrical – Equipment Storage Box	5	33"H X 20"D X 22.5"W, 13 - 42920F014, w/Louvered Back Panel (Add Equipment Storage Box Ventilator)			$ -	$ -	$ -	402.94	$ 431.75
Electrical – Equipment Storage Box	6	Strategic Mapping sensors, cabling, CPU only			$ 9,473.75	$ 10,589.76	$ 12,178.22	Quote	Quote
		Other Option - Specify				$ -	$ -		$ -
Electrical - Lights, Exterior						$ -	$ -		$ -
Electrical – Lights, Exterior	1	All Exterior Lights LED - Type Lamps	Inc In Base		$ -	$ -	$ -	$ -	$ -
Electrical – Lights, Exterior	2	Headlight LED Dialight - Low Beam	Inc In Base		$ -	$ -	$ -	$ -	$ -
Electrical – Lights, Exterior	3	Headlight LED Dialight - High Beam	Inc In Base		$ -	$ -	$ -	$ -	$ -
Electrical – Lights, Exterior	4	Halogen Sealed Beam Headlights	Not Available		N/A	N/A	N/A	N/A	N/A
Electrical – Lights, Exterior	5	Tail Lights - Manufacturer Dialite LED, Fixture Size - 7" Diameter	Option		$ 167.00	$ 186.67	$ 214.67	$ 170.05	$ 182.21
Electrical – Lights, Exterior	6	Tail Lights - Manufacturer Dialite LED, Fixture Size - 4" Diameter	Inc In Base		$ -	$ -	$ -	$ -	$ -
		Other Option - Specify			N/A	N/A	N/A		$ -
Electrical - Intelligent Vehicle Network						$ -	$ -		$ -
Electrical – Intelligent Vehicle Network	1	none	Inc In Base			$ -	$ -	$ -	$ -
Electrical – Intelligent Vehicle Network	2	Clever Devices IVN III W/Voice Annunciation, APC, Wireless LAN	Option		$ 34,206.69	$ 38,236.24	$ 43,971.67	Quote	Quote
Electrical – Intelligent Vehicle Network	3	AVAIL IVN W/MDC, GPS, APC, WLAN	Option		$ 31,301.52	$ 34,988.84	$ 40,237.16	Quote	Quote
Electrical – Intelligent Vehicle Network	4	Init Voice Enunciator/AVL/GPS/APC/WLAN	Option		$ 46,285.83	$ 51,738.30	$ 59,499.05	Quote	Quote
Electrical – Intelligent Vehicle Network	5	Siemens Transit Master	Not Available		N/A	N/A	N/A	N/A	N/A
Electrical – Intelligent Vehicle Network	6	Transloc Transit Visualization System AVL	Not Available		N/A	N/A	N/A	N/A	N/A
Electrical – Intelligent Vehicle Network	7	Orbital TMS CAD/AVL System W/Voice Annunciation, APC	Not Available		N/A	N/A	N/A	N/A	N/A
Electrical – Intelligent Vehicle Network	8	Intelligent Vehicle System Prewire only	Option		N/A	N/A	N/A	Quote	Quote
Electrical – Intelligent Vehicle Network	9	Mapping and Database Setup for GPS per Customer Requirement	Not Available		N/A	N/A	N/A	N/A	N/A
Electrical – Intelligent Vehicle Network	10	Trimble "Button" Antenna	Not Available		N/A	N/A	N/A	N/A	N/A
Electrical – Intelligent Vehicle Network	11	Low Profile Blade Antenna	Option		N/A	N/A	N/A	Quote	Quote

Category	Item #	Description	Designation	Propulsion (if applicable)	Price	6/1/22 Price Change	4/1/23 Price Change	June 2023 Revised Price	7/19/24 Price
Electrical – Intelligent Vehicle Network	12	Strategic Mapping IVN	Not Available		N/A	N/A	N/A	N/A	N/A
Electrical – Intelligent Vehicle Network	13	Complete INIT on-board ITS system, CoPilot PC, APC, CAD/AVL, Visual/Voice Stop Enunciator, Emergency button	Option		N/A	N/A	N/A	Quote	Quote
		Other Option - Specify							
Electrical - Multiplexing									
Electrical – Multiplexing	1	Dinex, I/O Controls G3 System	Not Available		N/A	N/A	N/A	N/A	N/A
Electrical – Multiplexing	2	I/O Controls Wireless RF Module	Not Available		N/A	N/A	N/A	N/A	N/A
Electrical – Multiplexing	3	I/O Controls, Gateway Module (included in the ITS Prewire Option)	Not Available		N/A	N/A	N/A	N/A	N/A
Electrical – Multiplexing	4	Vansco	Inc In Base		$ -	$ -	$ -	$ -	$ -
Electrical – Multiplexing	5	VDO	Not Available		N/A	N/A	N/A	N/A	N/A
		Other Option - Specify			N/A	N/A	N/A		$ -
Electrical - Pleasure						$ -	$ -		$ -
Electrical – Pleasure	1	none	Inc In Base		$ -	$ -	$ -	$ -	$ -
Electrical – Pleasure	2	Radio Tacho Link Event Data Recorder	Option		$ 5,352.35	$ 5,982.86	$ 6,880.29	Quote	Quote
Electrical – Pleasure	3	Radio	Not Available		N/A	N/A	N/A	N/A	N/A
Electrical – Pleasure	4	Radio Am/FM/CD	Option		$ 552.08	$ 617.12	$ 709.68	$ 657.74	$ 704.77
Electrical - Pleasure	5	On-Board entertainment system including 6 video screen DVD CD-ROM player (Luminator)	Option		N/A	N/A	N/A	$ 15,708.00	$ 16,831.12
Electrical - Pleasure	6	On-Board entertainment system including 6 video screen DVD CD-ROM player (Clever)	Option		N/A		$ -	$ 20,018.63	$ 21,449.96
Electrical - Pleasure	7	On-Board entertainment system including 6 video screen DVD CD-ROM player (Hanover)	Option		N/A		$ -	$ 11,602.94	$ 12,432.55
Electrical - Pleasure	8	Hanover Software Licensing (per Customer, may be required for Electrical - Pleasure Option 7)	Option - Required with Item 7		$ -		$ -	$ 6,750.00	$ 7,232.63
		Other Option - Specify			N/A	N/A	N/A		$ -
Electrical - Public Announcement						$ -	$ -		$ -
Electrical – Public Announcement	1	Drivers Speaker W/Separate Volume Control	Inc In Base		$ 22.23	$ 24.85	$ 28.58	$ -	$ -
Electrical – Public Announcement	2	REI Model 750040 PA W/Handheld Mic W/(6) Flush Mounted Speakers	Option		$ (1,004.85)	$ (1,123.22)	$ (1,291.70)	$ -	$ -
Electrical – Public Announcement	3	Luminator IVS W/GPS Capability, w/LED Sign, W/O Mapping	Option		$ 7,651.88	$ 8,553.27	$ 9,836.26	Quote	Quote
Electrical – Public Announcement	4	DR700 Vehicle Logic Unit W/GPS Capability, w/LED Sign, W/O Mapping	Option		$ 14,661.00	$ 16,388.07	$ 18,846.28	Quote	Quote
Electrical – Public Announcement	5	Clever Devises - Speakeasy II	Inc In Base		$ -	$ -	$ -	$ -	$ -
Electrical – Public Announcement	6	Rei Echo PA System	Option		$ (1,069.30)	$ (1,195.26)	$ (1,374.55)	$ -	$ -
Electrical – Public Announcement	7	Shure Brothers Lapel Microphone w/REI PA System	Option		$ 1,452.76	$ 1,623.90	$ 1,867.48	$ -	$ -
Electrical – Public Announcement	8	Midwest Lapel Microphone (Use w/Voice Annunciation System)	Option		$ 161.56	$ 180.59	$ 207.68	$ 207.68	$ 222.53
Electrical – Public Announcement	9	Interior LED Sign	Inc In Base		In Item #4	N/A	N/A	$ -	$ -
Electrical – Public Announcement	10	One Additional Pair of Interior Speakers	Option		$ 55.41	$ 61.94	$ 71.23	$ 71.23	$ 76.32
Electrical – Public Announcement	11	One Additional exterior Speaker ~~Each~~	Option		$ 28.45	$ 31.80	$ 36.57	$ 36.57	$ 39.18
Electrical – Public Announcement	12	REI w/switch mounted in Driver's Area	Option		$ 1,452.76	$ 1,623.90	$ 1,867.48	$ -	$ -
		Other Option - Specify			N/A	N/A	N/A		$ -
Electrical - Video Surveillance									$ -
Electrical – Video Surveillance	1	none	Inc In Base			$ -	$ -	$ -	$ -
Electrical – Video Surveillance	2	Apollo RoadRunner DVR 2TB 4 Camera System w/Audio	Option		$ 4,477.44	$ 5,004.88	$ 5,755.61	Quote	Quote
Electrical – Video Surveillance	3	Apollo RoadRunner DVR 2TB 8 Camera System w/Audio	Option		$ 7,388.07	$ 8,258.38	$ 9,497.14	Quote	Quote
Electrical – Video Surveillance	4	Apollo RoadRunner DVR 2TB 12 Camera System w/Audio	Option		$ 9,636.99	$ 10,772.23	$ 12,388.06	Quote	Quote
Electrical – Video Surveillance	5	Apollo RoadRunner DVR 2TB 16 Camera System w/Audio	Option		$ 12,315.88	$ 13,766.69	$ 15,831.69	Quote	Quote
Electrical – Video Surveillance	6	Apollo RoadRunner HDR DVR 2TB 4 Camera System & Audio	Option		$ 6,254.13	$ 6,990.87	$ 8,039.50	Quote	Quote
Electrical – Video Surveillance	7	Apollo RoadRunner HDR DVR 2TB 8 Camera System & Audio	Option		$ 9,572.86	$ 10,700.54	$ 12,305.62	Quote	Quote
Electrical – Video Surveillance	8	Apollo RoadRunner HDR DVR 2TB 12 Camera System & Audio	Option		$ 12,186.16	$ 13,621.69	$ 15,664.94	Quote	Quote
Electrical – Video Surveillance	9	Apollo RoadRunner HDR DVR 2TB 16 Camera System & Audio	Option		$ 15,354.76	$ 17,163.55	$ 19,738.08	Quote	Quote
Electrical – Video Surveillance	10	Apollo Wireless Data Download capable	Option		$ 463.49	$ 518.09	$ 595.80	Quote	Quote
Electrical – Video Surveillance	11	Apollo Cellular "Live Look Through" Capable	Option		$ 1,447.30	$ 1,617.79	$ 1,860.46	Quote	Quote
Electrical – Video Surveillance	12	Apollo Vehicle Information Management System (ViM)	Option		$ 6,120.04	$ 6,840.98	$ 7,867.13	Quote	Quote
Electrical – Video Surveillance	13	Apollo video 4K DVR w/9 camera system w/ Audio	Option		$ 10,905.02	$ 12,189.63	$ 14,018.08	Quote	Quote
Electrical – Video Surveillance	14	Cole Hersee 12063 Electrical Tow Connector	Inc In Base		$ -	$ -	$ -	$ -	$ -
Electrical – Video Surveillance	15	(4) Camera Pre Wire Package	Option		$ 145.75	$ 162.92	$ 187.36	Quote	Quote
Electrical – Video Surveillance	16	SEON TX8 8 channel w/1 TB hard drive	Not Available		Obsolete	N/A	N/A	N/A	N/A
Electrical – Video Surveillance	17	SEON DX-HD 13 channel w/1 TB hard drive	Not Available		Obsolete	N/A	N/A	N/A	N/A
Electrical – Video Surveillance	18	SEON 2 TB hard drive upgrade	Option		$ 3,881.25	$ 4,338.46	$ 4,989.23	Quote	Quote
Electrical – Video Surveillance	19	SEON WP00AG4 Explorer DX12 and DX-HD Smart-Link 12 VDC module to DVR cable, diagnostic indicator/alarm button & harness, GPS4 receiver mount.	Not Available		Obsolete	N/A	N/A	N/A	N/A
Electrical – Video Surveillance	20	SEON CQ903A integrated IR Dome day/Night 600TVL interior camera, audio, 2.9 mm lens.	Option		$ 253.80	$ 283.70	$ 326.25	Quote	Quote
Electrical – Video Surveillance	21	SEON CA904EI Day/Night 600TVL camera, exterior (w/infrared, no audio), 3.6 mm lens (Replaced with C3Q9PD04AF-BK)	Option		$ 371.25	$ 414.98	$ 477.23	Quote	Quote
Electrical – Video Surveillance	22	SEON CJ904A Dome Day/Night 600TVL camera, audio, 3.6mm lens w/mount (Replaced with C3Q9PD04AF-BK)	Option		$ 253.80	$ 283.70	$ 326.25	Quote	Quote
Electrical – Video Surveillance	23	SEON CHW702EJ HD progressive scan camera, 16mm lens, exterior (no audio) and APPINJ POE injector w/mount.	Not Available		Obsolete	N/A	N/A	N/A	N/A
Electrical – Video Surveillance	24	SEON SRLGA07 Smart-Reach Lite, 2.4GHz Wireless bridge w/antenna	Option		N/A	N/A	N/A	Quote	Quote
Electrical – Video Surveillance	25	SEON HDD-STB Vmax View software, docking station & handheld mouse.	Option		N/A	N/A	N/A	Quote	Quote
Electrical – Video Surveillance	26	SEON LMK LCD monitor, 5.6 inch, AC charger, battery pack	Option		$ 354.06	$ 395.77	$ 455.13	Quote	Quote
Electrical – Video Surveillance	27	Safety Vision RR6000 Pro w/(4) Digital Color Cameras, 120 GB DVR, w/Audio	Option		$ 11,812.94	$ 13,204.50	$ 15,185.18	Quote	Quote
Electrical – Video Surveillance	28	Angel Trax - 6 HD/IR Camera System - 500 G HD Storage with SD Card Backup and Wi-Fi ready	Option		N/A	N/A	N/A	Quote	Quote
Electrical – Video Surveillance	29	Angel Trax - 8 HD/IR Camera System - 500 G HD Storage with SD Card Backup and Wi-Fi ready	Option		N/A	N/A	N/A	Quote	Quote
Electrical – Video Surveillance	30	Angel Trax - 12 HD/IR Camera System - 750 G HD Storage with SD Card Backup and Wi-Fi ready	Option		N/A	N/A	N/A	Quote	Quote
Electrical – Video Surveillance	31	Angel Trax -16 HD/IR Camera System - 750 G HD Storage with SD Card Backup and Wi-F- ready	Option		N/A	N/A	N/A	Quote	Quote
Electrical – Video Surveillance	32	Angel Trax Upgrade to 1 Tb - Double Stacked 500 G HD	Option		N/A	N/A	N/A	Quote	Quote
Electrical – Video Surveillance	33	Angel Trax Live View, Live GPS, and System Health Notification option	Option		N/A	N/A	N/A	Quote	Quote
Electrical – Video Surveillance	34	March Network (8) Camera System	Option		$ 14,435.08	$ 16,135.53	$ 18,555.86	Quote	Quote
Electrical – Video Surveillance	35	REI Bus Watch Digital	Option		$ 6,705.24	$ 7,495.12	$ 8,619.38	Quote	Quote
Electrical – Video Surveillance	36	TVSS Claim Safe III w/4 Digital Cameras	Not Available		N/A	N/A	N/A	N/A	N/A
Electrical – Video Surveillance	37	Mobileview IV Digital, (5) Cameras, 250 GB DVR, w/Audio	Not Available		N/A	N/A	N/A	N/A	N/A
Electrical – Video Surveillance	38	Mobilview PENTA DVR	Not Available		N/A	N/A	N/A	N/A	N/A
Electrical – Video Surveillance	39	Mobileview MV3000 DVR	Not Available		N/A	N/A	N/A	N/A	N/A
Electrical – Video Surveillance	40	Rear View Camera System	Option		N/A	N/A	N/A	Quote	Quote

Category	Item #	Description	Designation	Propulsion (if applicable)	Price	6/1/22 Price Change	4/1/23 Price Change	June 2023 Revised Price	7/19/24 Price
Electrical – Video Surveillance	41	Add Additional Color Camera	Option		$ 274.01	$ 306.29	$ 352.23	Quote	Quote
Electrical – Video Surveillance	42	Central Station Mobileview (Kalatel)	Not Available		N/A	N/A	N/A	N/A	N/A
Electrical – Video Surveillance	43	Verint 4 Camera System	Not Available		N/A	N/A	N/A	N/A	N/A
Electrical – Video Surveillance	44	Verint 5 Camera System	Not Available		N/A	N/A	N/A	N/A	N/A
Electrical – Video Surveillance	45	Video Test Kit Mobileview IV - Kalatal	Not Available		N/A	N/A	N/A	N/A	N/A
Electrical – Video Surveillance	46	Desk Top Viewing Station (REI)	Option		N/A	N/A	N/A	Quote	Quote
Electrical – Video Surveillance	47	Velvac Hyperion Virtual DVR (up to 7 camera views through dash mounted tablet)	Not Available		N/A	N/A	N/A	N/A	N/A
		Other Option - Specify			N/A	N/A	N/A		
Engine - Accessories									
Engine – Accessories	1	Cummins Compucheck Fittings for (Air, Oil, Fuel & Coolant Testing)	Not Available	Diesel/CNG/Hybrid Only	N/A	N/A	N/A	N/A	N/A
Engine – Accessories	2	Williams Controls 41 Degree Throttle Pedal	Not Available	Diesel/CNG/Hybrid Only	N/A	N/A	N/A	N/A	N/A
Engine – Accessories	3	Williams Controls 45 Degree Throttle Pedal	Inc In Base	Diesel/CNG/Hybrid Only	N/A	N/A	N/A	$ -	$ -
Engine – Accessories	4	Teleflex Adjustable Throttle and Brake Pedal	Not Available	Diesel/CNG/Hybrid Only	N/A	N/A	N/A	N/A	N/A
Engine – Accessories	5	STD Donaldson (RBX00- 2277) - Air Intake Restriction	Discontinued	Diesel/CNG/Hybrid Only	$ 23.93	$ 26.75	$ 30.76	N/A	N/A
Engine – Accessories	6	Ashcraft (25-1490a02L) - Air Intake Restriction	Not Available	Diesel/CNG/Hybrid Only	N/A	N/A	N/A	N/A	N/A
Engine – Accessories	7	Filterminder # SP - 3832 - Air Intake Restriction	Not Available	Diesel/CNG/Hybrid Only	N/A	N/A	N/A	N/A	N/A
Engine – Accessories	8	Donaldson Informer - Air Intake Restriction	Not Available	Diesel/CNG/Hybrid Only	N/A	N/A	N/A	N/A	N/A
Engine – Accessories	9	Spin on Filters Supplied By Engine Manufacturer (Fleetguard), L9 Engines Only	Option	Diesel/CNG/Hybrid Only	$ 1,391.76	$ 1,555.71	$ 1,789.07	$ 246.56	$ 264.19
Engine – Accessories	10	By Pass Filter - Spinner - Bypass Model ~~976~~ 576 (976 is obsolete)	Option	Diesel/Hybrid	N/A	N/A	N/A	$ 1,615.21	$ 1,730.70
Engine – Accessories	10	By Pass Filter - Spinner - Bypass Model ~~976~~ 576 (976 is obsolete)	Option	CNG	N/A		$ -	$ 1,428.03	$ 1,530.13
Engine – Accessories	11	Sample Test Port - Titan Probalizer OD-1014 (Obsolete - added replacement in otion #26)	Discontinued	Diesel/CNG/Hybrid Only	$ (36.10)	$ (40.35)	$ (46.41)	N/A	N/A
Engine – Accessories	12	FEMCO Oil Drain Plug	Option	Diesel/CNG/Hybrid (L9) Only	$ 83.34	$ 93.16	$ 107.13	$ 107.13	$ 114.79
Engine – Accessories	13	Magnetic Drain Plug	Inc In Base	Diesel/CNG/Hybrid Only	N/A	N/A	N/A	$ -	$ -
Engine – Accessories	14	Test Ports Shall Be Provided for Commonly Checked Functions on the Bus (Transmission Drain Plugs)	Option	Diesel/CNG	N/A	N/A	N/A	$ 93.44	$ 100.12
Engine – Accessories	16	Rear Run Box Starter - Delco MT 42 - 24v Electric	Inc In Base	Diesel/CNG/Hybrid Only	$ -	$ -	$ -	$ -	$ -
Engine – Accessories	17	Rear Run Box	Inc In Base	Diesel/CNG/Hybrid Only	$ -	$ -	$ -	$ -	$ -
Engine – Accessories	18	Rear Run Box Rear Hand Throttle	Inc In Base	Diesel/CNG/Hybrid Only	$ 4.91	$ 5.49	$ 6.31	$ -	$ -
Engine – Accessories	19	Rear Run Box Engine Hour Meter	Inc In Base	Diesel/CNG/Hybrid Only	$ -	$ -	$ -	$ -	$ -
Engine – Accessories	20	Rear Run Box A/C Hour Meter	Inc In Base	Diesel/CNG/Hybrid Only	N/A	N/A	N/A	$ -	$ -
Engine – Accessories	21	Rear Run Box Voltmeter J1939	Inc In Base	Diesel/CNG/Hybrid Only	$ -	$ -	$ -	$ -	$ -
Engine – Accessories	22	Rear Run Box Oil Pressure Gauge J1939	Inc In Base	Diesel/CNG/Hybrid Only	$ -	$ -	$ -	$ -	$ -
Engine – Accessories	23	Rear Run Box Coolant Gauge J1939	Inc In Base	Diesel/CNG/Hybrid Only	$ -	$ -	$ -	$ -	$ -
Engine – Accessories	24	Mechanical Gauges - Murphy Oil Pressure and Coolant Temperature	Discontinued	Diesel/CNG/Hybrid Only	$ -	$ -	$ -	N/A	N/A
Engine - Accessories	25	Adjustable brake and accelerator pedals (minimum 3 in.)	Not Available	Diesel/CNG/Hybrid Only	N/A	N/A	N/A	N/A	N/A
Engine - Accessories	26	Sample Test Port - KST18N-VC	Option		N/A		$ -	$ 82.42	$ 88.31
Engine - Accessories	27	High Grade Motor	Option	Electric / Fuel Cell				$ 27,923.25	$ 29,919.77
		Other Option - Specify			N/A	N/A	N/A		$ -
Engine - Diagnostics						$ -	$ -		$ -
Engine – Diagnostics	1	Cummins Inline 6 Adapter Kit, Insite Basic	Option		See Section 10 for bus model specific diagnostics	N/A	N/A	Quote	Quote
Engine – Diagnostics	2	Cummins Quickserve Online 1 Year Subscription	Option		See Section 10 for bus model specific diagnostics	N/A	N/A	Quote	Quote
Engine – Diagnostics	3	Cummins Quickserve Online each Additional Year Subscription	Option		See Section 10 for bus model specific diagnostics	N/A	N/A	Quote	Quote
Engine – Diagnostics	4	Cummins INSITE Diagnostic Program 1 Year Subscription	Option		See Section 10 for bus model specific diagnostics	N/A	N/A	Quote	Quote
Engine – Diagnostics	5	Cummins INSITE Diagnostic Program each Additional Year Subscription	Option		See Section 10 for bus model specific diagnostics	N/A	N/A	Quote	Quote
Engine – Diagnostics	6	ISL G Fold Up Wiring Diagram	Option		See Section 10 for bus model specific diagnostics	N/A	N/A	Quote	Quote
		Other Option - Specify			See Section 10 for bus model specific diagnostics	N/A	N/A	Quote	Quote
Engine - Tune Up Kit						$ -	$ -		$ -
Engine – Tune Up Kit	1	Cummins Tune - Up Kit (Includes the Following)	Option		$ 7,675.22	$ 8,579.37	$ 9,866.27	$ 9,866.27	$ 10,571.71
Engine – Tune Up Kit	2	Includes - Pressure Gauge	Included in Line 1		Included in Line 1	N/A	N/A	Included in Line 1	Included in Line 1
Engine – Tune Up Kit	3	Includes - Torque Wrench	Included in Line 1		Included in Line 1	N/A	N/A	Included in Line 1	Included in Line 1
Engine – Tune Up Kit	4	Includes - Oil Filter Wrench	Included in Line 1		Included in Line 1	N/A	N/A	Included in Line 1	Included in Line 1
Engine – Tune Up Kit	5	Includes - Engine Coolant & Fuel Wrench	Included in Line 1		Included in Line 1	N/A	N/A	Included in Line 1	Included in Line 1
Engine – Tune Up Kit	6	Includes - Belt Tension Gauge	Included in Line 1		Included in Line 1	N/A	N/A	Included in Line 1	Included in Line 1
Engine – Tune Up Kit	7	Includes - Belt Tension Gauge	Included in Line 1		Included in Line 1	N/A	N/A	Included in Line 1	Included in Line 1
Engine – Tune Up Kit	8	Includes - Charge- A/C CAC Pressure Kit	Included in Line 1		Included in Line 1	N/A	N/A	Included in Line 1	Included in Line 1
Engine – Tune Up Kit	9	Includes - Engine Barring Gear	Included in Line 1		Included in Line 1	N/A	N/A	Included in Line 1	Included in Line 1
Engine – Tune Up Kit	10	Includes - Torque Wrench	Included in Line 1		Included in Line 1	N/A	N/A	Included in Line 1	Included in Line 1
Engine – Tune Up Kit	11	Includes - Roller Follower Rem. & Installation Tool	Included in Line 1		Included in Line 1	N/A	N/A	Included in Line 1	Included in Line 1
Engine – Tune Up Kit	12	Includes - Compucheck Fitting	Included in Line 1		Included in Line 1	N/A	N/A	Included in Line 1	Included in Line 1
		Other Option - Specify							$ -
Flare Box									$ -
Fare Box	1	No Fare box, Power Circuit and Ground strap only	Inc In Base		$ -	$ -	$ -	$ -	$ -
Fare Box	2	GFI 36" Fastfare	Option		$ 15,159.38	$ 16,945.15	$ 19,486.93	$ 28,811.75	$ 30,871.79
Fare Box	3	GFI 36" Odyssey	Discontinued		$ 15,159.38	$ 16,945.15	$ 19,486.93	N/A	N/A
Fare Box	4	GFI 41" Fast Fare	Option		$ 15,159.38	$ 16,945.15	$ 19,486.93	$ 28,811.75	$ 30,871.79
Fare Box	5	GFI 41" Odyssey	Discontinued		$ 15,159.38	$ 16,945.15	$ 19,486.93	N/A	N/A
Fare Box	6	Diamond Model H w/Two (2) Vaults	Not Available		N/A	N/A	N/A	N/A	N/A
Fare Box	7	Diamond Model SV w/Two (2) Vaults	Option		$ 1,588.68	$ 1,775.83	$ 2,042.20	$ 2,640.00	$ 2,828.76
Fare Box	8	Main T1 Fare box w/Two V1 Vaults in Standard Paint Colors	Option		$ 1,195.15	$ 1,335.94	$ 1,536.33	$ 2,908.13	$ 3,116.06
Fare Box	9	Main M 4 Fare box w/Two V4 Vaults in Standard Paint Colors	Option		$ 991.10	$ 1,107.85	$ 1,274.03	$ 2,392.50	$ 2,563.56
Fare Box	10	Main SL 5 Fare box w/Two V5 Vaults in Standard Paint Colors	Discontinued		$ 3,033.06	$ 3,390.35	$ 3,898.91	N/A	N/A
Fare Box	11	Cubic Fare box	Not Available		N/A	N/A	N/A	N/A	N/A
Fare Box	12	Denominator Manual Passenger Counter	Not Available		N/A	N/A	N/A	N/A	N/A
Fare Box	14	Globe Transfer Cutter	Option		$ 61.12	$ 68.32	$ 78.57	$ 87.12	$ 93.35
		Other Option - Specify			N/A	N/A	N/A		$ -
HVAC						$ -	$ -		$ -
HVAC	1	Thermo King System (Per Technical Specification)	Inc In Base		$ -	$ -	$ -	$ -	$ -
HVAC	2	TK Intelligaire 3 W/X 616 Compressor, R134A, Reliance Brushless Cond. & Evap. Motors	Not Available		$ -	$ -	$ -	$ -	$ -
HVAC	3	TK System w/General Electric Field Wound Motors (Cond & Evap)	Not Available		N/A	N/A	N/A	N/A	N/A
HVAC	4	TK System w/General Electric P.M. Motors	Not Available		N/A	N/A	N/A	N/A	N/A
HVAC	5	TK System w/X430Compressor	Option	Diesel/CNG	$ (1,030.48)	$ (1,151.87)	$ (1,324.65)	$ (1,090.00)	$ (1,090.00)

Category	Item #	Description	Designation	Propulsion (if applicable)	Price	6/1/22 Price Change	4/1/23 Price Change	June 2023 Revised Price	7/19/24 Price
HVAC	6	TK System w/S391 Screw Compressor	Inc In Base		$ -	$ -	$ -	$ -	$ -
HVAC	7	TK System w/S616 Screw Compressor	Not Available		$ -	$ -	$ -	$ -	$ -
HVAC	8	TK Electric HVAC System	Option	Diesel/CNG	$ 20,875.00	$ 23,334.08	$ 26,834.19	Quote	Quote
HVAC	8	TK Electric HVAC System	Option	Hybrid	$ 1,675.35	$ 1,872.71	$ 2,153.61	Quote	Quote
HVAC	9	TK Pressure and Return Gauges Mounted to Unit	Option		$ 391.88	$ 438.04	$ 503.75	$ 503.75	$ 539.77
HVAC	10	R407c Refrigerant	Option			$ -	$ -	$ -	$ -
HVAC	11	MCC Drivers Heater W/Brushless Motors	Option		$ -	$ -	$ -	$ 440.98	$ 472.51
HVAC	12	MCC Drivers Heater W/Brush Motors	Discontinued		$ -	$ -	$ -	N/A	N/A
HVAC	13	MCC Front Stepwell/Threshold Heater W/Brushless Motor (Each)	Inc In Base		$ 359.98	$ 402.39	$ 462.74	$ -	$ -
HVAC	14	MCC Underseat/Rear Stepwell Heater W/Brushless Motor (Each)	Inc In Base		N/A	N/A	N/A	$ -	$ -
HVAC	15	MCC Underseat/Rear Stepwell Heater W/Brush Motor (Each)	Not Available		N/A	N/A	N/A	N/A	N/A
HVAC	16	Sutrak All Electric Air Conditioning - Roof Mount	Discontinued		$ 71,185.24	$ 79,570.86	$ 91,506.49	N/A	N/A
HVAC	17	Sutrak All Electric Air Conditioning - Rear Mount	Discontinued		$ 45,324.40	$ 50,663.61	$ 58,263.16	N/A	N/A
HVAC	18	Change Floor Heating to ACT Convection Heater	Option		$ 437.26	$ 488.77	$ 562.08	$ -	$ -
HVAC	19	ACT Espar Fuel-Fired Supplemental Coolant Heater	Not Available		N/A	N/A	N/A	N/A	N/A
HVAC	20	Warm Welcome Mat (Rear Door)	Not Available		N/A	N/A	N/A	N/A	N/A
HVAC	21	Warm Welcome Mat (Installed on W/C Ramp)	Not Available		N/A	N/A	N/A	N/A	N/A
HVAC	22	Eberspacher AC 136 G3 AE	Not Available		N/A	N/A	N/A	N/A	N/A
HVAC	23	Air Purification System (Thermo King)	Option		$ 7,520.29	$ 8,406.18	$ 9,667.11	$ 3,828.00	$ 4,101.70
HVAC	24	Other Option - Air Purification System (Puradigm FLOW100 12V)	Option		$ 2,849.00	$ 3,184.61	$ 3,662.30	$ 4,414.84	$ 4,730.50
HVAC	25	Sanuv Air Filter System	Option		$ 8,527.45	$ 9,531.98	$ 10,961.78	$ 4,903.28	$ 5,253.86
HVAC Special Purpose						$ -	$ -		$ -
HVAC Special Purpose	1	TK Intelligaire - Diagnostics	Option		$ 1,592.38	$ 1,779.96	$ 2,046.95	$ 2,046.95	$ 2,193.31
HVAC Special Purpose	2	Carrier Micromax ATE Diagnostics	Option		$ 619.76	$ 692.77	$ 796.69	$ 796.69	$ 853.65
HVAC Special Purpose	3	Webasto Diagnostic Tool	Option		$ 416.28	$ 465.32	$ 535.12	$ 535.12	$ 573.38
HVAC Special Purpose	4	Van Steenburgh Regional Recovery System (JV90- 1)	Option		$ 11,167.31	$ 12,482.82	$ 14,355.24	$ 14,355.24	$ 15,381.64
HVAC Special Purpose	5	Eberspacher diagnostics	Not Available		N/A	N/A	N/A	N/A	N/A
		Other Option - Specify	Not Available		N/A	N/A	N/A	N/A	N/A
Manuals						$ -	$ -		$ -
Manuals	1	Drivers Handbook (1 Manual/1 CD per Bus Order)	Option		$ 90.00	$ 100.60	$ 115.69	$ 115.69	$ 123.96
Manuals	2	Service Manual (1 Manual/1 CD per Bus Order	Option		$ 210.00	$ 234.74	$ 269.95	$ 269.95	$ 289.25
Manuals	3	Parts Manual (1 Manual/1CD per Bus Order)	Option		$ 240.00	$ 268.27	$ 308.51	$ 308.51	$ 330.57
Manuals	4	Electrical Schematics (1 Manual/1CD per Bus Order)	Option		$ 180.00	$ 201.20	$ 231.38	$ 231.38	$ 247.93
Manuals	5	Vendor Manuals (1 Manual/1 CD per Bus Order)	Option		$ 31.38	$ 35.08	$ 40.34	$ 40.34	$ 43.22
Manuals	6	Additional Driver's Handbook	Option		$ 90.00	$ 100.60	$ 115.69	$ 115.69	$ 123.96
Manuals	8	Additional Parts Manuals	Option		$ 90.00	$ 100.60	$ 115.69	$ 115.69	$ 123.96
Manuals	9	Additional Electrical Schematics	Option		$ 90.00	$ 100.60	$ 115.69	$ 115.69	$ 123.96
Manuals	10	Additional Electrical Multiplex	Option		$ 650.00	$ 726.57	$ 835.56	$ 835.56	$ 895.30
Manuals	11	Additional Cummins ISL Manuals (4 Books)	Option		$ 49.92	$ 55.80	$ 64.17	$ 64.17	$ 68.76
Manuals	12	Additional Allison B400 Manuals (6 Books)	Option		$ 59.04	$ 65.99	$ 75.89	$ 75.89	$ 81.32
Manuals	13	Additional ZF 6hp594 Manuals (5 Books)	Option		quote	N/A	N/A	Quote	Quote
Manuals	14	Additional Voith Manuals (7 Books)	Option		quote	N/A	N/A	Quote	Quote
Manuals	15	Additional Amerex Manuals	Option		$ 132.00	$ 147.55	$ 169.68	$ 169.68	$ 181.81
Manuals	16	Additional TRW Steering Gear Manuals	Option		quote	N/A	N/A	Quote	Quote
Manuals	17	Additional Thermo King Manual	Option		$ 180.00	$ 201.20	$ 231.38	$ 231.38	$ 247.93
Manuals	18	Additional Carrier HVAC Manuals (2 Books)	Option		quote	N/A	N/A	Quote	Quote
		Other Option - Specify			quote	N/A	N/A		
Safety						$ -	$ -		
Safety	2	Amerex V-25lb ABC System	Option	Electric	$ 2,519.10	$ 2,815.85	$ 3,238.23	Quote	Quote
Safety	3	Amerex VH-25lb ABC Cylinder	Option	Electric	$ 7,862.40	$ 8,788.59	$ 10,106.88	Quote	Quote
Safety	4	Amerex V-30lb ABC Cylinder	Option	CNG	$ (47.62)	$ (53.23)	$ (61.21)	Quote	Quote
Safety	5	Amerex Fire Suppression System w/Automatic Shutdown, Programmable Heat Detectors (PHDs) and Automatic Maintenance Testing (AMT)	Not Available		N/A	N/A	N/A	N/A	N/A
Safety	6	Amerex Safety Net 2-Zone Fire Detection/Suppression System	Option		$ 3,712.66	$ 4,150.01	$ 4,772.51	Quote	Quote
Safety	7	Jomar Firestick Liquid	Not Available		N/A	N/A	N/A	N/A	N/A
Safety	8	Kidde - Dual Spectrum	Option	Diesel/Hybrid	$ (840.97)	$ (940.04)	$ (1,081.04)	$ (446.74)	$ (446.74)
Safety	8	Kidde - Dual Spectrum	Option	CNG	N/A		$ -	$ 1,260.30	$ 1,350.41
Safety	8	Kidde - Dual Spectrum	Option	Battery-Electric	$ -		$ -	$ 5,565.69	$ 5,963.64
Safety	9	Kidde - Ltd Spectrum	Not Available		N/A	N/A	N/A	N/A	N/A
Safety	10	Kidde TLSE Spectrum	Discontinued		$ 5,040.43	$ 5,634.19	$ 6,479.32	N/A	N/A
Safety	11	Fogmaker Fire Suppression System (water mist)	Option	Diesel/CNG/Hybrid	$ 248.41	$ 277.67	$ 319.32	$ -	$ -
Safety	11	Fogmaker Fire Suppression System (water mist)	Option	Battery-Electric			$ -	$ 4,643.44	$ 4,975.45
Safety	14	Firetrace Automatic Fire Detection/Suppression System (gas detection base system)	Not Available		N/A	N/A	N/A	N/A	N/A
Safety	15	Remove Amerex	Option	CNG	$ (3,418.06)	$ (3,820.71)	$ (4,393.81)	$ (4,393.81)	$ (4,393.81)
Safety	15	Remove Amerex	Option	Diesel/Hybrid			$ -	$ (3,992.98)	$ (3,992.98)
Safety	16	Fire Extinguisher and Safety Triangle Kit	Inc In Base		$ -	$ -	$ -	$ -	$ -
Safety	17	Twenty - Four Unit First Aid Kit	Option		$ 73.56	$ 82.23	$ 94.56	$ 94.56	$ 101.32
Safety	18	Ten Unit First Aid Kit	Option		$ 73.56	$ 82.23	$ 94.56	$ 76.09	$ 81.53
Safety	19	Blood Borne Pathogens Kit	Option		$ 36.52	$ 40.82	$ 46.95	$ 55.58	$ 59.55
Safety	20	Bio - Hazard Disposal Kit	Option		$ 36.55	$ 40.86	$ 46.98	$ 46.98	$ 50.34
Safety	21	High Temperature Protective Sleeves for Component Lines	Option	Diesel/CNG	N/A	N/A	N/A	$ 194.55	$ 208.46
Safety	22	(3) 20 - Minute Road Flares	Discontinued		$ 52.54	$ 58.73	$ 67.54	N/A	N/A
Safety	23	Wheel Chocks (Per Set)	Option		$ 121.80	$ 136.15	$ 156.57	$ 156.57	$ 167.76
Safety	24	Electric - Standard no fire suppression	Inc In Base	Battery-Electric	$ -	$ -	$ -	$ -	$ -
		Other Option - Specify			N/A	N/A	N/A		$ -
Steering						$ -	$ -		$ -
Steering	1	Ross Model TS 65	Not Available		N/A	N/A	N/A	N/A	N/A
Steering	2	Sheppard Model M110	Inc In Base		$ -	$ -	$ -	$ -	$ -
Steering	3	ZF ReAX ~~TRW~~ Electric Assisted Steering with Tilt and Telescopic Features	Option		$ 2,225.83	$ 2,488.03	$ 2,861.24	$ 3,208.68	$ 3,438.10
Steering	4	TRW TAS650S	Not Available		N/A	N/A	N/A	N/A	N/A
Steering	5	Standard Size Padded Steering Wheel	Inc In Base		$ -	$ -	$ -	$ -	$ -
Steering	6	Douglas Autotech 'Double-Knuckle' Steering Column (PN 9003148-C) (Double Tilt)	Option		$ 354.64	$ 396.42	$ 455.88	$ 455.88	$ 488.48
		Other Option - Specify				$ -	$ -		$ -
Towing & Hoisting						$ -	$ -		$ -
Towing & Hoisting	1	Set Towing Adapters/Tow Bar	Option		$ 200.50	$ 224.12	$ 257.74	$ 801.25	$ 858.54
Towing & Hoisting	2	Set of Hoist Adapters (Includes the 4 Following Items)	Option		$ 260.66	$ 291.37	$ 335.07	$ 335.07	$ 359.03
Towing & Hoisting	3	Incl w/set - Front Saddle	Not Available		N/A	N/A	N/A	N/A	N/A
Towing & Hoisting	4	Incl w/set - Front Adapters	Not Available		N/A	N/A	N/A	N/A	N/A
Towing & Hoisting	5	Incl w/set - Rear Saddle	Not Available		N/A	N/A	N/A	N/A	N/A
Towing & Hoisting	6	Incl w/set - Rear Adapters	Not Available		N/A	N/A	N/A	N/A	N/A
Towing & Hoisting	7	Front towing point	Inc In Base		$ -	$ -	$ -	$ -	$ -
Towing & Hoisting	8	Rear towing point	Not Available		N/A	N/A	N/A	N/A	N/A
		Other Option - Specify				$ -	$ -		$ -
Training									$ -
Training	1	none	Inc In Base			$ -	$ -	$ -	$ -
Training	2	Operator Orientation - 4 Hours, (Procuring Agency)	Option		$ 877.20	$ 980.53	$ 1,127.61	$ 1,127.61	$ 1,208.24
Training	3	Operator Orientation - 8 Hours, (Procuring Agency)	Option		$ 1,754.40	$ 1,961.07	$ 2,255.23	$ 2,255.23	$ 2,416.48
Training	4	Operator Orientation - Additional hours of training, per hour	Option		$ 219.30	$ 245.13	$ 281.90	$ 281.90	$ 302.06
Training	5	Maintenance Orientation - 4 Hours, (Procuring Agency)	Option		$ 877.20	$ 980.53	$ 1,127.61	$ 1,127.61	$ 1,208.24
Training	6	Maintenance Orientation - 24 Hours, (Procuring Agency)	Option		$ 5,263.20	$ 5,883.20	$ 6,765.69	$ 6,765.69	$ 7,249.43
Training	7	Maintenance Orientation - 32 Hours, (Procuring Agency)	Option		$ 7,017.60	$ 7,844.27	$ 9,020.91	$ 9,020.91	$ 9,665.91
Training	8	Maintenance Orientation - Additional hours of training, per hour	Option		$ 219.30	$ 245.13	$ 281.90	$ 281.90	$ 302.06
Training	9	Technical Training - 96 Hours, (Procuring Agency) Price Proposal Form	Option		$ 29,220.00	$ 32,662.12	$ 37,561.43	$ 37,561.43	$ 40,247.08
Training	10	Technical Training - Additional hours of training, per hour	Option		$ 310.50	$ 347.08	$ 399.14	$ 399.14	$ 427.68
Training	11	OEM Training - Two Slots for "Train the Trainers" Technical Instruction	Option		$ 3,600.00	$ 4,024.08	$ 4,627.69	$ 4,627.69	$ 4,958.57
Training	12	OEM Training - Additional Slots for "Train the Trainers" Technical Instruction	Option		$ 1,800.00	$ 2,012.04	$ 2,313.85	$ 2,313.85	$ 2,479.29
Training	13	Body, Chassis, Suspension and Steering - (8 Hour Class), Procuring Agency	Option		$ 1,754.40	$ 1,961.07	$ 2,255.23	$ 2,255.23	$ 2,416.48
Training	14	Body, Chassis, Suspension and Steering - (24 Hour Class), Procuring Agency	Option		$ 5,263.20	$ 5,883.20	$ 6,765.69	$ 6,765.69	$ 7,249.43
Training	15	Body, Chassis, Suspension and Steering - Additional hours of training per hour, Procuring Agency	Option		$ 219.30	$ 245.13	$ 281.90	$ 281.90	$ 302.06
Training	16	Electrical and Electronics - (8 Hour Class), Procuring Agency	Option		$ 1,754.40	$ 1,961.07	$ 2,255.23	$ 2,255.23	$ 2,416.48
Training	17	Electrical and Electronics - (24 Hour Class), Procuring Agency	Option		$ 5,263.20	$ 5,883.20	$ 6,765.69	$ 6,765.69	$ 7,249.43
Training	18	Electrical and Electronics - Additional hours of training per hour, Procuring Agency	Option		$ 219.30	$ 245.13	$ 281.90	$ 281.90	$ 302.06
Training	19	Air and Brake Systems - (24 Hour Class), Procuring Agency	Option		$ 5,263.20	$ 5,883.20	$ 6,765.69	$ 6,765.69	$ 7,249.43
Training	20	Air and Brake Systems - (8 Hour Class), Procuring Agency	Option		$ 1,754.40	$ 1,961.07	$ 2,255.23	$ 2,255.23	$ 2,416.48
Training	21	Air and Brake Systems - Additional hours of training per hour, Procuring Agency	Option		$ 219.30	$ 245.13	$ 281.90	$ 281.90	$ 302.06
Training	22	HVAC and Climate Controls - (4 Hour Class), Procuring Agency	Option		$ 1,560.00	$ 1,743.77	$ 2,005.33	$ 2,005.33	$ 2,148.71
Training	23	HVAC and Climate Controls - (8 Hour Class), Procuring Agency	Option		$ 3,120.00	$ 3,487.54	$ 4,010.67	$ 4,010.67	$ 4,297.43
Training	24	HVAC and Climate Controls - Additional hours of training per hour, Procuring Agency	Option		$ 390.00	$ 435.94	$ 501.33	$ 501.33	$ 537.18
Training	25	Engine - (8 Hour Class), per Student at Procuring Agency	Option		$ 3,360.00	$ 3,755.81	$ 4,319.18	$ 4,319.18	$ 4,628.00
Training	26	Engine - (24 Hour Class), per Student at Procuring Agency	Option		$ 10,080.00	$ 11,267.42	$ 12,957.54	$ 12,957.54	$ 13,884.00
Training	27	Engine - additional hour of training per hour, per Student at Procuring Agency	Option		$ 420.00	$ 469.48	$ 539.90	$ 539.90	$ 578.50
Training	28	Transmission - (8 Hour Class), per Student, at Procuring Agency	Option		$ 4,080.00	$ 4,560.62	$ 5,244.72	$ 5,244.72	$ 5,619.71
Training	29	Transmission - (24 Hour Class), per Student, at Procuring Agency	Option		$ 12,240.00	$ 13,681.87	$ 15,734.15	$ 15,734.15	$ 16,859.14
Training	30	Transmission - Additional hour of training per hour, per Student, at Procuring Agency	Option		$ 510.00	$ 570.08	$ 655.59	$ 655.59	$ 702.46

Category	Item #	Description	Designation	Propulsion (if applicable)	Price	6/1/22 Price Change	4/1/23 Price Change	June 2023 Revised Price	7/19/24 Price
Training	31	Wheelchair Ramp - (2 Hour Class), at Procuring Agency	Option		$ 438.60	$ 490.27	$ 563.81	$ 563.81	$ 604.12
Training	32	Wheelchair Ramp - (4 Hour Class), at Procuring Agency	Option		$ 877.20	$ 980.53	$ 1,127.61	$ 1,127.61	$ 1,208.24
Training	33	Wheelchair Ramp - Additional hour of training per hour, at Procuring Agency	Option		$ 219.30	$ 245.13	$ 281.90	$ 281.90	$ 302.06
Training	34	Destination Sign - (4 Hour Class), at Procuring Agency	Option		$ 1,200.00	$ 1,341.36	$ 1,542.56	$ 1,542.56	$ 1,652.86
Training	35	Destination Sign - (8 Hour Class), at Procuring Agency	Option		$ 2,400.00	$ 2,682.72	$ 3,085.13	$ 3,085.13	$ 3,305.71
Training	36	Destination Sign - Additional hour of training per hour, at Procuring Agency	Option		$ 300.00	$ 335.34	$ 385.64	$ 385.64	$ 413.21
Training	38	Axles and Tires - Procuring Agency. Included in Body/Chassis	Not Available		N/A	N/A	N/A	N/A	N/A
Training	39	Fire Suppression - (4 Hour Class), at Procuring Agency	Option		$ 960.00	$ 1,073.09	$ 1,234.05	$ 1,234.05	$ 1,322.29
Training	40	Fire Suppression - (8 Hour Class), at Procuring Agency	Option		$ 1,920.00	$ 2,146.18	$ 2,468.10	$ 2,468.10	$ 2,644.57
Training	41	Fire Suppression - Additional hour of training per hour, at Procuring Agency	Option		$ 240.00	$ 268.27	$ 308.51	$ 308.51	$ 330.57
Training	42	Engine OEM Training (8 Hour Class, Per Person), at Local Dealer	Option		$ 720.00	$ 804.82	$ 925.54	$ 925.54	$ 991.71
Training	43	Engine OEM Training (24 Hour Class, Per Person), at Local Dealer	Option		$ 2,160.00	$ 2,414.45	$ 2,776.62	$ 2,776.62	$ 2,975.14
Training	44	Engine OEM Training (Additional hour of training per hour, Per Person), at Local Dealer	Option		$ 90.00	$ 100.60	$ 115.69	$ 115.69	$ 123.96
Training	45	Transmission Training (8 Hour Class, Per Person), at Local Dealer	Option		$ 720.00	$ 804.82	$ 925.54	$ 925.54	$ 991.71
Training	46	Transmission Training (24 Hour Class, Per Person), at Local Dealer	Option		$ 2,160.00	$ 2,414.45	$ 2,776.62	$ 2,776.62	$ 2,975.14
Training	47	Transmission Training (Additional hour of training per hour, Per Person), at Local Dealer	Option		$ 90.00	$ 100.60	$ 115.69	$ 115.69	$ 123.96
Training	48	Data Communications System OEM Training (4 Hour Class, Per Person), at Local Dealer	Option		$ 360.00	$ 402.41	$ 462.77	$ 462.77	$ 495.86
Training	49	Data Communications System OEM Training (8 Hour Class, Per Person), at Local Dealer	Option		$ 720.00	$ 804.82	$ 925.54	$ 925.54	$ 991.71
Training	50	Data Communications System OEM Training (Additional hour of training per hour, 2 Persons), at Local Dealer	Option		$ 90.00	$ 100.60	$ 115.69	$ 115.69	$ 123.96
Training	51	Hybrid Drive - (8 Hour Class), at Procuring Agency	Option		$ 4,080.00	$ 4,560.62	$ 5,244.72	$ 5,244.72	$ 5,619.71
Training	52	Hybrid Drive - (24 Hour Class), at Procuring Agency	Option		$ 12,240.00	$ 13,681.87	$ 15,734.15	$ 15,734.15	$ 16,859.14
Training	53	Hybrid Drive - (Additional hour of training per hour), at Procuring Agency	Option		$ 510.00	$ 570.08	$ 655.59	$ 655.59	$ 702.46
Training	54	Hybrid Drive OEM Training (8 Hour Class, Per Person), at Local Dealer	Option		$ 720.00	$ 804.82	$ 925.54	$ 925.54	$ 991.71
Training	55	Hybrid Drive OEM Training (24 Hour Class, Per Person), at Local Dealer	Option		$ 2,160.00	$ 2,414.45	$ 2,776.62	$ 2,776.62	$ 2,975.14
Training	56	Hybrid Drive OEM Training (Additional hour of training per hour, Per Person), at Local Dealer	Option		$ 90.00	$ 100.60	$ 115.69	$ 115.69	$ 123.96
Training	57	Hybrid Transmission Training - (8 Hour Class, Per Person), at Local Dealer	Option		$ 720.00	$ 804.82	$ 925.54	$ 925.54	$ 991.71
Training	58	Hybrid Transmission Training - (24 Hour Class, Per Person), at Local Dealer	Option		$ 2,160.00	$ 2,414.45	$ 2,776.62	$ 2,776.62	$ 2,975.14
Training	59	Hybrid Transmission Training - (Additional hour of training per hour, Per Person), at Local Dealer	Option		$ 90.00	$ 100.60	$ 115.69	$ 115.69	$ 123.96
Training	60	Additional training ...	Option		$ 220.00	$ 245.92	$ 282.80	$ 282.80	$ 303.02
		Other Option - Specify			N/A	N/A	N/A		$ -
Training Equipment Modules						$ -	$ -		$ -
Training Equipment Modules	1	Fare Collection OEM Training (2 Persons), At Local Dealer	Option		$ 2,880.00	$ 3,219.26	$ 3,702.15	$ 3,702.15	$ 3,966.86
Training Equipment Modules	2	ISL/Voith D864.5	Not Available		N/A	N/A	N/A	N/A	N/A
Training Equipment Modules	3	ISL/ZF 6AP1400B	Not Available		N/A	N/A	N/A	N/A	N/A
Training Equipment Modules	4	ISL/ZF HP594	Not Available		N/A	N/A	N/A	N/A	N/A
Training Equipment Modules	5	ISX 12 G	Not Available		N/A	N/A	N/A	N/A	N/A
Training Equipment Modules	6	ISL G	Not Available		N/A	N/A	N/A	N/A	N/A
Training Equipment Modules	7	HVAC Training Module	Option		$ 40,800.00	$ 45,606.24	$ 52,447.18	$ 52,447.18	$ 56,197.15
Training Equipment Modules	8	I/O Controls Multiplex Board	Option		$ 55,800.00	$ 62,373.24	$ 71,729.23	$ 71,729.23	$ 76,857.87
Training Equipment Modules	9	Air Brake Training Board	Option		$ 38,400.00	$ 42,923.52	$ 49,362.05	$ 49,362.05	$ 52,891.43
Training Equipment Modules	10	ISB 6.7	Option		Same as Option 11	N/A	N/A	Same as Option 11	Same as Option 11
Training Equipment Modules	11	ISL/B400R Power Plant	Option		$ 186,000.00	$ 207,910.80	$ 239,097.42	$ 239,097.42	$ 256,192.89
		Other Option - Specify			N/A	N/A	N/A		$ -
Transmission						$ -	$ -		$ -
Transmission	1	Allison B- 400R, GEN IV	Not Available		Inc In Base	N/A	N/A	$ -	$ -
Transmission	2	Allison B- 500R, GEN IV	Not Available		N/A	N/A	N/A	N/A	N/A
Transmission	3	Allison B- 400R, ~~GEN V~~	Inc In Base	Diesel/CNG	N/A	N/A	N/A	$ -	$ -
Transmission	4	Allison B- 500R, ~~GEN V~~	Not Available		N/A	N/A	N/A	N/A	N/A
Transmission	5	Voith D854.6	Option	Diesel/CNG	$ (1,830.00)	$ (2,045.57)	$ (2,352.41)	$ -	$ -
Transmission	6	ZF 6AP1400B	Discontinued	Diesel/CNG	$ (140.00)	$ (156.49)	$ (179.97)	N/A	N/A
Transmission	7	ZF 6HP594	Not Available		N/A	N/A	N/A	N/A	N/A
Transmission	8	"Transynd" Synthetic	Inc In Base		$ -	$ -	$ -	$ -	$ -
Transmission	9	Titan Probalizer OD- 1014 (Obsolete - Replaced by Option 15)	Discontinued	Diesel/CNG	$ (35.70)	$ (39.91)	$ (45.89)	N/A	N/A
Transmission	10	Davco Electronic Fluid Level Gauge	Not Available		N/A	N/A	N/A	N/A	N/A
Transmission	11	Keyed Transmission Lockout Switch on Dash	Option		$ 981.46	$ 1,097.08	$ 1,261.64	$ 1,261.64	$ 1,351.85
Transmission	12	Transmission Oil Temperature Gauge (Dash and Rear Run Box)	Inc In Base		Inc In Base	N/A	N/A	$ -	$ -
Transmission	13	Electric Transmission - 2 speed	Not Available		N/A	N/A	N/A	N/A	N/A
Transmission	14	Electric Transmission - 4 speed	Not Available		N/A	N/A	N/A	N/A	N/A
Transmission	15	Checkfluid KST18N-VC	Option	Diesel/CNG	Inc In Base	$ -	$ -	$ 19.43	$ 20.82
		Other Option - Specify			N/A	N/A	N/A		$ -
Transmission Diagnostics						$ -	$ -		$ -
Transmission Diagnostics	1	Allison Cable & Software	Option		See Section 10 for bus model specific diagnostics	N/A	N/A	Quote	Quote
Transmission Diagnostics	2	Voith Cable & Software	Option		See Section 10 for bus model specific diagnostics	N/A	N/A	Quote	Quote
Transmission Diagnostics	3	Voith Service Tool Kit	Option		See Section 10 for bus model specific diagnostics	N/A	N/A	Quote	Quote
Transmission Diagnostics	4	Set of ZF Diagnostics (Includes the 3 Following Items)	Option		See Section 10 for bus model specific diagnostics	N/A	N/A	Quote	Quote
Transmission Diagnostics	5	Includes - Testman Diagnostic System	Option		See Section 10 for bus model specific diagnostics	N/A	N/A	Quote	Quote
Transmission Diagnostics	6	Includes - SAE Cable	Option		See Section 10 for bus model specific diagnostics	N/A	N/A	Quote	Quote
Transmission Diagnostics	7	Includes - Ecomat Testman Software	Option		See Section 10 for bus model specific diagnostics	N/A	N/A	Quote	Quote
		Other Option - Specify	Option		See Section 10 for bus model specific diagnostics	N/A	N/A	Quote	Quote
W/C Restraints						$ -	$ -		$ -
W/C Restraints	1	AMSECO - A.R.M.	Option		$ 576.13	$ 644.00	$ 740.60	$ 740.60	$ 793.55
W/C Restraints	2	AMSECO Reliant Mobility Aid Securement System	Not Available		N/A	N/A	N/A	N/A	N/A
W/C Restraints	3	AMESCO Passive rear-facing restraints (rear facing barriers)	Option		$ 1,654.13	$ 1,848.99	$ 2,126.33	Quote	Quote
W/C Restraints	4	USSC - First	Not Available		N/A	N/A	N/A	N/A	N/A
W/C Restraints	5	Freedman - First	Not Available		Same as Option #4	N/A	N/A	N/A	N/A
W/C Restraints	6	AMSECO - Q'Straint - QRT	Option		$ 728.75	$ 814.60	$ 936.79	$ 936.79	$ 1,003.77
W/C Restraints	7	AMSECO - Q'Straint - QRT 360	Option		$ 1,042.25	$ 1,165.03	$ 1,339.78	$ 1,339.78	$ 1,435.57
W/C Restraints	8	Q'Straint - Q'UBE 3- Point Securement Station	Discontinued		$ 844.25	$ 943.70	$ 1,085.26	N/A	N/A
W/C Restraints	9	Q'Straint - Quantum Securement System (One Quantum)	Option		$ 25,864.78	$ 28,911.65	$ 33,248.40	$ 15,152.50	$ 16,235.90
W/C Restraints	10	AMSECO - Q'Straint/Sure-Lok - OMNI Floor Anchor System	Option		$ 125.13	$ 139.87	$ 160.85	$ 160.85	$ 172.35
W/C Restraints	11	AMSECO - Q'Straint Slide N Click floor mount restraint system	Option		$ 728.75	$ 814.60	$ 936.79	$ 936.79	$ 1,003.77
W/C Restraints	12	AMSECO - Q- Pod W/C Restraint System	Option		$ 4,915.63	$ 5,494.69	$ 6,318.89	$ 5,468.38	$ 5,859.37
W/C Restraints	13	USSC - Q- Pod W/C Restraint System	Option		$ 830.50	$ 928.33	$ 1,067.58	$ 4,873.00	$ 5,221.42
W/C Restraints	14	AMESCO Dual Auto Lock W/C Restraint System	Not Available		N/A	N/A	N/A	N/A	N/A
W/C Restraints	15	USSC - V- PRO	Inc In Base		$ 830.50	$ 928.33	$ 1,067.58	$ -	$ -
W/C Restraints	16	Sure LOK - RTT Electric (USSC)	Option		N/A	N/A	N/A	$ 1,067.58	$ 1,143.91
W/C Restraints	17	Additional L-track per/foot	Not Available		N/A	N/A	N/A	N/A	N/A
W/C Restraints	18	RESNA WC18 compliant restraint	Not Available		N/A	N/A	N/A	N/A	N/A
W/C Restraints	19	RESNA WC19 compliant restraint	Not Available		N/A	N/A	N/A	N/A	N/A
		Other Option - Specify			N/A	N/A	N/A		$ -
Wheel Chair Ramp (low-floor only) / Lift (high-floor only)						$ -	$ -		$ -
Wheel Chair Ramp (low-floor only) / Lift (high-floor only)	1	Lift- U Model LU11, 1:6 Ratio, Front Door only	Option		$ 900.00	$ 1,006.02	$ 1,156.92	$ -	$ -
Wheel Chair Ramp (low-floor only) / Lift (high-floor only)	2	LIFT- U Model LU18, Dual- Mode 1:6 (Street)/1:8 (Sidewalk)	Option		$ 2,500.00	$ 2,794.50	$ 3,213.68	$ 311.56	$ 333.84

Category	Item #	Description	Designation	Propulsion (if applicable)	Price	6/1/22 Price Change	4/1/23 Price Change	June 2023 Revised Price	7/19/24 Price
Wheel Chair Ramp (low-floor only) / Lift (high-floor only)	3	Ricon 6:1 SA Self-Leveling Ramp	Not Available		N/A	N/A	N/A	N/A	N/A
						$ -	$ -		
Wheel - Brakes						$ -	$ -		
Wheel – Brakes	1	S - Cam Drum w/Wabsco ABS System - (DEDUCT)	Not Available		N/A	N/A	N/A	N/A	N/A
Wheel – Brakes	2	Front Wheel Drum Brakes - (DEDUCT)	Not Available		N/A	N/A	N/A	N/A	N/A
Wheel – Brakes	3	Rear Wheel Drum Brakes - (DEDUCT)	Not Available		N/A	N/A	N/A	N/A	N/A
Wheel – Brakes		All Wheel Drum Brakes	Not Available		N/A	N/A	N/A	N/A	N/A
Wheel – Brakes	4	MGM "E-Stroke" Electronic Brake Monitoring System – Disc Brakes	Inc In Base		$ 3,244.17	$ 3,626.33	$ 4,170.28	$ -	$ -
Wheel – Brakes	5	MGM "E-Stroke" Electronic Brake monitoring System – Drum Brakes	Not Available		N/A	N/A	N/A	N/A	N/A
Wheel – Brakes	6	All Wheel Disc Brakes	Inc In Base		$ -	$ -	$ -	$ -	$ -
		Other Option - Specify			N/A	N/A	N/A		$ -
Wheel - Hubometer						$ -	$ -		$ -
Wheel Hubometer	1	none	Inc In Base			$ -	$ -	$ -	$ -
Wheel Hubometer	2	Veeder Root w/o Tenths w/o Guard	Option		$ 78.86	$ 88.15	$ 101.37	$ 101.37	$ 108.62
Wheel Hubometer	3	S&A Fleetwatch 392 Electronic	Option		$ 659.99	$ 737.74	$ 848.40	$ 705.75	$ 756.21
Wheel Hubometer	4	E J Ward Data System (Includes Receiver, Display Unit and Antenna)	Option		$ 1,247.76	$ 1,394.75	$ 1,603.96	$ 1,343.86	$ 1,439.95
Wheel Hubometer	5	Engler (Stemco) Mechanical W/o Tenths W/o Guard	Option		$ 57.91	$ 64.73	$ 74.44	$ 74.44	$ 79.76
Wheel Hubometer	6	Engler Hubometer W/Powder Coat Guard	Option		$ 91.55	$ 102.33	$ 117.68	$ 117.68	$ 126.09
		Other Option - Specify			N/A	N/A	N/A		$ -
Wheel - Hubs						$ -	$ -		$ -
Wheel Hubs	1	Hub Piloted Wheels and Axles W/Grease Seals	Not Available		$ -	$ -	$ -	N/A	N/A
Wheel Hubs	2	Hub Piloted w/Oil Seals (per Axle)	Not Available		N/A	N/A	N/A	N/A	N/A
Wheel Hubs	3	Stud Piloted Wheels and Axles w/Grease Seals	Not Available		N/A	N/A	N/A	N/A	N/A
Wheel Hubs	4	Stud Piloted Wheels and Axles w/Oil Seals	Not Available		N/A	N/A	N/A	N/A	N/A
Wheel Hubs	5	Wabco Traction Control	Inc In Base		$ -	$ -	$ -	$ -	$ -
Wheel Hubs	6	Hydraulic drop down snow chain system	Not Available		N/A	N/A	N/A	N/A	N/A
		Other Option - Specify			N/A	N/A	N/A		
Wheel - Tires						$ -	$ -		
Wheel – Tires	1	Customer Supplied	Inc In Base		N/A	N/A	N/A	$ -	$ -
Wheel – Tires	2	Michelin XZU2 (305/85R/22.5)	Not Available		N/A	N/A	N/A	N/A	N/A
Wheel – Tires	3	Michelin XZU2 (305/70R/22.5)	Not Available		$ 2,800.00	$ 3,129.84	$ 3,599.32	N/A	N/A
Wheel – Tires	4	Michelin X incity Z (305/70R/22.5) - NFI Supplied	Option		$ 2,800.00	$ 3,129.84	$ 3,599.32	$ 4,900.50	$ 5,250.89
Wheel – Tires	5	Michelin XZU3 (305/85/22.5)	Not Available		N/A	N/A	N/A	N/A	N/A
Wheel – Tires	6	Michelin XZU2 (275/70R/22.5)	Not Available		N/A	N/A	N/A	N/A	N/A
Wheel – Tires	7	Michelin XZE2+(H) (295/80/R22.5)	Not Available		N/A	N/A	N/A	N/A	N/A
Wheel – Tires	8	G152 (305/85R/22.5)	Not Available		N/A	N/A	N/A	N/A	N/A
Wheel – Tires	9	Goodyear G152 (305/70R/22.5)	Not Available		$ 2,800.00	$ 3,129.84	$ 3,599.32	N/A	N/A
Wheel – Tires	10	Goodyear G152 (275/70R/22.5)	Not Available		N/A	N/A	N/A	N/A	N/A
Wheel – Tires	11	Firestone 18J (315/80R/22.5)	Not Available		N/A	N/A	N/A	N/A	N/A
Wheel – Tires	12	Firestone 16H (305/70R/22.5)	Not Available		N/A	N/A	N/A	N/A	N/A
Wheel – Tires	13	Bridgestone 16H (275/70R/22.5)	Not Available		N/A	N/A	N/A	N/A	N/A
Wheel – Tires	14	Tire Pressure Monitoring System	Option		N/A	N/A	N/A	$ 1,332.38	$ 1,427.65
		Other Option - Specify			N/A	N/A	N/A		$ -
Wheels						$ -	$ -		$ -
Wheels	1	(7) Powder Coated Steel Wheels (~~White and~~ Black) - White included in Base	Option		$ -	$ -	$ -	$ 255.46	$ 273.73
Wheels	2	(7) Aluminum Alcoa - Full Polish (Wheels Only Change)	Option		$ 1,813.34	$ 2,026.95	$ 2,330.99	$ 1,733.33	$ 1,857.26
Wheels	3	(7) Aluminum Alcoa - Full Polish W/Dura Bright Finish (Wheels Only Change)	Option		$ 2,147.05	$ 2,399.97	$ 2,759.97	$ 2,232.45	$ 2,392.07
Wheels	4	(7) Aluminum Alcoa - Machine Finish (Wheels Only Change)	Option		$ 1,266.71	$ 1,415.93	$ 1,628.32	$ 1,402.09	$ 1,502.34
Wheels	5	(7) Aluminum Alcoa - Machine Finish W/Dura Bright Finish (Wheels Only Change)	Option		$ 1,634.37	$ 1,826.90	$ 2,100.93	$ 2,395.80	$ 2,567.10
Wheels	6	Remove Spare Wheel (One Spare), Steel	Option	Diesel / Hybrid	$ (817.97)	$ (914.33)	$ (1,051.48)	$ (108.32)	$ (108.32)
Wheels	7	Remove Spare Wheel (One Spare), Aluminum	Option	Electric / CNG / Fuel Cell	$ (817.97)		$ -	$ (242.00)	$ (242.00)
Wheels	7	Add Dura Flange to Alcoa (Per Wheel)	Option		$ 2,846.00	$ 3,181.26	$ 3,658.45	$ 282.84	$ 303.06
		Other Option - Specify			N/A	N/A	N/A		$ -
Windows						$ -	$ -		$ -
Windows	2	Laminated Safety Glass (1/4") - Framed Sliders	Option		N/A	N/A	N/A	Quote	Quote
Windows	3	Laminated Safety Glass (1/4") - Framed Fixed	Option		$ 217.81	$ 243.47	$ 279.99	Quote	Quote
Windows	4	Laminated Safety Glass (1/4") - Framed Transom - openable	Inc In Base		$ -	$ -	$ -	$ -	$ -
Windows	5	Hidden Framed Bonded - Fixed	Option		$ 4,741.59	$ 5,300.15	$ 6,095.17	Quote	Quote
Windows	6	Hidden Framed Bonded - Transom -openable	Option		$ 3,567.56	$ 3,987.82	$ 4,585.99	Quote	Quote
Windows	7	Add Window Guards (Acrylic Liner and Film)	Option		$ 2,853.13	$ 3,189.23	$ 3,667.61	Quote	Quote
Windows	8	anti-graffiti 3M film (per inside window)	Option		$ 3,987.50	$ 4,457.23	$ 5,125.81	Quote	Quote
Windows	9	Stormite flush-mount serviceable w/lip	Option		Quote	N/A	N/A	Quote	Quote
Windows	10	All windows equipped with liners attached	Option		$ 1,675.00	$ 1,872.32	$ 2,153.16	Quote	Quote
		Other Option - Specify			N/A	N/A	N/A		$ -
Other Items						$ -	$ -		$ -
Other Items	1	Brake System Diagnostics	Option		$ 1,562.44	$ 1,746.49	$ 2,008.46	$ 2,008.46	$ 2,152.06
Other Items	2	Meritor Software (Tool Box), Serial Link/Interface Kit	Not Available		N/A	N/A	N/A	N/A	N/A
Other Items	3	Engine Dolly	Option		$ 2,154.63	$ 2,408.44	$ 2,769.71	$ 2,769.71	$ 2,967.74
Other Items	4	Phillips Thermo Block Heater	Option		$ 1,042.99	$ 1,165.86	$ 1,340.74	$ 1,084.82	$ 1,162.38
Other Items	5	Engine Skid Protection (Add curb side skid rail)	Option		$ -	$ -	$ -	$ 66.22	$ 70.95
Other Items	6	Mobile Receiver for S&A 392 Hubometer	Option		$ 576.71	$ 644.64	$ 741.34	$ 741.34	$ 794.35
Other Items	7	Floor Mounted 4 -Way Flasher Switch	Included in base		$ -	$ -	$ -	$ -	$ -
Other Items	8	Cup Holder	Option		$ 28.44	$ 31.79	$ 36.56	$ 36.56	$ 39.17
Other Items	9	Auxiliary Drivers Fan	Option		$ -	$ -	$ -	$ 222.36	$ 238.26
Other Items	10	Stainless Steel Trash Bag Holder	Option		$ 75.44	$ 84.32	$ 96.97	$ 96.97	$ 103.90
Other Items	11	Transfer Cutter	Option		$ 53.41	$ 59.70	$ 68.65	$ 68.65	$ 73.56
Other Items	12	Keyed Ignition Switch	Not Available		$ 857.62	$ 958.65	$ 1,102.44	N/A	N/A
Other Items	13	Fiber Optic Backlighting on Drivers Dash	Option		N/A	N/A	N/A	$ 987.55	$ 1,058.16
Other Items	14	Exterior Ad Frame - Front 21" X 40"	Not Available		N/A	N/A	N/A	N/A	N/A
Other Items	15	Exterior Ad Frame - Curbside 30" X 88"	Option		$ 221.74	$ 247.86	$ 285.04	$ 285.04	$ 305.42
Other Items	16	Exterior Ad Frame -Streetside 30" X 144"	Option		$ 229.94	$ 257.03	$ 295.59	$ 567.34	$ 607.90
Other Items	17	Exterior Ad Frame Rear 21" X 72"	Not Available		$ 216.19	$ 241.66	$ 277.90	N/A	N/A
Other Items	18	I/O Controls LED Interior Lights	Not Available		N/A	N/A	N/A	N/A	N/A
Other Items	19	Pretoria LED Interior Lights	Option		$ 507.51	$ 567.30	$ 652.39	$ -	$ -
Other Items	20	See Ii Transit Airfoil	Not Available		N/A	N/A	N/A	N/A	N/A
Other Items	21	Open Bottom Racks	Option		$ 4,230.42	$ 4,728.76	$ 5,438.07	$ 5,549.78	$ 5,946.59
Other Items	22	Suburban Package Racks/Open Bottom	Option		$ 14,647.41	$ 16,372.88	$ 18,828.81	$ 19,109.97	$ 20,476.33
Other Items	23	Twin Automatic Greasing System	Not Available		N/A	N/A	N/A	N/A	N/A
Other Items	24	EMCO -Wheaton Posi -Lock Nozzle	Option		$ -	$ -	$ -	$ -	$ -
Other Items	25	Hybrid Drive Tools	Option		See Section 10 for bus model specific diagnostics	N/A	N/A	Quote	Quote
Other Items	26	Special Purpose Hybrid Drive Tool Kit	Option		See Section 10 for bus model specific diagnostics	N/A	N/A	Quote	Quote
Other Items	27	BAE (APS2) beltless power pack	Not Available		See Section 10 for bus model specific diagnostics	N/A	N/A	N/A	N/A
Other Items	28	WABCO E-COMP	Not Available		N/A	N/A	N/A	N/A	N/A
Other Items	29	ISB 6.7 Fold Up Wiring Diagram (hybrid option)	Option		Quote	N/A	N/A	Quote	Quote
Other Items	30	Allison Hybrid Manuals	Option		N/A	N/A	N/A	Quote	Quote
Other Items	31	BAE Hybrid Manuals	Option		$ -	$ -	$ -	Quote	Quote
Other Items	32	Allison Mid-Life Overhaul Parts List and Cost	Option		Quote	N/A	N/A	Quote	Quote
Other Items	33	BAE Mid-Life Overhaul Part List and Cost	Option		Quote	N/A	N/A	Quote	Quote
Other Items	34	winter weather package (heated front entrance)	Option		$ 198.94	$ 222.37	$ 255.73	$ 974.02	$ 1,043.66
Other Items	35	First Aid kit for 24 people option	Option		$ 64.38	$ 71.96	$ 82.75	$ 94.56	$ 101.32
Other Items	36	2 front dash-mounted fans to defrost front door	Option		$ 332.01	$ 371.12	$ 426.79	$ 537.33	$ 575.75
Other Items	37	driver's LED reading light	Inc In Base		$ -	$ -	$ -	$ -	$ -
Other Items	38	driver's sun visors	Option		$ 184.37	$ 206.09	$ 237.00	$ 347.77	$ 372.64
Other Items	39	driver's foot controls- adjustable Kongsberg system	Not Available		$ 34.22	$ 38.25	$ 43.99	N/A	N/A
Other Items	40	Stainless Steel molding to cover edges on entrance and rear rise on passenger assist	Not Available		Quote	N/A	N/A	N/A	N/A
Other Items	41	Separate control for non-synchronized wipers	Option		$ (8.31)	$ (9.29)	$ (10.68)	$ 357.98	$ 383.58
Other Items	42	Curb Side Skid Rail	Option				$ -	$ 66.22	$ 70.95
Other Items	43	Exterior Ad Frame - Front 15" X 66"	Option		$ -	$ -	$ -	$ 264.87	$ 283.81
Other Items	44	Exterior Ad Frame - Rear 24" X 65"	Option		$ -	$ -	$ -	$ 223.02	$ 238.97

SFMTA-2024-03-FTA

Agreement

Appendix A, Item A4

Amendment 1

State of Washington
Contracts & Procurement Division
Department of Enterprise Services
P.O. Box 41411
Olympia, WA 98504-1411

New Flyer of America, Inc.
6200 Glenn Carlson Dr.
St. Cloud, MN 56301

FIRST AMENDMENT
TO
CONTRACT NO. 06719-01
TRANSIT BUSES

This First Amendment ("Amendment") to Contract No. 06719-01 is made and entered into by and between the State of Washington acting by and through the Department of Enterprise Services, a Washington State governmental agency ("State") and New Flyer of America, Inc., a North Dakota corporation ("Contractor") and is dated as of June 1, 2022.

RECITALS

A. State and Contractor (collectively the "Parties") entered into that certain Contract No. 06719-01 for Transit Buses dated effective as of April 1, 2021 ("Contract").

B. The amendment set forth herein is within the scope of the Contract.

C. The Parties now desire to amend the Contract as set forth herein.

AGREEMENT

NOW THEREFORE, in consideration of the mutual covenants and agreements set forth herein, the Parties hereby agree to amend the Contract, as previously amended, as follows:

1. ECONOMIC PRICE ADJUSTMENT. Pursuant to Section 3.4 of the Master Contract Economic Price Adjustment using the Bureau of Labor Statistics Index for Truck and Bus Bodies, Series No. WPU 1413 to determine a price change, the prices set forth in the Exhibit B – Prices are increased by 11.78%.

2. NO CHANGE OTHER THAN AMENDMENT. Except as amended herein, the Contract is unaffected and remains in full force and effect.

3. INTEGRATED AGREEMENT; MODIFICATION. This Amendment constitutes the entire agreement and understanding of the Parties with respect to the subject matter and supersedes all prior negotiations and representations. In the event of any conflict between this Amendment and the Contract or any earlier amendment, this Amendment shall control and govern. This Amendment may not be modified except in writing signed by the Parties.

4. AUTHORITY. Each party to this Amendment, and each individual signing on behalf of each party, hereby represents and warrants to the other that it has full power and authority to enter into this Amendment and that its execution, delivery, and performance of this Amendment has been fully

authorized and approved, and that no further approvals or consents are required to bind such party.

5. ELECTRONIC SIGNATURES. A signed copy of this Amendment or any other ancillary agreement transmitted by facsimile, email, or other means of electronic transmission shall be deemed to have the same legal effect as delivery of an original executed copy of this Amendment or such other ancillary agreement for all purposes.

6. COUNTERPARTS. This Amendment may be executed in one or more counterparts, each of which shall be deemed an original, and all of which counterparts together shall constitute the same instrument which may be sufficiently evidenced by one counterpart. Execution of this Amendment at different times and places by the parties shall not affect the validity thereof so long as all the parties hereto execute a counterpart of this Amendment.

EXECUTED AND EFFECTIVE as of the day and date first above written.

NEW FLYER OF AMERICA, INC **A NORTH DAKOTA CORPORATION**	**STATE OF WASHINGTON** **DEPARTMENT OF ENTERPRISE SERVICES**
By: Jennifer McNeill	By:
Name: Jennifer McNeill	Name: David Mgebroff
Title: Vice President, Sales & Marketing	Title: Strategy Supervisor
Date: August 22, 2022	Date: August 24, 2022

SFMTA-2024-03-FTA

Agreement

Appendix A, Item A5

Amendment 2

State of Washington Contracts & Procurement Division Department of Enterprise Services P.O. Box 41411 Olympia, WA 98504-1411	**CONTRACT AMENDMENT**	
	Contract No.:	06719-01
New Flyer of America, Inc. 6200 Glenn Carlson Dr. St. Cloud, MN 56301	Amendment No.:	2
	Effective Date:	April 1, 2023

SECOND AMENDMENT
TO
STATEWIDE CONTRACT NO. 06719-01
TRANSIT BUSES

This Second Amendment ("Amendment") to Contract No. 06719-01 is made and entered into by and between the State of Washington acting by and through the Department of Enterprise Services, a Washington State governmental agency ("State") and New Flyer of America, Inc., a North Dakota corporation ("Contractor") and is dated as of April 1, 2023.

R E C I T A L S

A. State and Contractor (collectively the "Parties") entered into that certain Contract No. 06719-01 for Transit Buses dated effective as of April 1, 2021 ("Contract").

B. The Parties previously amended the Contract June 1, 2022 for an economic adjustment of 11.78%.

C. The amendment set forth herein is within the scope of the Contract.

D. The Parties now desire to amend the Contract as set forth herein.

A G R E E M E N T

NOW THEREFORE, in consideration of the mutual covenants and agreements set forth herein, the Parties hereby agree to amend the Contract, as previously amended, as follows:

1. CONTRACT TERM. Pursuant to Section 1 Term of the Contract, this Contract has been extended for an addition twelve (12) months, this extension term is until March 31, 2024.

2. ECONOMIC PRICE ADJUSTMENT. Section 3.4 of the contract is deleted in its entirety and replaced with the following:

   ECONOMIC ADJUSTMENT. Beginning twelve (12) months after the effective date of this Master Contract and for every annual anniversary thereafter, the prices set forth in Exhibit B shall be adjusted, based upon the percent changes (whether up or down) in the United States Department of Labor, Bureau of Labor and Statistics (BLS) indices described below, for the most recent year. The Index is the Producer Price Index for Truck and Bus Bodies, Series No. WPU 1413, published by the United States Department of Labor, Bureau of Labor Statistics, or if such Index is no longer in use, then such replacement that is most comparable to the

Index as may be designated by the Bureau of Labor Statistics, or as agreed by the parties. Economic adjustment will lag one (1) calendar quarter past the Master Contract commencement date to allow for publication of BLS data. All calculations for the index shall be based upon the latest version of data published as of February each year. Prices shall be adjusted on April 1st. If an index is recoded, that is the replacement is a direct substitute according to the BLS, this Master Contract will instead use the recode. If an index becomes unavailable, Enterprise Services shall substitute a proxy index. If there is not a direct substitute, the next higher aggregate index available will be used. The economic adjustment shall be calculated as follows:
New Price = Old Price x (Current Period Index/Base Period Index).

3. ECONOMIC PRICE ADJUSTMENT. Pursuant to Section 3.4 of the Master Contract Economic Price Adjustment using the Bureau of Labor Statistics Index for Truck and Bus Bodies, Series No. WPU 1413 to determine a price change, the prices set forth in the Exhibit B – Prices are increased by 15.00%.

4. NO CHANGE OTHER THAN AMENDMENT. Except as amended herein, the Contract is unaffected and remains in full force and effect.

5. INTEGRATED AGREEMENT; MODIFICATION. This Amendment constitutes the entire agreement and understanding of the Parties with respect to the subject matter and supersedes all prior negotiations and representations. In the event of any conflict between this Amendment and the Contract or any earlier amendment, this Amendment shall control and govern. This Amendment may not be modified except in writing signed by the Parties.

6. AUTHORITY. Each party to this Amendment, and each individual signing on behalf of each party, hereby represents and warrants to the other that it has full power and authority to enter into this Amendment and that its execution, delivery, and performance of this Amendment has been fully authorized and approved, and that no further approvals or consents are required to bind such party.

7. ELECTRONIC SIGNATURES. An electronic signature or electronic record of this Amendment or any other ancillary agreement shall be deemed to have the same legal effect as delivery of an original executed copy of this Amendment or such other ancillary agreement for all purposes.

8. COUNTERPARTS. This Amendment may be executed in one or more counterparts, each of which shall be deemed an original, and all of which counterparts together shall constitute the same instrument which may be sufficiently evidenced by one counterpart. Execution of this Amendment at different times and places by the parties shall not affect the validity thereof so long as all the parties hereto execute a counterpart of this Amendment.

EXECUTED AND EFFECTIVE as of the day and date first above written.

NEW FLYER OF AMERICA, INC.,
A NORTH DAKOTA CORPORATION

By: Jennifer McNeill

Name: Jennifer McNeill

Title: Vice President, Sales & Marketing

Date: 3/31/2023

STATE OF WASHINGTON
DEPARTMENT OF ENTERPRISE SERVICES

By:

Name: Alexander Kenesson

Title: Procurement Supervisor

Date: 3/31/2023

SFMTA-2024-03-FTA

Agreement

Appendix A, Item A6

Amendment 3

State of Washington Contracts & Procurement Division Department of Enterprise Services P.O. Box 41411 Olympia, WA 98504-1411	**CONTRACT AMENDMENT**	
	Contract No.:	06719-01
New Flyer of America, Inc 6200 Glenn Carlson Dr. St. Cloud, MN 56301	Amendment No.:	3
	Effective Date:	April 25, 2024

THIRD AMENDMENT

TO

CONTRACT No. 06719-01

TRANSIT BUSES

This third Amendment ("Amendment") to Contract No. 06719-01 is made and entered into by and between the State of Washington acting by and through the Department of Enterprise Services, a Washington State governmental agency ("Enterprise Services") and New Flyer of America, Inc., A North Dakota corporation ("Contractor") and is dated as of April 1, 2024.

RECITALS

A. Enterprise Services and Contractor (collectively the "Parties") entered into that certain Contract No. 06719-01 for Transit Buses dated effective as of April 1, 2021 ("Contract").

B. The Parties previously amended the Contract 06719-01 as followed:

   a. First Amendment: to make an Economic Price Adjustment of 11.78% dated on June 1, 2022.

   b. Second Amendment: to extend contract for an additional twelve (12} months, and to make an economic price adjustment of 15% on April 1, 2023.

C. The amendment set forth herein is within the scope of the Contract.

D. The Parties now desire to amend the Contract as set forth herein.

AGREEMENT

NowTHEREFORE, in consideration of the mutual covenants and agreements set forth herein, the Parties hereby agree to amend the Contract, as previously amended, as follows:

1. CONTRACT TERM. Pursuant to Section 1 Term of the Contract, this Contract has been extended for an addition twelve (12} months, this extension term is until March 31, 2025.

2. NONDISCRIMINATION. The following provision is added as a new subsection at the end of Section 18 of the Contract (General Provision):

   18.24. NONDISCRIMINATION.

(a) Nondiscrimination Requirement. During the term of this Contract, Contractor, including any subcontractor, shall not discriminate on the bases enumerated at RCW 49.60.530(3). In addition, Contractor, including any subcontractor, shall give written notice of this nondiscrimination requirement to any labor organizations with which Contractor, or subcontractor, has a collective bargaining or other agreement.

(b) Obligation to Cooperate. Contractor, including any subcontractor, shall cooperate and comply with any Washington state agency investigation regarding any allegation that Contractor, including any subcontractor, has engaged in discrimination prohibited by this Contract pursuant to RCW 49.60.530(3).

(c) Default. Notwithstanding any provision to the contrary, Enterprise Services may suspend Contractor, including any subcontractor, upon notice of a failure to participate and cooperate with any state agency investigation into alleged discrimination prohibited by this Contract, pursuant to RCW 49.60.530(3). Any such suspension will remain in place until Enterprise Services receives notification that Contractor, including any subcontractor, is cooperating with the investigating state agency. In the event Contractor, or subcontractor, is determined to have engaged in discrimination identified at RCW 49.60.530(3), Enterprise Services may terminate this Contract in whole or in part, and Contractor, subcontractor, or both, may be referred for debarment as provided in RCW 39.26.200. Contractor or subcontractor may be given a reasonable time in which to cure this noncompliance, including implementing conditions consistent with any court-ordered injunctive relief or settlement agreement.

(d) Remedies for Breach. Notwithstanding any provision to the contrary, in the event of Contract termination or suspension for engaging in discrimination, Contractor, subcontractor, or both, shall be liable for contract damages as authorized by law including, but not limited to, any cost difference between the original Contract and the replacement or cover contract and all administrative costs directly related to the replacement contract, which damages are distinct from any penalties imposed under Chapter 49.60, RCW. Enterprise Services and/or Purchasers shall have the right to deduct from any monies due to Contractor or subcontractor, or that thereafter become due, an amount for damages Contractor or subcontractor will owe Enterprise Services and/or Purchasers for default under this provision.

3. No CHANGE OTHER THAN AMENDMENT. Except as amended herein, the Contract is unaffected and remains in full force and effect.

4. INTEGRATED AGREEMENT; MODIFICATION. This Amendment constitutes the entire agreement and understanding of the Parties with respect to the subject matter and supersedes all prior negotiations and representations. In the event of any conflict between this Amendment and the

Contract or any earlier amendment, this Amendment shall control and govern. This Amendment may not be modified except in writing signed by the Parties.

5. AUTHORITY. Each party to this Amendment, and each individual signing on behalf of each party, hereby represents and warrants to the other that it has full power and authority to enter into this Amendment and that its execution, delivery, and performance of this Amendment has been fully authorized and approved, and that no further approvals or consents are required to bind such party.

6. ELECTRONIC SIGNATURES. An electronic signature or electronic record of this Amendment or any other ancillary agreement shall be deemed to have the same legal effect as delivery of an original executed copy of this Amendment or such other ancillary agreement for all purposes.

7. COUNTERPARTS. This Amendment may be executed in one or more counterparts, each of which shall be deemed an original, and all of which counterparts together shall constitute the same instrument which may be sufficiently evidenced by one counterpart. Execution of this Amendment at different times and places by the parties shall not affect the validity thereof so long as all the parties hereto execute a counterpart of this Amendment.

EXECUTED AND EFFECTIVE as of the day and date first above written.

NEW FLYER OF AMERICA, INC.,
A NORTH DAKOTA CORPORATION

By: Jennifer McNeil

Name: Jennifer McNeil!

Title: Vice President, Sales & Marketing

Date: April 22, 2024

STATE OF WASHINGTON
DEPARTMENT OF ENTERPRISE SERVICES

By: Kelli Carmony

Name: Kelli Carmony

Title: Procurement Supervisor

Date: 4/24/24

NewFlyer 06719 Amd3 updated 4-21

Final Audit Report 2024-04-22

Created:	2024-04-22
By:	Cindy Campbell (cindy.campbell@mcicoach.com)
Status:	Signed
Transaction ID:	CBJCHBCAABMWH-zi0q9K7O1bvYy-EU-bR4VFfmx1Dg4

"NewFlyer 06719 Amd3 updated 4-21" History

f:l Document created by Cindy Campbell (cindy.campbell@mcicoach.com)
2024-04-22 - 7:43:22 PM GMT

12'.. Document emailed to Jennifer McNeil! Uennifer_mcneill@newflyer.com) for signature
2024-04-22 - 7:43:40 PM GMT

f:l Email viewed by Jennifer McNeil! Uennifer_mcneill@newflyer.com)
2024-04-22 - 8:06:20 PM GMT

i&-0 Document e-signed by Jennifer McNeil! Uennifer_mcneill@newflyer.com)
Signature Date: 2024-04-22 - 8:06:48 PM GMT - Time Source: server

0 Agreement completed.
2024-04-22 - 8:06:48 PM GMT

SFMTA-2024-03-FTA

Agreement

Appendix A, Item A7

Amendment 4

State of Washington Contracts & Procurement Division Department of Enterprise Services P.O. Box 41411 Olympia, WA 98504-1411	**CONTRACT AMENDMENT**	
	Contract No.:	06719-01
New Flyer of America, Inc 6200 Glenn Carlson Dr. St. Cloud, **MN** 56301	Amendment No.:	4
	Effective Date:	July 19, 2024

FOURTH AMENDMENT

TO

CONTRACT No. 06719-01

TRANSIT BUSES

This fourth Amendment ("Amendment") to Contract No. 06719-01 is made and entered into by and between the State of Washington acting by and through the Department of Enterprise Services, a Washington State governmental agency ("Enterprise Services") and New Flyer of America, Inc., a North Dakota corporation ("Contractor") and is dated and effective as of July 19, 2024.

RECITALS

A. Enterprise Services and Contractor (collectively the "Parties") entered into that certain Contract No. 06719-01 for Transit Buses dated effective as of April 1, 2021 ("Contract").

B. The Parties previously amended the Contract 06719-01 as followed:

   a. By instrument titled First Amendment to Contract (dated June 1, 2022) to make an Economic Price Adjustment of 11.78%.

   b. By instrument titled Second Amendment to Contract (dated April 1, 2023) to extend the term of contract twelve (12) months ending March 31, 2024, and to make an economic price adjustment of 15%.

   c. By instrument titled Third Amendment to Contract (dated April 25, 2024) to extend contract twelve (12) months, ending March 31, 2025.

C. The Parties now desire to amend the Contract to make an economic price adjustment, add goods, and modify of the Contact.

D. The amendment set forth herein is within the scope of the Contract.

AGREEMENT

NowTHEREFORE, in consideration of the mutual covenants and agreements set forth herein, the Parties hereby agree to amend the Contract, as previously amended, as follows:

1. ADVANCE PAYMENTS. Section 6.5 of the Contract (No Advanced Payment) is hereby amended by deleting the existing Section 6.5 in its entirety and inserting the following in lieu thereof:

6.5 ADVANCE PAYMENTS. Participant and Contractor may agree to advance payments, provided that adequate security is made for the payments. Unless otherwise agreed between Participant and Contractor, security shall be in the form of a performance bond or letter of credit in the amount of the payment.

2. EXHIBIT B - PRICE SHEET

   a. ECONOMIC PRICE ADJUSTMENT. Pursuant to section 3.4 of the Contract, using the Bureau of Labor Statistics Index for Truck and Bus Bodies, Series No. WPU 1413 to determine a price change, the price set forth in *Exhibit B - Price Sheet (Amd. 4)* are increased by 7.15%.

   b. GOODS AND SERVICE ADDITION. Pursuant to section 3.6 of the Contract, the Parties agree to add Battery charging infrastructure solutions. *Exhibit B - Price Sheet (Amd. 4)* is modified to include plug-in chargers, overhead chargers, mobile chargers, and charge management systems.

   Attached *Exhibit B - Price Sheet (Amd. 4)* supersedes all previous versions. As of the effective date of this Amendment, any reference to *Exhibit B* in the Contract is deemed to be a reference to *Exhibit 8- Price Sheet (Amd. 4).*

3. No CHANGE OTHER THAN AMENDMENT. Except as amended herein, the Contract is unaffected and remains in full force and effect.

4. INTEGRATED AGREEMENT; MODIFICATION. This Amendment constitutes the entire agreement and understanding of the Parties with respect to the subject matter and supersedes all prior negotiations and representations. In the event of any conflict between this Amendment and the Contract or any earlier amendment, this Amendment shall control and govern. This Amendment may not be modified except in writing signed by the Parties.

5. AUTHORITY. Each party to this Amendment, and each individual signing on behalf of each party, hereby represents and warrants to the other that it has full power and authority to enter into this Amendment and that its execution, delivery, and performance of this Amendment has been fully authorized and approved, and that no further approvals or consents are required to bind such party.

6. ELECTRONIC SIGNATURES. An electronic signature or electronic record of this Amendment or any other ancillary agreement shall be deemed to have the same legal effect as delivery of an original executed copy of this Amendment or such other ancillary agreement for all purposes.

7. COUNTERPARTS. This Amendment may be executed in one or more counterparts, each of which shall be deemed an original, and all of which counterparts together shall constitute the same instrument which may be sufficiently evidenced by one counterpart. Execution of this Amendment at different times and places by the parties shall not affect the validity thereof so long as all the parties hereto execute a counterpart of this Amendment.

EXECUTED AND EFFECTIVE as of the day and date first above written.

NEW FLYER OF AMERICA, INC.,
A NORTH DAKOTA COMPANY

By: Jennifer McNeil

Name: Jennifer McNeil

Title: Vice President, Sales & Marketing

Date: 12/07/24

STATE OF WASHINGTON
DEPARTMENT OF ENTERPRISE SERVICES

By: Jemmott, Michellee (DES) Digitally signed by Jemmott, Michellee (DES) Date: 2024.07.15 11:25:53 -07'00'

Name: Michellee Jemmott

Title: Procurement Supervisor

Date:

BID 20-046 SoW NewFlyer 06719 Amd 4

Final Audit Report 2024-07-12

Created:	2024-07-12
By:	Luciana Marques (luciana_marques@newflyer.com)
Status:	Signed
Transaction ID:	CBJCHBCAABAA6ZTjkQYo3e0zHbWFTRnamEvo2EbkiTMu

"BID 20-046 SoW NewFlyer 06719 Amd 4" History

Document created by Luciana Marques (luciana_marques@newflyer.com)
2024-07-12 - 1:53:26 AM GMT

Document emailed to Jennifer McNeil! Uennifer_mcneill@newflyer.com) for signature
2024-07-12 - 1:53:29 AM GMT

Email viewed by Jennifer McNeil! Uennifer_mcneill@newflyer.com)
2024-07-12 - 3:03:57 PM GMT

Document e-signed by Jennifer McNeil! Uennifer_mcneill@newflyer.com)
Signature Date: 2024-07-12 - 3:05:21 PM GMT - Time Source: server

Agreement completed.
2024-07-12 - 3:05:21 PM GMT

Appendix B

Schedule 1 – Schedule of Prices

City is exempt from federal excise taxes. State, local sales, and use taxes are not to be included in these prices.

No.	Qty.	Description	Unit Price	Total Price
1	94	40-ft Low Floor Hybrid Electric Coaches	$1,188,844.66	$111,751,397.62
2	1	Spare Parts Allowance (To be determined)	N/A	$3,000,000 (fixed allowance)
3	1	Training for 40-ft Low Floor Hybrid Electric Coaches	N/A	$1,000,000 (fixed allowance)
4	1	Operating, Maintenance and Parts Manuals	Included	Included
5	1	Special Tools (from Schedule 1B)	N/A	$1,000,000 (fixed allowance)
6	1	Telematics License for twelve years.	Included	Included
7	1	Allowance for regulatory mandated changes, requested passenger enhancements and system modifications resulting from changes to project interface	N/A	$1,000,000 (fixed allowance)
Grand Total				**$117,751,397.62**

Schedule 1A – Spare Parts List

Recommended Spare Parts List (provided by New Flyer) to be determined after the final configuration of the vehicles.

Schedule 1B – Special Tools List

Recommended Special Tools List (provided by New Flyer) to be determined after the final configuration of the vehicles.

Appendix C

Regulatory and Compliance Requirements

1. Delivery

Contractor must comply with the following delivery requirements.

A. Notice of Delivery: Prior to all deliveries, Contractor shall provide scheduled delivery dates to the ordering department. Any deliveries made without prior scheduling will be rejected by the department with no additional costs incurred.

B. Hours of Delivery: All deliveries shall be made and accepted at the City location indicated by the ordering department between the hours of 8:00 A.M. and 1:00 P.M.

C. Substitutions: No substitutions will be allowed unless approved in advance in writing by City.

D. Emergency Deliveries: Emergency deliveries shall be delivered by best means possible. Should the emergency delivery cause City to incur additional costs not contemplated by this Agreement, Contractor shall obtain City's prior approval. Contractor shall notify City of the estimated time of delivery.

E. Back Orders: Contractor shall notify the ordering department immediately if it is unable to deliver the items and/or quantity ordered. Contractor must notify and obtain approval from the ordering department prior to delivery of any back-ordered items. Department may reject back-ordered items at no additional costs incurred to the City. In the event that back-ordered items are delayed in excess of five (5) working days, the City reserves the right to reject partial shipment or cancel the item(s) ordered from the Agreement, at no additional cost incurred to the City.

F. Packing Slips: All deliveries must include a packing slip and must provide the following information:

1. Complete description including manufacturer's name and part number
2. Quantity ordered
3. Agreement number and contract item numbers
4. Back-ordered items and amount back-ordered
5. Date back-ordered items will be delivered
6. Purchase Order Number

2. Price

Only prices that appear on Appendix B Schedule 1 will be considered. No other pages with prices or attached price lists and/or catalog prices will be considered. In the event of a discrepancy between the unit price and the extended price, the unit price will prevail.

3. Price Adjustment

Contractor's Prices are to be firm for the term of the Agreement, from start date through the end of the term, including extensions.

4. Additional Goods and Services

If, in the satisfaction of governmental interests it is necessary to purchase additional Goods and Services from Contractor, additional Goods and Services may be added to this Agreement by mutual agreement of the Parties in accordance with Chapter 21 of the San Francisco Administrative Code.

Appendix F

Grant Terms

FTA REQUIREMENTS FOR PROCUREMENT CONTRACTS

I. DEFINITIONS

A. Approved Project Budget means the most recent statement, approved by the FTA, of the costs of the Project, the maximum amount of Federal assistance for which the City is currently eligible, the specific tasks (including specified contingencies) covered, and the estimated cost of each task.

B. Contractor means the individual or entity awarded a third party contract financed in whole or in part with Federal assistance originally derived from FTA.

C. Cooperative Agreement means the instrument by which FTA awards Federal assistance to a specific Recipient to support a particular Project or Program, and in which FTA takes an active role or retains substantial control.

D. Federal Transit Administration (FTA) is an operating administration of the U.S. DOT.

E. FTA Directive includes any FTA circular, notice, order or guidance providing information about FTA's programs, application processing procedures, and Project management guidelines. In addition to FTA directives, certain U.S. DOT directives also apply to the Project.

F. Grant Agreement means the instrument by which FTA awards Federal assistance to a specific Recipient to support a particular Project, and in which FTA does not take an active role or retain substantial control, in accordance with 31 U.S.C. § 6304.

G. Government means the United States of America and any executive department or agency thereof.

H. Project means the task or set of tasks listed in the Approved Project Budget, and any modifications stated in the Conditions to the Grant Agreement or Cooperative Agreement applicable to the Project. In the case of the formula assistance program for urbanized areas, for elderly and persons with disabilities, and non-urbanized areas, 49 U.S.C. §§ 5307, 5310, and 5311, respectively, the term "Project" encompasses both "Program" and “each Project within the Program," as the context may require, to effectuate the requirements of the Grant Agreement or Cooperative Agreement.

I. Recipient means any entity that receives Federal assistance directly from FTA to accomplish the Project. The term " Recipient" includes each FTA "Grantee" as well as each FTA Recipient of a Cooperative Agreement. For the purpose of this Agreement, Recipient is the City.

J. Secretary means the U.S. DOT Secretary, including his or her duly authorized designee.

K. Third Party Contract means a contract or purchase order awarded by the Recipient to a vendor or contractor, financed in whole or in part with Federal assistance awarded by FTA.

L. Third Party Subcontract means a subcontract at any tier entered into by Contractor or third party subcontractor, financed in whole or in part with Federal assistance originally derived from FTA.

M. U.S. DOT is the acronym for the U.S. Department of Transportation, including its operating administrations.

II. FEDERAL CHANGES

Contractor shall at all times comply with all applicable FTA regulations, policies, procedures and directives, including without limitation those listed directly or by reference in the Master Agreement between the City 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.

III. ACCESS TO RECORDS

A. The Contractor agrees to provide the City and County of San Francisco, 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 which are directly pertinent to this Agreement for the purposes of making audits, examinations, excerpts and transcriptions.

B. 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.

C. The Contractor agrees to maintain all books, records, accounts and reports required under this Agreement for a period of not less than three years after the date of termination or expiration of this Agreement, except in the event of litigation or settlement of claims arising from the performance of this Agreement, in which case Contractor agrees to maintain same until the City, 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. 49 CFR 18.36(i)(11).

IV. DEBARMENT AND SUSPENSION (Contracts over $25,000)

See Certification Regarding Debarment, Suspension, and Other Responsibility Matters (Attachment G).

A. The Contractor shall comply and facilitate compliance with U.S. DOT regulations, "Nonprocurement Suspension and Debarment," 2 C.F.R. part 1200, which adopts and supplements the U.S. Office of Management and Budget (U.S. OMB) "Guidelines to Agencies on Governmentwide Debarment and Suspension (Nonprocurement)," 2 C.F.R. part 180. These provisions apply to each contract at any tier of $25,000 or more, and to each contract at any tier for a federally required audit (irrespective of the contract amount), and to each contract at any tier that must be approved by an FTA official irrespective of the contract amount. As such, the Contractor shall verify that its principals, affiliates, and subcontractors are eligible to participate in this federally funded contract and are not presently declared by any Federal department or agency to be:

a) Debarred from participation in any federally assisted Award;

b) Suspended from participation in any federally assisted Award;
c) Proposed for debarment from participation in any federally assisted Award;
d) Declared ineligible to participate in any federally assisted Award;
e) Voluntarily excluded from participation in any federally assisted Award; or
f) Disqualified from participation in any federally assisted Award.

B. The Contractor agrees to include a provision in its lower-tier covered transactions requiring lower-tier participants to comply with the requirements of 2 CFR Part 180, Subpart C, and Part 1200, Subpart C.

V. NO FEDERAL GOVERNMENT OBLIGATIONS TO CONTRACTOR

A. The City 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 City, Contractor, or any other party (whether or not a party to that contract) pertaining to any matter resulting from the underlying contract.

B. 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.

VI. CIVIL RIGHTS

A. Nondiscrimination - In accordance with Title VI of the Civil Rights Act, as amended, 42 U.S.C. § 2000d, section 303 of the Age Discrimination Act of 1975, as amended, 42 U.S.C. § 6102, section 202 of the Americans with Disabilities Act of 1990, 41 U.S.C. § 12132, and Federal transit law at 49 U.S.C. § 5332, the Contractor agrees that it will not discriminate against any employee or applicant for employment because of race, color, 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.

B. Equal Employment Opportunity - The following equal employment opportunity requirements apply to the underlying contract:

1. Race, Color, Creed, National Origin, Sex - In accordance with Title VII of the Civil Rights Act, as amended, 42 U.S.C. § 2000e, and Federal transit laws at 49 U.S.C. § 5332, the Contractor agrees to comply with all applicable equal employment opportunity requirements of U.S. Department of Labor (U.S. DOT) 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 U.S.C. § 2000e note), and with any applicable Federal statutes, executive orders, regulations, and Federal policies that may in the future affect construction activities undertaken in the course of the Project. The Contractor agrees to take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, creed, national origin, sex, or age. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer,

recruitment or recruitment advertising, layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.

2. Age - In accordance with section 4 of the Age Discrimination in Employment Act of 1967, as amended, 29 U.S.C. § 623 and Federal transit law at 49 U.S.C. § 5332, the Contractor agrees to refrain from discrimination against present and prospective employees for reason of age. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.

3. Disabilities - In accordance with section 102 of the Americans with Disabilities Act, as amended, 42 U.S.C. § 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.

C. 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.

VII. DBE/SBE ASSURANCES

Pursuant to 49 C.F.R. Section 26.13, the Contractor is required to make the following assurance in its agreement with SFMTA and to include this assurance in any agreements it makes with subcontractors in the performance of this contract:

> The Contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 49 C.F.R. Part 26 in the award and administration of DOT-assisted contracts. Failure by the Contractor or subcontractor 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 SFMTA deems appropriate.

VIII. CONTRACT WORK HOURS AND SAFETY STANDARDS *(applicable to non-construction contracts in excess of $100,000 that employ laborers or mechanics on a public work)*

A. Overtime requirements - No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

B. Violation; liability for unpaid wages; liquidated damages - In the event of any violation of the clause set forth in paragraph A of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States 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 A of

this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph A of this section.

C. Withholding for unpaid wages and liquidated damages - The City and County of San Francisco shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2) of this section.

D. Subcontracts - The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs A through D 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 A through D of this section.

IX. ENERGY CONSERVATION REQUIREMENTS

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

X. CLEAN WATER REQUIREMENTS *(applicable to all contracts in excess of $100,000)*

A. The Contractor agrees to comply with all applicable standards, orders, or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. §§ 1251 et seq. Contractor agrees to report each violation of these requirements to the City and understands and agrees that the City will, in turn, report each violation as required to assure notification to FTA and the appropriate EPA regional office.

B. 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.

XI. CLEAN AIR *(applicable to all contracts and subcontracts in excess of $100,000, including indefinite quantities where the amount is expected to exceed $100,000 in any year.)*

A. Contractor agrees to comply with applicable standards, orders, or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. §§ 7401 et seq. The Contractor agrees to report each violation to the City and understands and agrees that the City will, in turn, report each violation as required to assure notification to FTA and the appropriate EPA Regional Office.

B. 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.

XII. PRIVACY

If Contractor or its employees administer any system of records on behalf of the Federal Government, Contractor and its employees agree to comply with the information restrictions and other applicable requirements of the Privacy Act of 1974, 5 U.S.C. § 552a (the Privacy Act). Specifically, Contractor agrees to obtain the express consent of the Federal Government before the Contractor or its employees operate a system of records on behalf of the Government. Contractor acknowledges that the requirements of the Privacy Act, including the civil and criminal penalties for violations of the Privacy Act, apply to those individuals involved, and that failure to comply with the terms of the Privacy Act may result in termination of this Agreement. The Contractor also agrees to include these requirements in each subcontract to administer any system of records on behalf of the Federal Government financed in whole or in part with Federal assistance provided by FTA.

XIII. DRUG AND ALCOHOL TESTING

To the extent Contractor, its subcontractors or their employees perform a safety-sensitive function under the Agreement, Contractor agrees to comply with, and assure compliance of its subcontractors, and their employees, with 49 U.S.C. § 5331, and FTA regulations, "Prevention of Alcohol Misuse and Prohibited Drug Use in Transit Operations," 49 CFR Part 655.

XIV. TERMINATION FOR CONVENIENCE OF CITY *(required for all contracts in excess of $10,000)*

See Agreement Terms and Conditions.

XV. TERMINATION FOR DEFAULT *(required for all contracts in excess of $10,000)*

See Agreement Terms and Conditions.

XVI. BUY AMERICA

The Contractor agrees to comply with 49 U.S.C. 5323(j) and 49 CFR Part 661, which provide that Federal funds may not be obligated unless steel, iron, manufactured products, and construction materials (excluding cement and cementitious materials, aggregates such as stone, sand, or gravel, or aggregate binding agents or additives) 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. "Construction materials" include an article, material, or supply that is or consists primarily of:

- Non-ferrous metals;
- Plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables);
- Glass (including optic glass);
- Lumber; or
- Drywall.

General waivers are listed in 49 CFR 661.7, and include microcomputer equipment, software, and small purchases ($150,000 or less) made with capital, operating, or planning funds. Contractor agrees to be solely responsible for all costs relating to compliance with the Buy America requirements. Failure to comply with these requirements constitutes a material breach

of this contract. See 49 CFR § 661.17. Contractors who intentionally or wilfully fail to comply with the Buy America requirements may also be subject to debarment or suspension proceedings. 49 CFR §§ 661.18, 661.19.

XVII. CARGO PREFERENCE - USE OF UNITED STATES FLAG VESSELS

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

XVIII. RECYCLED PRODUCTS

The Contractor agrees to comply with all the requirements of Section 6002 of the Resource Conservation and Recovery Act (RCRA), as amended (42 U.S.C. 6962), including, but not limited to, the regulatory provisions of 40 CFR Part 247, and Executive Order 12873, as they apply to the procurement of the items designated in Subpart B of 40 CFR Part 247.

XIX. BUS Testing *(applies to contracts for rolling stock)*

To the extent applicable, the Contractor (or Manufacturer) agrees to comply with the requirements of 49 U.S.C. § 5323(c) and FTA implementing regulations at 49 CFR Part 665, and shall perform the following:

A. A manufacturer of a new bus model or a bus produced with a major change in components or configuration shall provide a copy of the final test report to the Recipient 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.

B. 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.

C. If the manufacturer represents that the vehicle was previously tested, the vehicle being sold should have the identical configuration and major components as the vehicle in the test report, which must be provided to the Recipient prior to 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.

D. If the manufacturer represents that the vehicle is "grandfathered" (has been used in mass transit service in the United States before October 1, 1988, and is currently being produced without a major change in configuration or components), the manufacturer shall

provide the name and address of the recipient of such a vehicle and the details of that vehicle's configuration and major components.

XX. PRE-AWARD AND POST-DELIVERY AUDIT REQUIREMENTS

To the extent applicable, Contractor agrees to comply with the requirements of 49 U.S.C. § 5323(l) and FTA implementing regulations at 49 CFR Part 663, and to submit the following certifications:

A. Buy America Requirements: The Contractor shall complete and submit a declaration certifying either compliance or noncompliance with Buy America. If the Bidder/Offeror certifies compliance with Buy America, it shall submit documentation which 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 are planned to take place and actually took place at the final assembly point and the cost of final assembly.

B. Solicitation Specification Requirements: The Contractor shall submit evidence that it will be capable of meeting the bid specifications and provide information and access to Recipient and its agents to enable them to conduct post-award and post-delivery audits.

C. Federal Motor Vehicle Safety Standards (FMVSS): The 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.

XXI. FALSE OR FRAUDULENT STATEMENTS AND CLAIMS

A. The Contractor acknowledges that the provisions of the Program Fraud Civil Remedies Act of 1986, as amended, 31 U.S.C. §§ 3801 et seq. and U.S. DOT regulations, "Program Fraud Civil Remedies," 49 CFR Part 31, apply to its actions pertaining to this Project. Upon execution of the underlying Agreement, the Contractor certifies or affirms the truthfulness and accuracy of any statement it has made, it makes, it may make, or causes to be made, pertaining to the underlying contract or 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.

B. 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 U.S.C. § 5307, the Government reserves the right to impose the penalties of 18 U.S.C. § 1001 and 49 U.S.C. § 5307(n)(1) on the Contractor, to the extent the Federal Government deems appropriate.

C. 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.

XXII. FLY AMERICA

The Contractor agrees to comply with 49 U.S.C. 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 subrecipients 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.

XXIII. NATIONAL ITS ARCHITECTURE POLICY *(Applicable to contracts for ITS projects)*

If providing Intelligent Transportation Systems (ITS) property or services, Contactor shall comply with the National ITS Architecture and standards to the extent required by 23 U.S.C. § 512, FTA Notice, "FTA National ITS Architecture Policy on Transit Projects," 66 FR 1455, et seq., January 8, 2001, and later published policies or implementing directives FTA may issue.

XXIV. INCORPORATION OF FEDERAL TRANSIT ADMINISTRATION (FTA) TERMS

The preceding provisions include, in part, certain Standard Terms and Conditions required by DOT, whether or not expressly set forth in the preceding contract provisions. All contractual provisions required by DOT, as set forth in FTA Circular 4220.1F, are hereby incorporated by reference. Anything to the contrary herein notwithstanding, all FTA mandated terms shall be deemed to control in the event of a conflict with other provisions contained in this Agreement. The Contractor shall not perform any act, fail to perform any act, or refuse to comply with any (name of grantee) requests which would cause (name of grantee) to be in violation of the FTA terms and conditions.

XXV. TEXTING WHILE DRIVING; DISTRACTED DRIVING

Consistent with Executive Order 13513 "Federal Leadership on Reducing Text Messaging While Driving", Oct. 1, 2009 (available at http://edocket.access.gpo.gov/2009/E9-24203.htm) and DOT Order 3902.10 "Text Messaging While Driving", Dec. 30, 2009, SFMTA encourages Contractor to promote policies and initiatives for employees and other personnel that adopt and promote safety policies to decrease crashes by distracted drivers, including policies to ban text messaging while driving, and to include this provision in each third party subcontract involving the project.

XXVI. SEAT BELT USE

In compliance with Executive Order 13043 "Increasing Seat Belt Use in the United States", April 16, 1997 23 U.S.C. Section 402 note, the SFMTA encourages Contractor to adopt and promote on-the-job seat belt use policies and programs for its employees and other personnel

that operate company owned, rented, or personally operated vehicles, and to include this provision in each third party subcontract involving the project.

XXVII. DISPUTE RESOLUTION PROCEDURE

A. Negotiation; Alternative Dispute Resolution. The Parties will attempt in good faith to resolve any dispute or controversy arising out of or relating to the performance of services under this Agreement. If the Parties are unable to resolve the dispute, then, pursuant to San Francisco Administrative Code Section 21.35, Contractor may submit to the Contract Administrator a written request for administrative review and documentation of the Contractor's claim(s). Upon such request, the Contract Administrator shall promptly issue an administrative decision in writing, stating the reasons for the action taken and informing the Contractor of its right to judicial review. If agreed by both Parties in writing, disputes may be resolved by a mutually agreed-upon alternative dispute resolution process. If the parties do not mutually agree to an alternative dispute resolution process or such efforts do not resolve the dispute, then either Party may pursue any remedy available under California law. The status of any dispute or controversy notwithstanding, Contractor shall proceed diligently with the performance of its obligations under this Agreement in accordance with the Agreement and the written directions of the City. Neither Party will be entitled to legal fees or costs for matters resolved under this section.

Government Code Claim Requirement. No suit for money or damages may be brought against the City until a written claim therefor has been presented to and rejected by the City in conformity with the provisions of San Francisco Administrative Code Chapter 10 and California Government Code Section 900, et seq. Nothing set forth in this Agreement shall operate to toll, waive or excuse Contractor's compliance with the California Government Code Claim requirements set forth in San Francisco Administrative Code Chapter 10 and California Government Code Section 900, et seq.

XXVIII. LOBBYING *(To be submitted with each bid or offer exceeding $100,000)*

Certification required (See Attachment F).

XXIX. PROMPT PAYMENT

A. In accordance with SFMTA's SBE/DBE Program, no later than three days from the date of Contractor's receipt of progress payments by SFMTA, the Contractor shall pay any subcontractors for work that has been satisfactorily performed by said subconsultants. Unless the prime consultant notifies the CCO Director in writing within 10 Working Days prior to receiving payment from the City that there is a bona fide dispute between the prime consultant and the subconsultant. Within five Working Days of such payment, Consultant shall provide City with a declaration under penalty of perjury that it has promptly paid such subconsultants for the work they have performed. Failure to provide such evidence shall be cause for City to suspend future progress payments to Consultants.

B. Consultant may withhold retention from subconsultants if City withholds retention from Consultant. Should retention be withheld from Consultant, within 30 days of City's payment of retention to Consultant for satisfactory completion of all work required of a subconsultant, Contractor shall release any retention withheld to the subconsultant. Satisfactory completion shall mean when all the tasks called for in the subcontract with subconsultant have

been accomplished and documented as required by City. If the Consultant does not pay its subconsultant as required under the above paragraph, it shall pay interest to the subconsultant at the legal rate set forth in subdivision (a) of Section 685.010 of the California Code of Civil Procedure.

XXX. VETERANS EMPLOYMENT (*applicable to Capital Projects)*

As provided by 49 U.S.C. § 5325(k):

A. To the extent practicable, Contractor agrees that it:

1. Will give a hiring preference to veterans (as defined in 5 U.S.C. § 2108), who have the skills and abilities required to perform construction work required under a third party contract in connection with a capital project supported with funds made available or appropriated for 49 U.S.C. chapter 53, and

2. Will not require an employer to give a preference to any veteran over any equally qualified applicant who is a member of any racial or ethnic minority, female, an individual with a disability, or a former employee, and

B. Contractor also assures that its subcontractor will:

1. Will give a hiring preference to veterans (as defined in 5 U.S.C. § 2108), who have the skills and abilities required to perform construction work required under a third party contract in connection with a capital project supported with funds made available or appropriated for 49 U.S.C. chapter 53, to the extent practicable, and

2. Will not require an employer to give a preference to any veteran over any equally qualified applicant who is a member of any racial or ethnic minority, female, an individual with a disability, or a former employee.

XXXI. PROHIBITION AGAINST USE OF CONTRACT FUNDS FOR COVERED TELECOMMUNICATIONS EQUIPMENT

Under 2 CFR Section 216, Contractors and Subcontractors are prohibited from using Contract funds to:

A. Procure or obtain;

B. Extend or renew a contract to procure or obtain; or

C. Enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. As described in Section 889 of Public Law 115-232, covered telecommunications equipment is:

1. telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).

2. For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications

Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).

3. Telecommunications or video surveillance services provided by such entities or using such equipment.

4. Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

Appendix G

SFMTA's Technical Specifications

Please see the attached conformed Technical Specifications.

SFMTA-2024-03-FTA

Agreement

Appendix G

SFMTA's Technical Specifications

Exhibit E

CITY AND COUNTY OF SAN FRANCISCO
SAN FRANCISCO MUNICIPAL TRANSPORTATION AGENCY

TECHNICAL SPECIFICATIONS

FOR

THE PROCUREMENT OF
40-FOOT LOW FLOOR
HYBRID MOTOR COACHES

CONTRACT NO.

SFMTA-2024-03-FTA

TABLE OF CONTENTS

1 OVERALL REQUIREMENTS

1.1 SCOPE

These specifications detail the technical requirements for the construction of new heavy-duty 40-foot Low Floor Hybrid Motor Coaches for the San Francisco Municipal Transportation Agency (SFMTA). The new Coaches are intended to provide superior performance in the unique San Francisco operating environment with improved reliability and reduced emissions compared to existing SFMTA equipment. These Coaches are intended for the widest possible spectrum of passengers, including children, adults, seniors, and the ADA community.

The Coach shall be designed to operate in transit service for at least 12 years or 500,000 miles.

The Contractor shall be responsible for designing, fabricating, assembling, testing, and finishing transit Coaches, which are in all respects compliant with the requirements of the Contract Documents. Included with these requirements are specified components, equipment, and systems often accompanied by the phrase “or approved equal.” Such components, equipment and systems, or deviations and substitution items specifically approved by the SFMTA shall be provided as part of the completed Coaches by the Contractor.

The Contractor shall ensure that the application and installation of major Coach subcomponents and systems are compliant with all such subcomponent vendors’ requirements and recommendations. The Contractor and the Agency shall identify subcomponent vendors that shall submit installation/application approval documents with the completion of a pilot or lead Coach.

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

1.1.1 Definitions

The following are definitions of special terms used in the Technical Specifications:

Ambient Temperature – The temperature of the surrounding air. Unless otherwise specified, ambient temperature shall be between 16°C (50°F) and 38°C (100°F).

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

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 four (4) decibels (dB) or more.

Auxiliary Power Unit (APU) – Converts consumable fuel energy into mechanical and/or electrical energy.

Battery Rated Ampere-hour Capacity – Manufacturer rated capacity of a batter in Ampere-hours obtained from a battery discharged at the manufacturer's recommended discharge rate such that a specified minimum cut-off terminal voltage is reached.

BMS (Battery Management System) – Monitors energy, as well as temperature, individual 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.

Break over Angle – 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 Coach that defines the largest ramp over which the Coach can roll.

Coach – The term refers to the coach specified for procurement in this contract, unless otherwise specified.

Curb Weight – Weight of Coach, including maximum fuel, oil, coolant, and all equipment required for operation and required by this specification, but without passengers or operator.

Day - (whether or not capitalized) means a calendar day, unless otherwise designated.

dBA – Decibels with reference to 002 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. May also be referred to as a "converter".

Defect(s) – Patent or latent malfunctions or failure in manufacture or design of any component or subsystem.

Departure Angle – The angle measured between a line tangent to the rear tire static loaded radius and the initial point of structural interference rearward of the rear tire to the ground.

DR – Diagnostic Reader

ECM – Engine Control Module

Electric Drive System – Traction motor, system controller, generator, energy storage system, propulsion cooling system, and all related electronic and mechanical components.

Energy Density - The relationship between the mass of an energy storage device and its energy capacity in units of watt-hours per kilogram (W*h/kg).

Energy Storage System (ESS) - A component or system of components that stores energy and for which its supply of energy is re-chargeable by an APU, an off-vehicle electric energy source, or both.

EAM (Enterprise Asset Management) – The SFMTA's computerized maintenance system by Hexagon which is utilized for tracking Coach history including but not limited to labor, parts, warranty, vendor activity, in addition to inventory of parts and supplies.

Fireproof - Materials that will not burn or melt at temperatures less than 2,000°F.

Fire-Resistant - Materials that have a flame spread index less than 150 as measured in a radiant panel flame test per ASTM-E 162-75.

Free Floor Space - Floor area available to standees, excluding stepwells, area under seats, area occupied by feet of seated passengers, area outboard of the exit door standee line, and the vestibule area forward of the standee line. Floor area of 1.5 square feet shall be allocated to be occupied by the feet of each standee.

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

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

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

Gross Vehicle Weight Rating (GVWR) - The maximum total weight, as determined by the Coach manufacturer, at which the Coach can be safely and reliably operated for its intended purpose. The GVWR shall be greater than or equal to GVW.

Heating, Ventilation, and Air Conditioning (HVAC) – The on-board system which keep the Coach properly heated, cooled, and ventilated.

High Voltage – Electrical potential of 50 volts or greater (AC and DC).

Hybrid-electric Drive System – Propulsion system comprised of an APU and a corresponding electric drive system connected with the APU.

Illustrated Parts Catalog (IPC) – Layout drawings containing essential parts and part numbers which make up an assembly. These documents include the original manufacturers' names, part numbers, part quality, part quantities, and sub-part and vendor information.

Intelligent Transportation Systems (ITS) – A secured cabinet that accommodates all onboard electronic equipment, including the mobile radio/AVL equipment and third-party auxiliary equipment.

J1708 & J1939 – SAE standards defining bi-directional, serial communication links among control modules containing microcomputers in heavy-duty Coach applications.

Low Floor - Coach configuration primarily identified by the lack of steps at the front and rear doors.

Low Voltage – Under 50 volts (AC and DC).

Major Component - A complete system that is an essential part of the vehicle. Major Components include, but are not limited to, the Vehicle chassis, destination signs, customer information system, automatic passenger counter, Propulsion System, Telematics, Onboard Charging System(s), suspension, power steering system, braking system, axles, computer-aided dispatch and voice annunciation system, door system, wheelchair ramp, fire suppression system, HVAC system, fare collection system, and video surveillance system.

Mean Distance Between Failures (MDBF): Average distance between any incident, malfunction, intermittent condition, or failure of equipment or hardware which causes a delay in revenue service or under normal operating conditions would cause passengers to be transferred to another Coach.

Propulsion Control System (PCS) - The PCS regulates the amount of energy, (DC power in the case of batteries and capacitors), that is transferred (or converted to AC power by the inverter in AC motors) for acceleration. It also ensures that voltage is maintained within the specifications required for operating the motor(s). An electronic controller can also recover electrical energy by switching the motor(s) to a generator to capture the Coach's kinetic energy through regenerative braking. The controller also ensures that the regenerative current does not overcharge the energy storage system and that regenerative energy is otherwise safely dissipated when not captured.

Parallel Hybrid – Electric motor and APU are both mechanically connected to the drive wheels.

Propulsion System - System that provides propulsion for the Coach in an amount proportional to what the driver commands. Includes the ESS and system controllers, including all wiring and any converter or inverter.

Regenerative Braking - Deceleration of the Coach caused by operating an electric motor-generator system. This act returns energy to the Coach propulsion system and provides charge to the ESS.

Related Defect(s) – Damages inflicted on any component or subsystem as a direct result of a Defect.

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

Series Hybrid – No mechanical connection between the APU and the drive wheels. The APU supplies electricity to the motor(s) and ESS. There are three (3) basic variations: 1) a single electric motor or set of motors drives the wheels directly or 2) a single electric motor or set of motors drives the wheels through a mechanical transmission; or 3) an independent wheel motor drives each drive wheel. In each case, the electric motor(s) may draw energy from either the energy storage device or from the APU as determined by the controller. Subcategories of series hybrids include: engine-dominant and battery-dominant. These subcategories are generally linked to whether the hybrid system is charge sustaining or charge depleting.

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

Standee Line - A line designating an area outward of which a passenger may not stand while the Coach is moving. The front standee line refers to the line marked across the Coach aisle in line with the front curbside modesty panel. The rear standee line refers to the line marked adjacent to the exit door.

State of charge (SOC) - Quantity of electric energy remaining in a battery relative to the maximum rated capacity of the battery expressed in percent. This is a dynamic measurement used for the energy storage system. 100% SOC indicates that the energy storage system cannot accept further charging from external sources. An absolute SOC is based on the total battery capacity at the beginning of a battery's life. A relative SOC is based on the total degraded capacity at the time of measurement.

Structure – The basic Coach body, including floor deck material and installation, load-bearing external panels, structural components, axle mounting provisions, suspension beams, attachment points, and any other significant load-bearing component.

Telematics – Coach data monitoring system. Capable of providing tools for energy management, Coach battery statistics, automated reports, real time Coach position, data management, diagnostics, and automated fault reporting. Integrates with APC, CAD/AVL, and fixed route scheduling system.

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., kWh) and is used in the overall calculation of available range. WEOL shall be used as a condition for the battery's state of health and replacement and to potentially initiate warranty claims.

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

Working Day - All 24-hour periods beginning and ending at midnight, Monday through Friday inclusive.

1.1.2 Acronyms

The following is a list of acronyms used in the Technical Specifications:

A/C	Air Conditioning
ABS	Anti-Lock Braking System
AC	Alternating Current
ADA	Americans with Disabilities Act
Ah	Amp hour
ANSI	American National Standards Institute
APC	Automatic Passenger Counter
API	Application Programming Interface
APTA	American Public Transportation Association
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASTM	American Society for Testing and Materials
AVL	Automatic Vehicle Location
AWS	American Welding Society
BMS	Battery Management System
CAD	Computer-Aided Dispatch
CCR	California Code of Regulations
CCTV	Closed-Circuit Television
CFR	Code of Federal Regulations
dB	Decibel
DC	Direct Current
DDU	Driver Display Unit
DR	Diagnostic Reader
DTE	Diagnostic Test Equipment

DVAS	Digital Voice Annunciation System
DVD	Digital Versatile Disc
EMC	Electromagnetic Compatibility
EMF	Electromagnetic Force
EMI	Electromagnetic Interference
EPA	Environmental Protection Agency
EPU	Emergency Propulsion Unit
ESS	Energy Storage System
FCC	Federal Communications Commission
FEA	Finite Element Analysis
FEMA	Failure Mode Effects Analysis
FSRP	Field Service Repair Procedure
FMCSR	Federal Motor Carrier Safety Regulations
FMVSS	Federal Motor Vehicle Safety Standards
FTA	Federal Transit Administration
GAWR	Gross Axle Weight Rated
GPS	Global Positioning System
GVW	Gross Vehicle Weight
GVWR	Gross Vehicle Weight Rating
HVAC	Heating, Ventilation and Air Conditioning
IEEE	Institute of Electrical and Electronics Engineers
IPC	Illustrated Parts Catalog
IP	Internet Protocol
ISO	International Organization for Standardization
JIC	Joint Industrial Council
kWh	Kilowatt-Hours
LED	Light Emitting Diode
MIL-STD	Military Standard
NEC	National Electrical Code
NFPA	National Fire Protection Association
NHTSA	National Highway Traffic Safety Administration
NTSC	National Television System Committee

OCU	Operator Control Unit
OEM	Original Equipment Manufacturer
PA	Public Address
PCB	Printed Circuit Board
PLC	Programmable Logic Controller
PPU	Primary Propulsion Unit
psi	Pounds per Square Inch
RFI	Radio Frequency Interference
SAE	Society of Automotive Engineers
SPI	Society of the Plastics Industry
SDTS	Self Diagnostic Testing Software
SLW	Seated Load Weight
UL	Underwriters Laboratories
USDOT	United States Department of Transportation
VDC	Volts of Direct Current

1.1.3 Legal Requirements

A. The Coach shall meet all applicable FMVSS in effect at the date of manufacture. The Coach and equipment must comply with all applicable federal, state, and local regulations. Local regulations are defined as those below the state level. In the event of any conflict between the requirements of these specifications and any applicable legal requirement, the legal requirement shall prevail.
B. The manufacturer shall certify to the SFMTA that the Coach complies with 49 U.S.C. § 5323l and FTA implementing regulations at 49 CFR Part 665 concerning Coach testing.
C. The manufacturer shall test the prototype Coach at the Altoona, PA Testing Facility and shall provide copies of all testing reports. If the Coach design proposed by the manufacturer has already been tested successfully at the Altoona, PA Testing Facility, then re-test of the prototype will not be necessary, subject to the SFMTA's approval of the test results.
D. The manufacturer shall verify that the Coach is certified by the California Air Resources Board (CARB) for meeting both exhaust emissions and engine durability requirements as specified for use in heavy-duty, urban transit coaches. If manufacturer intends to emissions certify through vehicle testing, a detailed testing strategy and design review shall be approved by the SFMTA prior to testing.
E. Manufacturer shall certify that the proposed Coach meets the specifications set forth in the ADA.

1.2 DIMENSIONS

With the exceptions of exterior mirrors, marker and signal lights, flexible portions of the bumpers, and fender skirts, the Coach shall have the following overall general dimensions:

TABLE 1.2 – Bus Requirements

	40’ Bus
Length, excluding bumpers	40’ +/- 1’
Width, exterior, excluding mirrors	102” max
Overall height without roof-mounted HVAC system	125” max
Overall height with roof-mounted HVAC system	140” max
Seating capacity	32 min
Overall passenger capacity	65 min
Seat width (one passenger)	18” min
Seat width (two passengers)	35” min
General aisle width	22” min
Headroom along center aisle, at front axle wheelhouse	80” min
Headroom along center aisle, at rear axle wheelhouse	77” min
Front door height from ground (normal)	15” max
Front door height from ground (kneeled)	10” max
Rear door height from ground (normal)	15” max
Body ground clearance	8” min
Approach angle, with/without over-raise feature	9 degrees min
Break over angle with/without over-raise feature	9 degrees min
Departure angle with/without over-raise feature	9 degrees min
Turning radius (outside body corners)	45’ max.

1.2.1 Turning Radius

The Coach shall meet the outside body turning radius requirements specified in Table 1.2 regardless of load to the GVWR.

1.2.2 Underbody Clearance

The Coach shall maintain the minimum clearance dimensions as shown in Table 1.2 and defined in SAE Standard J689, regardless of load, up to the GVWR. All components under the Coach, including the engine, oil pan, traction motor, and generator shall be protected from impacts.

Ramp Clearances: Any encroachment into the approach or departure angle area shall encounter a structural member before any component. The Contractor shall verify the approach and departure angles.

Ground Clearance: Ground clearance shall be no less than eight (8) inches except within the axle zone and wheel area.

Axle Zone Clearance: Axle zone clearance (the axle zone is the projected area between tires and wheel on the same axial centerline) shall be no less than five (5) inches.

1.3 PROPULSION SYSTEM PERFORMANCE

The Coach shall be road-tested and shall meet the following criteria with respect to GVWR. Acceleration times begin when the accelerator pedal is depressed; lag time between depression of the accelerator pedal and movement of the Coach shall not be noticeable. Minimum actual Coach speed and acceleration requirements can be found in Table 1.3.1. The SFMTA, at its sole discretion, may require the Contractor to verify the performance of the Coach on any or all the grades listed.

TABLE 1.3.1 – Performance Requirements

Speed on Grade

Grade	Speed Requirement 40-Foot
0% Grade	63 mph (max)
2% Grade	55 mph
5% Grade	25 mph
10% Grade	15 mph
16% Grade	10 mph
18% Grade	Not Applicable
20% Grade	Not Applicable
23% Grade	8 mph

Acceleration on Grade

Grade	mph	Time (seconds) 40-Foot
0% Grade	0-10	5
0% Grade	0-20	7
0% Grade	0-40	25
2% Grade	0-15	7
5% Grade	0-18	7
10% Grade	0-14	7
16% Grade	0-10	7

Locations of Grades for Speed and Acceleration Tests:

Interstate 280 at 25th St	0% grade heading southbound toward San Jose.
Hwy. 101 at Beatty Ave	2% grade heading southbound toward San Jose.
California St & 28th Ave	5% grade heading westbound for three blocks.
Jackson St & Steiner St	10% grade heading westbound.
Castro St & 24th Ave	16% grade heading northbound.
Pine St from Kearny St to Grand Ave	18% grade heading westbound.
Mississippi St from 22nd St to 20th St	20% grade heading northbound.
Noe St & 26th Ave	23% grade heading southbound.

1.4 DUTY CYCLE

The Coach shall be designed to be compatible with the terrain and environment found in the SFMTA's service area. Also, the Coach shall be capable of running continuously at GVWR in the environmental conditions found in the SFMTA's service area. These conditions include high humidity, rain, and occasional temperature extremes.

The Coach shall meet all propulsion and braking system performance requirements specified below in this section. Braking application and performance shall remain consistent regardless of ESS 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 Contractor shall supply new performance data to the SFMTA as appropriate when programming changes affect the Coach performance.

The Contractor to provide a complete list of programmable acceleration and deceleration settings and list the changes to the Coach performance for each setting. Performance data shall include acceleration data as shown in Table 1.3.1 and an estimate of effect on energy consumption per mile on a standard drive cycle.

The Contractor shall supply documentation confirming the Coach meets all relevant requirements of 49 CFR Part 571, Section 121, as well as Division 12, Chapter 3 of the California Vehicle Code.

Jerk, the rate of change of acceleration, shall be minimized throughout acceleration and deceleration and shall average no greater than 0.3 g/s over any half-second interval. This requirement shall be achieved regardless of operator actions.

The Coach shall be capable of continuous operation at freeway speeds with GVWR and an ambient temperature of 115°F without overheating or degradation of any operating component. It shall operate in stop-and-go downtown traffic with no adverse effects. The Coach shall also be able to safely and efficiently negotiate the hilly conditions found in San Francisco. The SFMTA's service area includes grades of up to 23 percent.

The Coach shall achieve normal operation in the environmental conditions of San Francisco with temperature ranges of 0°F to 115°F, at relative humidity between 5 percent and 100 percent, and at essentially sea level altitudes. Any exception to the above requirement must be approved by the SFMTA.

The Coach shall be capable of traveling along the paths specified below with adequate clearance such that its chassis does not contact the road or sidewalk. The SFMTA, at its sole

discretion, may require the Contractor to verify the clearance of the Coach on any or all the locations listed below.

Paths for Clearance Testing:

- Sacramento Street – from Drumm Street To Van Ness Avenue.
- Clay Street – from Van Ness Avenue to Drumm Street.
- 24 Divisadero Line – from 30th Steet & Mission Street, heading west on 30th Street, turning right/north on Noe Street, turning left/west on 26th Street, then right/north on Castro Street/Divisadero Street – following that north to Geary Boulevard. This route is repeated in the opposite direction.
- Operate around turn from Clayton Street onto Market Street and from Market Street onto Clayton Street
- DeHaro Street – from Mariposa Street. To 23rd Street (note: this is a 21% grade).
- 23rd Street – between Indiana Street and Pennsylvania Avenue in both directions (note: this provides severe grade changes to check the straight-on approach, break-over, and departure clearances).
- Mansell Street at San Bruno Avenue intersection; confirm the departure angle.
- Rhode Island Street at 26th Street – negotiate southbound turn onto 26th without contact between road surface and chassis (note: this determines front-left side chassis clearance through left hand turn).
- Golden Gate bridge toll plaza
- Southbound 19th Avenue to Westbound Lincoln Way (curb lane to curb side bus stop right turn) or Northbound 3rd Street to Eastbound 20th Street.
- 22 Filmore Line – U-turn loops at Fillmore Street and Marina Boulevard
- 6 Haight/Parnassus Line – U-turn loop at14th Avenue and Quintara Street.
- F-line ROW on The Embarcadero from Battery Street to Mission Street. (The SFMTA runs Coaches on the F-line as a substitute following the tracks with cobblestone.
- VA Hospital at Fort Miley to verify height clearance of 10’ 10”.

1.5 AUDIBLE NOISE LEVEL CONTROL

Instrumentation and other requirements shall conform to SAE Standard J366, except that the two-dBA tolerance is not allowed. The Contractor shall develop a test plan for validating the noise levels based on the following criteria. This plan shall be presented to the SFMTA for review and approval. The tests shall be configured to be conducted with the Coach unloaded.

1.5.1 Interior Noise

The Contractor shall use testing procedures in accordance with the Altoona interior noise test to: a) measure the noise level when the Coach is stationary with 80 dBA white noise on the left side exterior of the Coach; b) measure the noise level when the Coach is accelerating at full throttle

from 0-35 mph; and c) observe vibrations/rattles with the Coach is operating at various speeds from 0-55 mph.

TABLE 1.5.1

OPERATING MODE	Maximum Allowable at Any Seat Location in Passenger Area	Maximum Allowable at Operator Seat
Stationary w/80dBA	65 dBA	75 dBA
(0-35 mph)	80 dBA	75 dBA with AC OFF 78 dBA with AC ON
Vibration/Rattles	none	none

1.5.2 Exterior Noise

The Contractor shall use exterior noise testing procedures in accordance with the Altoona noise test to measure the exterior noise levels when the Coach is operating at all three conditions.

TABLE 1.5.2

OPERATING MODE (Curb Side)	MAXIMUM ALLOWABLE
Pull-away test at full throttle	72 dBA
Curb idle test w/AC ON	65 dBA

1.6 ELECTRONIC NOISE CONTROL

Electrical and electronic subsystems and components on the Coach shall not emit electromagnetic radiation that will interfere with on-board equipment, fare collection, telephone, radio, TV reception or be susceptible to R.F.I./E.M.I., and shall not be affected by external sources of R.F.I./E.M.I. (Reference Section 7.12, Electrical and Electronic Noise).

1.7 COMPONENT PROTECTION AND OVER-RIDE

All major components of the propulsion system shall be monitored for proper operation and shall be provided with automatic shut-down features that will protect the components from damage in the event of conditions such as over-speed, over-temperature, overload, or short circuit. Such shutdown features shall be tied to warning lights and alarms in the driver's area, and to fault codes logged in the diagnostic system. The Coach may continue to drive until the operator moves to a safe location and parks the Coach at which point the Coach will automatically shut down. The components that must be protected in this way include, but are not limited to APU and its major subsystems (including engine, emissions control equipment, and propulsion system generator), traction motor(s), power electronics, and energy storage units. Such

automatic shut-down features shall be capable of being overridden to allow the Coach to be safely moved a short distance (for example: out of the flow of traffic), unless overriding will pose a serious safety hazard (for example: a fire). The over-ride feature shall be activated by a guarded momentary contact switch located at the driver's position.

The control system shall be designed so that components that are mechanically connected to the rear wheels shall be prevented from over-speeding. This shall be accomplished automatically, without operator intervention, through a speed limiting control system. As an example, accelerator application shall be progressively reduced and/or regenerative braking shall be progressively applied to prevent the drive motor system from over-speeding.

1.8 SHOCK HAZARDS

Casual contact with components that have a sufficient voltage potential (EMF) to cause bodily injury shall not be possible. No passenger, driver, or passerby shall be able to contact such equipment.

Electrical systems and equipment shall conform to the applicable SAE standards and/or recommended practices for hybrid vehicles (including, J1673, J1742, J1766, J1797, J1798, J2344, J2293). The electrical system shall also conform to SAE standards for wiring (J1654 and J1673) and connectors (J1742).

There should be no high voltage areas within the passenger compartment. For maintenance purposes, all devices that contain high-voltage circuits (maximum circuit operating voltages greater than 50V) shall be contained within protective enclosures or enclosed Coach body compartments that are either non-conductive or have been coated with the SFMTA approved non-conductive insulation.

All access covers for such enclosures and compartments shall be permanently labeled with a warning and the voltage, for example "**DANGER-> 600 VOLTS DC**". All high voltage wiring and equipment shall be shielded by access covers, requiring the removal of at least one bolt, screw, or latch. It shall not be possible to contact high voltage devices with the access covers closed.

Appropriate warning signs and labels shall be used to alert maintenance personnel and/or emergency crews to the presence of high voltage batteries and cabling within the Coach. All visible high voltage equipment or conductors shall be identified with a "HIGH VOLTAGE" marking. The Coach should be clearly marked "HYBRID VEHICLE" on the exterior.

Energy storage box enclosures shall be properly grounded and considered part of the chassis ground. Ground fault protection circuits shall be provided to ensure insulation integrity between the high voltage circuit components and the Coach chassis. Circuit breakers and/or fuses (or approved equal) shall be provided to effect electrical isolation of components and systems (including the energy storage unit) in the case of a short circuit and/or excessive current draw. In the case of battery isolation, the disconnecting contactors shall be located as close as possible to the positive and negative output of the energy storage unit. A means for informing

the operator of the loss of high voltage ground isolation shall be provided by proper annunciation on the dashboard with visual and audible signals in a phased warning and shutdown.

High voltage cables and wires shall be installed in the dedicated harnesses, wire conduits, or raceways. High voltage wires and harnesses shall be permanently identified with the use of orange color per SAE specifications.

Low voltage systems should be independent of high voltage systems, so that emergency lighting, cameras, and all other accessories remain operable in the event of a high voltage system failure.

The Contractor shall provide specific safety precautions and procedures in the service manuals to enable maintenance personnel to safely access doors and covers on inverters, converters and other energy storing devices. Doors and covers shall utilize square “door key” latches allowing for commonality among other doors on the Coach.

The energy storage system enclosure, inverter(s), converter(s), main switch group, Propulsion Control System (PCS) and traction motor terminal covers shall all be labeled with “HIGH VOLTAGE WARNING” labels.

The energy storage system, inverter(s), converter(s), main switch group, PCS, traction motor and propulsion system generator shall be enclosed or covered to prevent casual contact. The PCS enclosure shall have a mechanical interlock to ensure that the high voltage connections are disconnected before the enclosure is opened. The energy storage unit shall be stored in a sealed container(s).

If the traction battery storage box cover is removable, the traction (energy storage) batteries will remain a live power source if the cover is removed. The distance between main terminals shall be beyond the mechanics reach to minimize potential problems. Energy storage modules shall be properly secured to withstand road vibrations and designed to ensure that their terminals do not contact any part of the Coach body or storage box or lid and are not ejected, or leak, even under severe crash conditions.

The storage box must be sealed to the extent practical while being well ventilated and kept within acceptable operating temperatures by a thermal management system. If the low voltage battery is removed from the Coach, all high voltage should be isolated within the battery boxes, regardless of the position of the master switch.

1.9 MASTER DISCONNECT

The Coach shall be equipped with a master disconnect switch that interrupts all high voltage power. If the master disconnect switch is in the “Off” position, there will be no high voltages originating from the ESS. The purpose and function of the switch shall be clearly and permanently marked to be easily understood by an individual unfamiliar with hybrid Coaches.

The switch shall be readily accessible to maintenance and emergency service personnel, but shall not be in areas that can be readily accessed by passengers. The design of this switch shall provide for hand operation and include physical lock-out/tag-out features for maintenance.

1.10 ELECTRO-MAGNETIC INTERFERENCE (EMI)

EMI requirements evaluation shall be performed to identify the following criteria:

1. Acceptable levels of radiated emissions from the Coach both in low frequency (30Hz-30kHz) and RF frequency (30kHz-100MHz) ranges shall be identified. A report shall be submitted to the SFMTA utilizing the guidelines of CISPR12 and ICES-002, or equivalent (such as MIL-STD-461 and/or SAE-J551) that identifies known properties of existing SFMTA-approved devices, such as: portable/mobile radios, PA systems, fare collection, multiplex and door control systems have been tested and approved.

2. RF susceptibility levels. Latest guidelines of MILSTD-461 and/or SAE-J551, as well as known properties of existing SFMTA devices, such as: radios, PA systems, fare collection, door control shall be included.

3. Electromagnetic compatibility between the various electrical and electronic devices mounted on the hybrid Coach shall be ensured by utilizing established EMC containment techniques, such as proper shielding, grounding, filtering, signal wiring separation, and switching frequency management.

4. Adequate EMI/EMC testing shall be conducted by analysis only on the individual components and on the finished Coach to prove that design goals for EMI/EMC are met.

5. A summary report shall be delivered to the SFMTA covering items 1-4 with problem areas identified.

1.11 PROTOTYPE

The Contractor shall produce and deliver to the SFMTA a prototype Coach that is entirely representative of a production unit. The prototype shall undergo qualification testing to verify that the requirements of these specifications have been met. The format for qualification testing shall be determined by the SFMTA.

The SFMTA will fully accept the Coach only if all major performance criteria, including those outlined in Sections 1.3, 1.4, and 1.5, are met. Any Coach that fail these performance criteria will be allowed no more than 90 working days to rectify the failures or obtain a waiver for that requirement. Any Coach that fails to meet the criteria after the 90-working-day period or obtain a valid waiver from the SFMTA will be rejected without conditional or final acceptance, and the OEM will be required to remove the Coach and associated equipment from the SFMTA's property as soon as possible.

The SFMTA shall notify the Contractor in writing of change orders and the specific areas in which the prototype does not comply with the specification no later than 90 working days after the prototype has successfully completed its evaluation period.

Any failure by the SFMTA to detect any Defects or omissions in this review shall in no way relieve the Contractor from fully complying with the Contract.

The prototype Coach shall be brought up to the final production Coach configuration in all respects at no additional cost to the SFMTA, except as may be agreed by change orders.

1.12 ALTOONA TESTING

Prior to Acceptance of the first Coach, the structure of the Coach shall have undergone appropriate structural testing and/or analysis, including FTA-required Altoona testing, to ensure adequacy of design for the urban transit service. A copy of the Altoona test shall be provided upon request. Any items that required repeated repairs or replacement must undergo corrective action with supporting test and analysis. A report clearly describing and explaining the failures and corrective actions taken to ensure all such failures will not occur shall be submitted to the SFMTA.

A manufacturer whose Coach is involved in a structural related fleet failure in any transit property in the U.S. or Canada in the last ten years must have completed a detailed investigation of the failure and a detailed structural analysis of the complete Coach structure to rule out any effect on any part of the structure. All failures involving basic body, structure, axles, and suspension are included as structural related failures for purposes of this specification. If the apparent responsive manufacturer's Coach has been involved in a structural related fleet failure, that manufacturer shall submit the report to the SFMTA project manager for review with the initial proposal.

The investigation of failure and structural analysis must be carried out by a reputable, independent Transit Industry Consultant and shall not only be limited to Finite Element Analysis (FEA) but be confirmed by actual track test with suitable time concentration, to prove ability of modified structure to perform for the specified 500,000 miles in the SFMTA's operating conditions. The report shall include all models and access to the software used to solve the model. Clear comparisons of the design, and improvements must be shown both in the report and the provided model. The SFMTA reserves the right to approve the consultant prior to work performance. The report submitted to the SFMTA must be detailed and must include proof of accuracy of the SFMTA's operating conditions.

1.13 MATERIALS

All materials used in construction of the Coach and all its parts shall conform in all respects to American Society of Testing Materials (ASTM), Society of Automotive Engineers (SAE), and industry recognized standards. Materials used shall be duplicated in manufacture, design, and construction on each Coach (Reference Section 8.1 Materials).

Materials shall be selected, and the body fabricated to reduce maintenance, extend durability, and provide consistency of appearance throughout the service life of the Coach. Detailing shall be kept simple, and add-on devices and trim shall be minimized and integrated into the basic design.

1.14 CORROSION RESISTANCE

The Coach shall resist corrosion from atmospheric conditions, road chemicals, salt and other commonly encountered corrosive substances, as well as from bus washing performed per the SFMTA's standards, for a period of either 12 years or 500,000 miles. An underbody coating shall be applied to the Coach unless the Coach underbody is not susceptible to corrosion; the SFMTA may grant a waiver to the Contractor for this requirement. It shall maintain structural integrity and maintain nearly original appearance throughout its service life, provided it is maintained by the SFMTA in accordance with the procedures specified in the service manual (Reference Section 2.1.8, Resistance to Corrosion).

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.

1.14.1 Electrolyte Spills

Battery boxes shall be designed to prevent all battery fluids from entering the passenger compartment during a crash involving the Coach.

1.15 WORKMANSHIP

The Coach shall be built in accordance with the Contractor's vehicle production drawings. Workmanship shall conform in all respects to the best practice in the industry. Welding procedures, welding materials, and qualifications of welding operators shall be in accordance with the standards of the ASTM and the AWS. Work performed outside the U.S. must conform to U.S. welding standards as approved by the SFMTA (Reference Section 8.2, OVERALL WORK QUALITY).

All lines, cables, and hoses shall be properly routed, supported, and secured with adequate clearance to mitigate any potential rubbing, fouling, ruptures, shorts, or similar issues.

1.15.1 Cable/Lines/Hoses/Wire Securement

All clamps shall always maintain a constant tension, expanding and contracting with the secured materials in response to temperature changes and aging of the material. Cables, lines, hoses,

and wires shall not foul or rub. All cables, lines, hoses, and wires shall be secured at a minimum of 30-inch intervals unless otherwise approved by the SFMTA.

1.16 MAINTAINABILITY

As a goal, relative accessibility of components, measured in time required to gain access, shall be inversely proportional to frequency of maintenance and repair of the components (Reference Section 11.5, MAINTAINABILITY).

1.16.1 Maintenance and Inspection

Scheduled maintenance or inspection tasks as specified by the Contractor shall be within the prevailing industry practices and subject to the SFMTA approval (Reference Section 11.5.4, Maintenance and Inspection).

1.16.2 Electronic Components

Electrical subsystems shall consist of replaceable units so that each major component, apparatus panel, or wiring harness is easily repairable or replaceable with standard hand tools or by means of connectors (Reference Section 7.5 Electrical Components). The Contractor shall provide general configuration layouts, arrangements, schematics (with or without dimensions), and, when applicable, specification sheets. The Contractor shall provide electrical drawings, which shall include a master wiring schematic (complete Coach electrical system), and individual sub-system schematics and wiring diagrams. The Contractor shall provide software information required by the SFMTA to perform maintenance.

The Coach shall have a self-diagnostic system for the purpose of self-testing and fault isolation such that a mechanic in the field should be able to isolate a failure to a single removable component in less than 30 minutes. The Contractor shall identify during the design review the systems that cannot be diagnosed in less than 30 minutes. The number of pieces of equipment required to locate a fault shall be minimized. All special test equipment required to locate a fault or test equipment function shall be supplied by the Contractor.

The Contractor shall supply a recommended list of and pricing for shop test equipment necessary for testing, troubleshooting, and calibrating individual electrical assemblies. Test equipment shall be able to isolate a failure to a component or component grouping. All test equipment will be accompanied by documentation to allow the SFMTA personnel to operate and repair them. This should include, but not be limited to, schematics, operation manuals, and maintenance manuals.

1.16.3 Interchangeability

Components with identical functions shall be fully interchangeable where possible. These components shall include, but are not limited to, passenger window hardware, interior trim, step

treads, lamps, lenses, and seat assemblies. Components with non-identical functions shall not be, or appear to be, interchangeable.

1.17 FIRE SAFETY

The Coach 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, firewalls, and the facilitation of fast passenger evacuation.

All materials used in the construction of the Passenger Compartment of the Coach shall be in accordance with the Recommended Fire Safety Practices defined in the latest version of FTA Docket 90 or document superseding Docket 90. Materials entirely enclosed from the passenger compartment, such as insulation within the sidewalls, need not comply. In addition, smaller components, such as seat grab rails, switch knobs and small light lenses, shall be exempt from this requirement.

A fire-retardant barrier or coating between the energy storage unit and storage box and the Coach itself should be used to prevent, or at the very least delay, the spread of fire.

An independently powered system of active thermal detection in the battery compartment that alerts the driver and/or personnel when the temperature is greater than 180°F shall be installed.

Battery container materials shall be non-reactive with the battery contents. The use of non-conductive storage boxes for the house batteries, or ones coated with non-conductive materials, is preferred.

Battery overheating, fire, or smoke conditions in the battery compartment shall actuate a visual and audible alarm at the operator's control panel. The specific type of alert shall be indicated to the operator. The alarm shall have a distinguishing audible level and configuration. The visual and audible alarm must be approved by the SFMTA.

A warning notice will be provided within the battery compartment and on the outside of the Coach NOT to pour water on the battery equipment in case of fire. Appropriate instructions will be posted.

A fire suppression system shall be provided inside the house battery box and traction motor compartment to reduce the risk of the fire from spreading to other parts of the Coach (Reference Section 5.9, FIRE DETECTION / SUPPRESSION). The fire suppression system shall be a dry chemical suppression system or approved alternative. Fire detection systems shall be provided for the house battery compartment, all ESS modules, traction motor compartment, and for all other power conversion hardware and electronics on the vehicle.

1.18 NEW COMPONENTS

All components not manufactured by the Contractor and are required or selected by the SFMTA that are not standard equipment on the Coach shall have the design, installation, and integration certified by the component/subcomponent manufacturer to ensure proper function of the component. The Contractor shall assume primary responsibility for systems integration. The SFMTA requires that a representative from the component/subcomponent manufacturer certify the design and installation. Records of these certifications shall be provided to the SFMTA prior to delivery of the prototype Coach. Certifications shall clearly indicate that the installation and application of the component/subcomponent meets the installation and operational guidelines of the manufacturer and has been approved by the manufacturer's representative. The component manufacturers shall, at minimum, certify the following Major Component installations:

- Engine
- Steering and Hydraulic System
- Emission control devices
- Brakes and Air System
- Electric Drive System
- Propulsion Control System
- Energy Storage and Management System
- Destination Sign and Voice Annunciation System
- Heating and Ventilation System
- Fire Detection / Suppression System
- Video Surveillance System
- Vehicle Telematics System
- Cooling System
- Paint
- Axles
- Passenger Doors
- Suspensions
- Wheelchair Ramp
- Wheelchair Securement System
- Bus Chassis

2 BODY

2.1 BODY STRUCTURE

The Coach shall have a clean, simple design, primarily derived from Coach performance requirements and passenger service criteria established in these specifications. The body and under-structure shall be built as an integral unit reinforced at points of stress and concentration.

The Coach shall navigate through all established SFMTA revenue bus infrastructure (including but not limited to charging areas, bus maintenance and storage areas, body shop areas, automatic coach washer, and tire shop areas) without coming into contact with any part of the facilities or its attachments or having any clearance issues.

Body materials shall be selected, and the body fabricated for easy replacement and repair, as well as to reduce maintenance, extend durability, and provide consistency of appearance throughout the service life of the Coach.

The passenger compartment shall be separated from the propulsion system and energy storage systems by fireproof bulkheads. This bulkhead shall preclude or retard propagation of a propulsion system or an energy storage system compartment fire into the passenger compartment and shall be in accordance with the Recommended Fire Safety Practices defined in the latest revision of FTA Docket 90. Only necessary openings shall be allowed in the bulkhead, and these shall be fire-resistant. If the Coach's overall design contains no bulkheads, the floor and roof may be used as a barrier between the high voltage batteries and the cabin. Any passageways for the climate control system air shall be separated from the electric drive system by fire- resistant material. Piping through the bulkhead shall have fire-resistant fittings or caulking 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. Service 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.

Detailing shall be kept simple. Add-on devices and trim shall be minimized and, where necessary, integrated into the basic design.

2.1.1 Strength and Fatigue Life

The basic structure shall be designed so that fatigue failure will not occur during the service life of the Coach. The structure shall also withstand impact and inertial loads due to street travel during normal SFMTA service throughout the Coach's service life without permanent deformation or damage. The Contractor shall test the proposed Coach chassis at GVWR utilizing strain gauges to determine the weak points and fatigue life analysis of the basic structure. The strain gauges shall be placed in accordance with the indicated high stress areas predicted by the computerized FEA. The FEA testing procedure must be approved by the SFMTA on a case-by-case basis. Copies of all analysis and testing shall be submitted to the SFMTA for review and Acceptance.

The Contractor may submit relevant test reports or previous FEA data for a similar coach structure to the SFMTA for review and approval. Based on the sufficiency of the FEA, the

SFMTA, in its discretion, may relieve the Contractor from its responsibility to perform the strain gauge testing.

2.1.2 Distortion

The Coach, at GVWR and under static or dynamic conditions, shall not exhibit deformation or deflection that will damage panels or structural members or impair operation of doors, windows, or other mechanical elements. Static conditions include the Coach at rest with any one wheel or dual set of wheels on a six-inch curb or in a six-inch deep hole. Dynamic conditions include operation on a variety of road surfaces at prudent speeds up to the maximum for each type of Coach and road irregularities such as chuckholes and railroad level crossings.

2.1.3 Crashworthiness

The Coach 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 six-inch reduction in any interior dimension. Windows shall remain in place and shall not open under such a load, but shall be easily opened when used as emergency exits.

Exterior panels below three feet from the ground and their supporting structural members shall withstand a static load of 2,000 pounds applied perpendicular to the Coach anywhere below the three-foot height by a pad no larger than five inches square. This load shall not result in deformation that prevents installation of new exterior panels to restore the original appearance of the Coach. Components located behind these panels cannot be damaged by this test method.

The Coach structure shall withstand a 25-mph impact by a 4,000-pound automobile at any point, excluding doorways, along either side of the Coach, with no more than three inches of permanent structural deformation at seated passenger hip height. This impact shall not result in sharp edges or protrusions into the Coach interior.

The Contractor shall demonstrate compliance by relevant test results or by dynamic FEA, per the requirements in Section 2.1.1 Strength and Fatigue Life.

2.1.4 Resonance

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

2.1.5 Towing

Fixed towing devices shall be provided on each end of the Coach. The towing devices shall withstand, without permanent deformation, tension loads up to 1.2 times the curb weight of the Coach within 20 degrees of the longitudinal axis of the Coach. The rear towing device(s) are only for extracting the Coach from a ditch or pulling it into position to be towed from the front and shall not provide a toehold for unauthorized riders. The front towing devices shall allow attachment of a rigid tow bar and shall permit lifting of the Coach, at curb weight, by the towing devices and the tow bar until the front wheels are clear of the ground. The method of attaching the tow bar must be approved by the SFMTA.

The Contractor shall provide a description of the towing provisions for approval by the SFMTA. Any specialized towing adapters for emergency road service and quick Coach recovery by

contracted towing companies must be approved by the SFMTA and the contracted towing company.

2.1.6 Jacking and Hoisting

Jacking pads, located on the axle or suspension near the wheels, shall permit easy and safe jacking of the Coach, at curb weight, with a common ten-inch-high jack or a ten-ton floor jack. Such jacking shall occur, when the Coach is on a level, hard surface, without the mechanic having to crawl under any portion of the Coach. Jacking from a single point shall permit raising the Coach sufficiently to remove and reinstall a wheel and tire assembly. Jacking and changing any one tire shall be reasonably completed by a mechanic in less than 30 minutes. The Coach shall withstand such jacking at any one or any combination of wheel locations without permanent deformation or damage.

The Coach axles and/or jacking plates shall accommodate the lifting pads of the SFMTA's hoist system. Jacking plates, if used as hoisting pads, shall be approximately 4 by 4 inches or a 4-inch diameter circle, with a turned-down flange, or approved alternate, not less than ½ inch-deep on each side. The "turned-down" flange can be of welded, bent or cast construction. Other pads, or the Coach structure, shall support the Coach on jack stands independent of the hoist. Hoist adapters, if required, shall be supplied by the Contractor for each in-ground hoist.

2.1.7 Exclusion of Water

The Coach shall be designed to assure that the underside, wheelhouses, floor, exterior body, windows, passenger doors, roof ventilators, lamps, access doors, and other openings do not admit water into the interior of the Coach or into any compartments covered by exterior doors during operation. Any equipment compartment located inside the Coach shall be sealed to prevent water entry.

The SFMTA requires that each Coach be water tested in the Contractor's manufacturing facility before shipment to San Francisco. The Contractor shall propose a water test method for the SFMTA's approval that includes a 20-minute water test.

The proposed water test method shall include duration of test, rate of water flow, amount and placement of nozzles, and nozzle pressure/pattern. Each Coach shall be water-tested. Coaches, which fail any part of the test shall be repaired and fully re-tested until they pass. Use of sealers, externally applied to already attached components to meet the water test requirement, is prohibited. All exterior hardware must be installed. No temporary sealing methods can be used.

Any leaks found during the water test shall be repaired by the Contractor, who will also make appropriate corrections in the assembly line and factory water test.

2.1.8 Resistance to Corrosion

The Coach shall resist corrosion from atmospheric conditions, road chemicals, salt, graffiti removal chemicals, commercial cleaning solutions, and other commonly encountered corrosive substance. It shall maintain structural integrity and maintain nearly original appearance throughout its service life, provided it is maintained by the SFMTA in accordance with the procedures specified in the service manual. Materials exposed to the elements and all joints and connections of dissimilar metals shall be either corrosion proof or protected from galvanic

corrosion. The corrosion inhibitor shall be non-flammable and the application must be approved by the SFMTA.

All interior and exterior stainless-steel hardware shall be of approved grades. Representative samples of all materials and connections shall withstand a two-week salt spray test in accordance with ASTM Procedure B-117 with no visual or structural detrimental effects and no significant structural degradation or weight loss over one percent.

2.1.9 Skid Resistance

The Coach shall be designed to resist damage from impact and skidding against asphalt roads when the road conditions exceed the vehicle's rated breakover, approach, and departure angles. Metal skid plates shall be provided on the underside of the front and rear overhangs of the Coach to protect sensitive components or any parts of the chassis that would be significantly damaged by skidding on the surface of a road.

2.2 EXTERIOR

The exterior and body features, including grilles and louvers, shall be shaped to allow complete and easy cleaning by the SFMTA's automatic coach washers without snagging washer brushes or retaining water and dirt. The body and windows shall be sealed to prevent leaking of air, dust, or water under normal operating conditions and during cleaning in automatic coach washers for the service life of the Coach. The windows, hatches, and doors shall be able to be sealed. Accumulation of spray and splash generated by the Coach's wheels shall be minimized on windows and mirrors.

Exterior panels shall be sufficiently stiff to minimize vibration, drumming or flexing while the Coach 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.

2.2.1 Strength and Installation

Exterior panels that are three feet above the road may be structural components. Exterior panels below three feet shall be easily repairable and may be replaced.

2.2.2 Pedestrian Safety

Exterior protrusions along the side and front of the Coach 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 Coach shall be designed to minimize toeholds or handholds.

Exterior protrusions shall not cause a line-of-sight blockage for the driver.

2.2.3 Rain Gutters

Gutters shall be provided or designed as an integral part of the Coach body to prevent water flowing from the roof onto side windows and doors. Regardless of the motion of the Coach, the

gutters shall not drain onto the windshield or operator's side window, or into the door boarding area.

2.2.4 License Plate Holders

Provisions shall be made to mount standard U.S. license plates per SAE J686 on the front and rear of the Coach. License plates shall be mounted so that they can be cleaned by the SFMTA's automatic coach washing equipment without being caught by the brushes. License plates and mountings shall not provide toeholds or handholds for unauthorized riders. The rear license plate shall be illuminated per SAE J587.

2.2.5 Bicycle Rack

The Contractor shall install a Byk-Rak with extra heavy-duty spring assist pivot bracket or Sportworks front-loading three-bicycle rack with non-glare finish, or approved equal, on the front bumper of the Coach. The mounting of the bicycle rack to the Coach shall be designed in a manner that the rack can be easily removed in the event the Coach needs to be towed. The bike rack shall not impair or obstruct the visibility of the headlights; the Contractor may submit an alternative bike rack design as necessary to meet this requirement. The Contractor shall submit details of installation to the SFMTA for approval during design review.

A bike rack deployment indicator light, clearly visible to the operator, shall be installed on the dash. The bike rack hardware shall be torqued appropriately and installed with durable rubber stops to mitigate rattle noise in both the deployed and stowed positions.

2.2.6 Finish and Color

The Coach exterior shall be painted to match the SFMTA's existing motor coach fleet. The exterior color scheme is given in ATTACHMENT 9: SFMTA EXTERMIOR COLOR SCHEME. The colors and paint specifications are given in ATTACHMENT 3: MATERIALS, COLORS, AND FINISHES. The top portion of the Coach shall be painted. The SFMTA and the Contractor shall develop a paint scheme that aligns with the SFMTA's latest brand guide (see ATTACHMENT 2: DECAL LISTING). The Contractor shall furnish anti-graffiti/vandalism treatment subject to the SFMTA approval; this treatment includes Axalta 8430S Clearcoat or approved equals.

All exterior surfaces shall be smooth and free of visible fasteners, wrinkles, dents, and blemishes. Exterior surfaces shall be properly prepared as required by the paint system supplier prior to application of paint to assure a proper bond between the basic surface and successive coats of original paint for the service life of the Coach. Drilled holes and cutouts in exterior surfaces shall be made prior to cleaning, priming, and painting, where possible, to prevent corrosion. The Coach shall be painted prior to installation of exterior lights, windows, mirrors, and other items that are applied to the exterior of the Coach. Body filler materials may be used for surface dressing, but not for repair of damaged or improperly fitted panels. Exterior shall be finished with lead-free Axalta Imron Elite, PPG Delta DBHS 2.7 VOC, Gelcoat, or approved equal in accordance with the paint manufacturer's recommendations. All paint used shall be lead free.

2.2.7 Fender Skirts

Fender skirts of flexible rubber shall be included in all wheel housings. Fender skirts shall be easily replaceable. Wheels and tires shall be removable with the fender skirts in place.

2.2.8 Splash Aprons

Splash aprons composed of composition or rubberized fabric at least ¼ inch thick shall be installed behind each wheel and shall extend downward to within three inches of the road surface. Apron widths shall be no less than tire widths. Splash aprons shall be bolted to the Coach under structure. Splash aprons and their attachments shall be inherently weaker than the structure to which they are attached. Splash aprons and their attachments 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.

2.2.9 Windshield Wipers and Washers

The Coach shall be equipped with Sprague, DOGA, or approved equal, electric powered, continuously variable speed windshield wipers for the windshield(s), preferably with separate motor for each windshield wiper. At 50 mph, no more than ten percent of the wiped area shall be lost due to windshield wiper lift. Windshield wiper motors and mechanisms shall be easily accessible for repairs or service, mounted with mechanical fasteners, and removable as individual units from the interior or exterior of the Coach. The information supplied for service and repair shall encompass the individual sub-assemblies to the lowest point of detail including the printed circuit boards of the sub-assemblies.

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

The windshield washer system shall have not less than a two-gallon reservoir located for easy refilling. A location inside the Coach near the front step is permissible. Access shall be provided through a spring-loaded paddle door. Reservoir pumps, lines, and fittings shall be corrosion resistant, and the reservoir itself shall be translucent for easy determination of fluid level. No equipment shall be located beneath the reservoir.

2.2.10 Service Compartments and Access Doors

The SFMTA prefers conventional doors with stainless steel piano hinges for access to the rear service compartment and all auxiliary equipment compartments. Access openings shall be sized for easy performance of tasks within the compartment, including tool-operating space. All handles shall be flush with, or recessed into, the body contour and shall be sized to provide an adequate grip for opening. 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 coach washing operations. Springs and hinges shall be corrosion resistant and shall last for the Coach's service life.

2.2.10.1 Access Doors

Access doors shall be of rugged, corrosion-resistant metal or composite construction and shall maintain mechanical integrity and function under normal operations throughout the service life of the Coach. They shall close flush with the body surface and be prevented from coming loose or opening during transit service or coach washing operations. Access doors when open, shall not restrict access for servicing other components or systems. The curbside and roadside engine compartment access doors shall fold up and out of the way. All maintenance access doors shall be locked with 5/16-inch square tool.

All access doors shall be retained in the open and closed positions with over-center gas-filled springs unless otherwise approved by the SFMTA. Doors smaller than 36 square inches shall be retained in the open and close positions by over-center springs. A thumbhole or handhold shall be provided on such doors to facilitate opening and closing.

2.2.10.2 Rear Equipment Compartment

The rear maintenance door, and both rear side maintenance doors shall be easily opened by one person. Engine oil and traction motor oil shall be checked and added through the maintenance compartment doors. Engine and traction motor coolant shall be checked and added through a paddle door located on the roadside of the Coach. The location of these fluid access points shall be approved by the SFMTA.

The SFMTA prefers that an access door be installed which allows easy maintenance access to engine exhaust after-treatment devices. The access door should be designed to minimize labor time related to periodic servicing of the after-treatment device.

2.2.10.3 Low Voltage Battery Compartment

The low voltage or auxiliary battery compartments shall be constructed of 304 stainless.. Low-voltage batteries shall be located under the floor of the Coach, properly vented and self-drained, and accessible only from the outside of the Coach. The Coach shall prevent accumulation of debris on top of the batteries. 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. Batteries shall be properly secured to withstand road vibrations and designed to ensure that their terminals do not contact any part of the Coach body or storage box and are not ejected, or leak, even under severe crash conditions.

Batteries shall be mounted on trays that are constructed of 304 stainless with a 304 stainless sub-frame, or approved corrosion resistant materials to resist corrosion. Batteries should be easily accessible; the SFMTA prefers that battery trays easily slide out of the body for service or replacement. Low voltage systems should be independent of high voltage systems, so that emergency lighting, cameras, and all other accessories remain operable in the event of a high voltage system failure. If the low voltage battery is removed from the Coach, all high voltage should be isolated within the battery boxes, regardless of the position of the master switch.

2.2.10.4 Electronic Equipment Compartment

The Contractor shall provide a secured enclosure for electronic equipment. The electronic equipment enclosure shall be lockable, waterproof, and dustproof. Location and design must be approved by the SFMTA.

2.2.11 Bumper System

Bumpers shall be Romeo Rim High Energy Level Polymer (HELP) bumpers or approved equal, adapted to the Coach provided, and installed to meet the performance requirements of these Technical Specifications. Bumpers shall provide impact protection for the front and rear of the Coach up to 26 inches above the ground. The bumpers may wrap around the Coach but shall not exceed the allowable Coach width. Bumper material shall be corrosion resistant. Visible surfaces shall be black. These qualities shall be sustained throughout the service life of the Coach. Support and backing of the resilient portion of the bumper shall be made from

appropriate materials and be mounted in a manner that shall protect the Coach in the event of an accident. A steel or reinforced aluminum sub-frame shall be used.

2.2.11.1 Front Bumper

No part of the Coach, including the bumper, shall be significantly damaged by a five-mph impact of the Coach at curb weight with a fixed, flat barrier perpendicular to the Coach's longitudinal centerline. The bumper shall return to its pre-impact shape within 10 minutes of the impact. The bumper shall protect the Coach from damage by 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 Coach. It shall protect the Coach from damage by 5.5-mph impacts into the corners at a 30° lateral angle to the longitudinal centerline of the Coach. The energy absorption system of the bumper shall be independent of every power system of the Coach and shall not require service or maintenance in normal operation during the service life of the Coach. The flexible portion of the bumper may increase the overall Coach length specified in (Section 1.2, DIMENSIONS) by no more than seven inches.

2.2.11.2 Rear Bumper

No part of the Coach, including the bumper shall be damaged by a two-mph impact with a fixed, flat barrier perpendicular to the longitudinal centerline of the Coach. The bumper shall return to its pre-impact shape within ten minutes of the impact. When using a yard tug with a smooth, flat plate bumper two feet wide contacting the horizontal centerline of the rear bumper, the bumper shall provide protection at speeds up to five mph, over pavement discontinuities up to two inches high, and at accelerations up to two mph/sec. The rear bumper shall protect the Coach 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 four mph parallel to or up to a 30° angle to the longitudinal centerline of the Coach.

The rear bumper or bumper extensions shall not offer footholds to unauthorized riders. The bumper extensions shall not hinder service and shall be integrated into the Coach body with no protrusions or sharp edges. The bumper shall be independent of all power systems of the Coach and shall not require service or maintenance in normal operation during the service life of the Coach. Any flexible portion of the bumper may increase the overall Coach length specified in Section 1.2, DIMENSIONS, by no more than six inches.

2.3 INTERIOR TRIM, PANELING AND ACCESS

Materials shall be selected based on ease of maintenance, durability, appearance, safety, flammability, and tactile qualities. Trim and attachment details shall be kept simple. Trim shall be secured to avoid resonant vibrations under normal operational conditions. Panels shall be reinforced to resist buckling, flexing, drumming, vandalism, and other rigors of transit bus service . They shall permit easy removal of paint, greasy fingerprints, and ink from felt-tip pens, be resistant to scratches and markings, and be easily replaceable and tamper resistant.

All interior surfaces below the lower edge of the 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. The entire interior, except for the driver's area, electric equipment box, and any other sensitive electrical equipment, shall be cleanable with a hose, using a liquid soap attachment. Interior mullion trim, moldings, and trim strips shall be textured stainless steel, or anodized aluminum. Individual trim

panels and parts shall be interchangeable. Untrimmed areas shall be painted and finished to the quality described in Section 2.2.6 (Finish and Color). The Contractor shall furnish samples of anti-graffiti/vandalism treatment for the SFMTA approval.

2.3.1 Divider and Side Trim Panel

Sturdy divider panels constructed of durable, unpainted, corrosion-resistant material complementing the interior shall be provided as required at the rear of the entry stepwell and at the front and rear of the exit stepwell. Surfaces of the divider panels shall conform to Attachment 3: Materials, Colors and Finishes.

These dividers may be mounted on the sidewall or floor and shall project toward the aisle no farther than passenger knee projection in longitudinal seats, the aisle side of the transverse seats, or the edge of a stepwell. Divider panels shall not extend more than 10 inches higher than the daylight opening of the side windows. Panels forward of longitudinal seats shall extend to below the level of the seat surface. Dividers positioned at the doorways shall provide no less than 2-1/4 inches of clearance between the divider panel and the opened door. 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.

Interior side wall panels shall be premium grade synthetic paneling, backed with a durable, moisture-resistant material of sufficient thickness. The material shall permit easy removal of paint, greasy fingerprints, and ink from felt-tip pens. Panels shall be easily replaceable without removing the window(s) and tamper resistant. They shall be reinforced, as necessary, to resist buckling, flexing, drumming, vandalism, and other rigors of transit bus service.

2.3.2 Rear Bulkhead

The rear bulkhead shall be paneled with melamine-type material, composite, scratch-resistant plastic, or approved equal, of sufficient thickness and trimmed with aluminum or stainless steel. The panels above the seat shall be contoured to fit the ceiling, sidewalls, and seatbacks. Any air vents in this area shall be louvered to reduce airflow noise and designed to reduce trash or litter being thrown or drawn through the grille. Air vents shall be reinforced to prevent bending by passengers. The air vents shall meet the requirements of Section 2.3.6, Access Doors, if components requiring service are located behind the grille.

2.3.3 Headlining

Ceiling panels and the trim between the passenger windows and in the front end down to the level of the lower daylight opening shall be made of durable, corrosion resistant, easily cleanable material approved by the SFMTA. For ease of graffiti removal, the surface shall be smooth and matte. The Contractor shall provide a proposal of graffiti-resistant materials and a suitable graffiti removal solution. The specific color and surface type must be approved by the SFMTA prior to production.

Headlining shall be supported to prevent buckling, drumming, or flexing, and shall be mechanically 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 tamper-proof, shall be aluminum or stainless steel,.

2.3.4 Front End

The entire front end of the Coach shall be sealed to prevent debris accumulation behind the dash and to prevent the operator's feet from kicking or fouling wiring and other equipment. The front end shall be free of hazardous protrusions. Paneling across the front of the Coach and any trim around the operator's area shall be durable and made of formed metal or reinforced fiberglass.

Formed metal dash panels shall be polymer coated or painted and finished to the quality described in Section 2.2.6 (Finish and Color). Plastic dash panels shall be reinforced as necessary, resistant to age discoloration and cracking, vandal resistant, and easily replaceable. All colored, painted, and plated parts forward of the operator's barrier and below the upper daylight opening shall be finished with a smooth, dull matte surface in a flat black color that matches or coordinates with the Coach interior.

The dash will be constructed with a metal support so that components designated for dash mounting can be securely affixed. Mounting areas shall be pre-drilled and tapped as appropriate. The components shall be mounted to appropriate structures using machine screws, threaded rivet nuts, or another approved fastening method. The Contractor and the SFMTA will determine which components shall be fastened to the dash during the design review.

2.3.5 Fastening

Interior panels shall be attached so that there are no exposed edges or rough surfaces. Panels and fasteners shall not be easily removed by passengers but shall be replaceable when necessary. Exposed interior fasteners shall be minimized. Fasteners shall be corrosion resistant. Self-tapping screws are not permissible for attachment of interior panels.

2.3.6 Access Doors

Access for maintenance and replacement of equipment shall be provided by panels and doors that appear to be an integral part of the interior. Removal of fixtures or equipment that is unrelated to the repair task to gain access is not permitted. Access doors shall be hinged with gas props or over center springs, where practical, to hold the doors out of the mechanic's way. All door hinges shall be stainless steel piano-style type hinges or approved alternative. All interior access doors, panels, and actuator compartments shall be retained securely with latches with self-contained tamper-resistant fasteners approved by the SFMTA. Panels shall prevent entry of mechanism lubricant into the Coach interior.

2.4 FLOOR

The floor shall consist of the subfloor and the floor covering that will last the life of the Coach. The floor deck may be integral with the basic structure or mounted securely on the structure to prevent chafing or horizontal movement. Sheet metal screws shall not be used to retain the floor, and all floor fasteners shall be serviceable from one side only. The joints should be filled with adhesive and rough surface areas faired with an appropriate bonding material and sanded smooth where required. 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 Coach.

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

The floor, as assembled, including the sealer, attachments, and coverings, shall be waterproof, non-hygroscopic, resistant to wet and dry rot, resistant to mold growth, and impervious to insects. All edges shall be sealed with an SFMTA-approved sealer.

All gaps in the floor shall be filled and made flush. Floor covering sheets shall run the full width of the Coach. Structural members shall support all joints in the floor. The use of parallel joints in the structural members shall be minimized to the extent practicable. Floor irregularities and joints shall not be visible after installation of floor covering.

Plywood is not acceptable flooring for this procurement. The flooring shall be composite material flooring, Coosa, Milwaukee, SpaceAge Synthetics, or an approved equal. Any de-laminations or bubbles formed between the floor covering and the subfloor is not acceptable. Reference Section 10.1.1.3 (Voiding of Warranty), FIGURE 10-1 for the flooring warranty requirement.

2.4.1 Height

Height of the floor above the street shall be no more than 15 inches measured at the centerline of the front and rear doorway when the doors are open. The floor shall be level from the front door to the rear door. Steps leading to the upper deck are preferable; however, a ramp with a slope may be acceptable to the SFMTA. Steps shall not be greater than 10-3/4 inches high. The Coach may adjust the floor height while the vehicle is in motion if the operator commands the doors to open; however, the doors shall not open before the 15-inch floor height is achieved and the vehicle is stationary.

2.4.2 Edges

Where the floor meets the walls of the Coach, the edges shall be blended with a fillet or be otherwise bonded to prevent water infiltration. The design of the Coach shall prevent debris accumulation between the floor and wheel housings or provide a transition between the floor and any walls that do not have cove moldings.

2.4.3 Floor Covering

Floor covering shall be Altro Transflor TFFG2704F “Rocket”, or approved equal. Floor covering shall be nonskid, material that remains effective in all weather conditions and complies with all ADA requirements. The floor covering, as well as transition of flooring material to the center aisle and to the stepwell area, shall be smooth and present no tripping hazards.

The standee line shall be at least two inches wide and shall extend across the Coach aisle in line with the rear of the front wheelhouse. At the exit door area the standee line shall be in line with the inward edge of the opened door. This line shall be the same yellow color as the edge of the door area. Color shall be consistent throughout the floor covering.

The floor covering shall closely fit the sidewall cove or extend to the top of the cove. The color of the floor covering in the passenger compartment shall be the same as that in the vestibule. Flooring inlays indicating that passengers should not stand in the doorways shall be inlay at each exit vestibules. Wheelchair inlays shall be inlay at each wheelchair securement and be centered with the 3-gang flip-up seats. The design and inlay locations shall be submitted for approval by the SFMTA.

2.5 STEPS AND STEPWELLS

Interior step risers shall be no more than 10-3/4 inches.

The plane of the step treads shall be essentially parallel to the plane of the floor, sloped only sufficiently to prevent water accumulation on the floor. All step treads shall be covered with the same nonskid floor covering material and shall remain effective in all weather conditions. The edge of the vestibule floor shall conform to ADA requirements and shall have a maximum of 5/16-inch overhang at the step riser. The outer edge of the step, just below the step nosing, at the rear door shall be covered with a stainless-steel strip. The edge of the vestibule floor tread shall have a bright, contrasting yellow band no less than two inches wide on the full width of the opening. The color shall be permanently blended into the floor covering material. Yellow / black caution stripe decal is required at each vertical face of the step.

2.6 WHEEL HOUSINGS

Sufficient clearance and air circulation shall be provided around the tires, wheels, and brakes to prevent overheating when the Coach is operating. Wheels and tires shall be removable when the Coach is raised by the axle or suspension, even with the air bags depleted. Interference between the tires and any portion of the Coach shall not be possible in maneuvers up to the limit of tire adhesion with Coach weights from curb 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.

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

2.7 INSULATION

The Contractor shall ensure that the Coach is properly insulated thermally and acoustically to meet the SFMTA's performance requirements. Any insulation material used between the inner and outer panels shall be fire resistant and installed to minimize entry and retention of moisture. Insulation properties shall be unimpaired during the service life of the Coach. The insulation material shall be non-hygroscopic and resistant to fungus and the breeding of insects. The material shall be physically retained to prevent tearing. All insulation materials shall comply with the Recommended Fire Safety Practices defined in FTA Docket 90-A, dated Oct. 20, 1993.

2.7.1 Thermal Insulation

The combination of inner and outer panels on the sides, roof, and ends of the Coach, and any material used between these panels shall provide a thermal insulation sufficient to meet the interior temperature requirements specified in Section 3.4 INTERIOR CLIMATE CONTROL. The Coach body shall be thoroughly sealed so that the operator or passengers during normal operations cannot feel drafts with the passenger doors closed.

2.7.2 Sound Insulation

The combination of inner and outer panels and any material used between them shall provide sufficient sound insulation to meet all performance requirements specified in Section 1.5.1. These conditions shall prevail with all openings, including doors and windows, closed and with the engine and accessories switched off.

3 FURNISHINGS

3.1 WINDSHIELD, DRIVER WINDOW, AND PASSENGER WINDOWS

The Coach body shall accommodate a windshield, driver's window, and passenger windows. All windows shall be supported by metal sub-structures. All designs and dimensions of windshield and windows must be approved by the SFMTA.

3.1.1 Passenger Windows

Windows shall be required on each side of the Coach. All passenger windows shall be of the smooth flush mount "BRT" style, also referred to as "seamless windows". Passenger windows shall not be bonded in place. The Contractor shall provide dimensions, specifications, and drawings for all windows.

3.1.1.1 Dimensions

At minimum, the height of all passenger windows shall span from the shoulder height of a 5th-percentile seated female passenger to the eye level of a 95th-percentile standing male passenger. Windows shall be divided horizontally. The bottom portions of the windows shall be fixed. The upper portion over the side destination signs shall be fixed. The upper portions of all other windows shall be 9 to 15 inches high, hinged along the lower edge, and open inward. All windows shall be easily replaceable without disturbing adjacent windows and shall be mounted so that flexing or vibration from engine operation or normal road excitation is not apparent. All windows shall be the same size to the extent practicable. The replacement of the window should be done by two persons within one hour.

3.1.1.2 Materials

All passenger windows and door windows 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. All passenger windows and door windows shall be no less than 50 percent luminous transmittance and shall have a solar heat gain coefficient of no greater than 40 percent; the Contractor shall submit the proposed luminous transmittances and solar heat gain coefficients of the passenger windows and door windows for the SFMTA's approval. Windows over the side destination signs shall not be tinted. Window sash shall be weather-protected and corrosion-resistant. The tracks and seals shall be designed to be vandal resistant and to last the service life of the Coach.

3.1.1.3 Anti-Vandalism Provision

The Contractor shall apply 1/8-inch thick, scratch resistant, clear panels to all the interior passenger windows. These panels shall protect the Coach windows from etching and other forms of vandalism. The protective panels shall be clear and shall have minimal effect on the transmittance of the underlying glazing. This material shall not be adversely affected by

ultraviolet rays and shall withstand normal cleaning practices. No accumulation of moisture shall be allowed between the surfaces of the original windows and the protective panels. Each protective panel shall be capable of being removed and installed by a single mechanic within three minutes. This anti-vandalism provision must be approved by the SFMTA.

3.1.1.4 Emergency Exits

All Coaches shall be provided with adequate exits for quick passenger escape during emergency conditions. All emergency exits shall comply with applicable codes and requirements, including FMVSS 217, as well as with best industry practices.

The operator's window and all passenger side windows shall open outward to provide an emergency exit except for the two rear most windows and the destination sign windows on each side of the Coach. The upper window mounting hinge shall be stainless steel. A simple red latch shall be provided on all passenger side windows that take no more than 20 pounds of force to manipulate. This latch shall not pinch a person's fingers or hands when operating and shall be designed so that it returns to its normally closed position. It shall not be possible for passengers to use the latch as an accessory hook. Latch design must be approved by the SFMTA. Each emergency exit window location shall be labeled with an instruction plate (preferably close to the latch). The Contractor shall provide emergency exit provision for the SFMTA approval.

3.2 DOORS

Doors shall be a dual linear Vapor slide-glide style at the front entrance area and Vapor slide-glide style at the rear exit area, or approved equal, on the curb side of the Coach. The front entrance door shall be forward of the front wheels and located so that the operator is able to collect or monitor the collection of fares. The rear exit doors shall be in front of the drive (rear) axle. Passenger entrance and exit doors and doorways shall comply with all requirements of the ADA.

The rear exit doors shall be equipped with Vapor CLASS (Contact-Less Acoustic Sensing System) or an approved alternative. This system shall allow passengers to open the rear doors through the movement of their hand or body after the operator enables this feature. Operator enabling of this feature shall result in the illumination of a green light above the doors notifying passengers that the exit door can be opened. The door system will recognize the presence of passenger in the exit area or within 24 inches of the outside opening of the Coach, and not close until the area is cleared of people.

On the outside of the Coach at the exit doors, there shall be pushbutton-style door request buttons to allow for onboarding passengers to open the exit door when the Coach is stopped and the operator has enabled the doors to open. These buttons shall be lit with green LEDs when passengers are able to open the door. The system shall have a positive mechanical locking feature when the door control is in the "OFF" position. A door annunciator shall make digitally recorded messages (such as warnings, greetings, or service announcements) in the exit

door area. The Contractor shall present details of their methodology for entrance and exit door operation for the SFMTA review. The task of the final commissioning shall be included in the Contract price.

3.2.1 Materials

The structure of the doors, their attachments, inside and outside trim panels, and any mechanism exposed to the elements shall be durable and corrosion resistant. Doors shall be constructed of aluminum or approved alternative materials. Top and bottom door seals shall be brush-type, flap-type, or an approved equal. The doors, when fully opened, shall provide a firm support and shall not be damaged if used as an assist by passengers. Door edges shall be sealed to prevent infiltration of exterior moisture, noise, dirt, and air from entering the passenger compartment, to the maximum extent possible.

3.2.2 Dimensions

Door openings shall be no less than 84.5 inches high. The front door free clear opening shall be able to accommodate a 32-inch wheelchair ramp at minimum. The rear door shall have a free clear opening of 44 inches wide for the entire vertical height. The rear door clear opening width may be reduced to 41 inches wide in the areas of the passenger assists and the passenger head and foot areas if these projections do not present hazards.

3.2.3 Door Glazing

The front doors shall be glazed as a one-piece panel at full length. The doors may be split into two sections with a rubber divider between the sections as approved by the SFMTA. The edge of a six inches high curb shall be visible to the seated operator through the closed front door when the Coach is more than 12 inches from the curb. The rear doors shall be split, with a glazed upper portion and an aluminum lower panel. Exit door glazing materials shall conform with Section 3.1.1.2 (Materials).

3.2.4 Door Projection

Exterior projection of the doors shall be minimized and shall not exceed 6-1/2 inches during the opening or closing cycles or when doors are fully opened. The inside edge of each door panel shall have no less than two inches of soft weather-stripping. The doors when closed shall be effectively sealed and the hard edges of the doors shall be at least four inches apart.

Inside the Coach, the door mechanisms shall be recessed into the ceiling or paneled over so that no ledges are created. Projection of any part of the doors inside the bus shall not cause an obstruction of the rear door mirror or cause a hazard for standees.

3.2.5 Door Height above Pavement

It shall be possible to open and close the passenger doors when the Coach, loaded to GVWR is not knelt and is parked with the tires touching an eight inches high curb on a street sloping toward the curb so that the street side wheels are five inches higher than the curb side wheels.

3.2.6 Actuator

Door opening and closing speeds shall be independently adjustable. Both door panels shall be operated by a single actuator for each door opening to guarantee synchronization of panels during opening and closing cycles. The door actuators shall be rebuildable. Actuators and the complex door mechanism shall be concealed from passengers but shall be easily accessible for servicing through an overhead panel that is secured by latches and can be opened and closed without tools.

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.

3.2.7 Emergency Door Operation

In the event of an emergency, it shall be possible to manually open doors designated as emergency exits from inside the Coach using a force of no more than 25 pounds after actuating an emergency door-unlocking device directly adjacent to each door. The unlocking device shall be clearly marked as an emergency-only devices and shall require punching in a small plastic window before being able to activate. Concise instructions for emergency exits shall be posted near the device. 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.

When any of the door emergency unlocking devices are actuated, the door interlock system shall inhibit propulsion, and the service brakes shall be applied to stop movement once the Coach reaches a safe speed (zero to two mph) regardless of the position of the override switch described in Section 4.1.4.3 (Interlock Override Switch). The interlock system shall be able to be overridden if the Coach is required to be moved.

Locked doors shall require a force of more than 300 pounds to open manually. When the locked doors are manually forced to open, damage shall be limited to the bending of minor door linkages with no resulting structural damage to the doors, motors, and complex mechanisms.

3.2.8 Sensitive Edges

The rear exit door shall be equipped with an air-wave-type sensitive edge, or approved equal, in the rubber weather stripping on the center edges of the doors. Closing door edge speed shall not exceed 12 inches per second and opening door speed shall not exceed 19 inches per second. The doors shall stop and reverse direction when the doors close on an object as small as a 1-inch diameter smooth cylinder held perpendicular to the plane of the door opening at any point where the door halves meet. These specifications shall not apply to the top two inches or the bottom two inches of the sensitive edge.

The sensitive edge system shall alert the Coach operator by a visual and audible alarm if the doors encounter an obstruction. The system shall react to this obstruction within no more than a second. Regardless of the function of the sensitive edge, 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.

3.2.9 Front Door Timing (Entrance Door)

Doors shall open or close completely within 2 - 4 seconds from the time of actuation.

3.2.10 Rear Door Timing (Exit Door)

Doors shall open or close completely within 2 - 4 seconds from the time of actuation.

3.3 LIGHTING

Wherever possible, the Contractor shall utilize LED lights from Truck Lite, Dialight, Hella, Luminator, Simcona, E-Corp, or an approved equal. Wheelchair ramp and kneeling indicator lights shall be illuminated with LED light's mounted flush with the coach exterior. The Contractor may utilize a single LED warning light to be used for wheelchair ramp deployment and the kneeling indicator. Stop, turn, tail, and marker lights shall be flush mounted or low profile without guards. LEDs shall have a minimum expected life of 50,000 hours of operation at 25 degrees Celsius.

3.3.1 Exterior Lighting

All exterior lights shall be sealed to prevent entry and accumulation of moisture or dust, and each lamp shall be replaceable in less than five minutes. LED lamps with anti-scratch coatings shall be used wherever possible. Lights mounted on any compartment doors or adjacent panels shall be protected from the impact shock of door opening and closing. Lamps, lenses, and fixtures shall be interchangeable to the extent practicable.

Turn signal lights shall be provided on both sides of the Coach. All side turn signal lights shall be mounted above or forward of each wheel well, except for the front curbside turn signal which may be aft of the wheel well. In addition to the amber lights, a right turn cornering lamp shall be

installed between the rear wheel well and the exit door. The right turn cornering lamp shall be activated by the right turn signal switch during night runs only.

3.3.1.1 Courtesy Lights

An ADA compliant door header LED strip light shall be provided at both entrance and exit doors. The LED lights will illuminate the door opening to the ground. The LED light shall provide a minimum 1.4 ft-candles at 36 inches from the front step edge. The SFMTA prefers the courtesy light to be flush or recess mounted and located inside the Coach.

3.3.1.2 Back-up 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.

3.3.2 Interior Lighting

The LED passenger interior lighting system shall be DINEX Sapphire, Hadley, TCB, Pretoria, or approved equal. The interior lighting system shall provide a minimum 15 foot-candle illumination on a one square foot plane at an angle of 45 degrees from horizontal, centered 33 inches above the floor and 24 inches in front of the seat back at each seat position. Allowable average light level for the rear bench seats shall be 7 foot-candles.

Floor surface in the aisles shall be a minimum of ten foot-candles, and the vestibule area a minimum of four foot-candles with the front doors open and two foot-candles with the front door closed. The front entrance area shall provide enough illumination to meet ADA requirements. The rear exit area shall illuminate when the rear door is unlocked.

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 brightness of the interior light system shall be adjustable to minimize glare.

Lens material shall be non-flammable polycarbonate in compliance with Docket-90. Lenses shall be designed to effectively "mask" the light source without visible bright or dim spots. Lens shall be sealed to inhibit incursion of dust and insects yet are easily removable for service. If threaded fasteners are used, they must be held captive in the lens. Access panels shall be provided to allow servicing of components located behind light panels.

When the master switch is in the Day Run or Night Run modes, the first light module on each side of the Coach shall turn off when the front door is in the closed position and illuminate to maximum light level when the door is opened. The light system may be designed to form part of the entire air distribution duct.

3.3.3 Service Area Lighting

LED lamps shall be provided in the propulsion compartments and all other compartments where service may be required to generally illuminate the area for night emergency repairs or adjustments. The propulsion compartment lights shall be controlled by a conveniently located toggle switch near the rear start controls in the compartment or in an SFMTA approved location. Lights located in other service compartments shall be provided with toggle switches on the light fixture or conveniently near the light fixture. 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. Adequacy of lighting must be approved by the SFMTA during prototype review.

3.4 INTERIOR CLIMATE CONTROL

The interior climate control system shall provide heating, ventilation, and air conditioning (HVAC). The HVAC system shall be a proven system from Thermo King, or approved equal. The Coaches shall be equipped with a single roof-mounted HVAC system.

The Contractor shall provide to the SFMTA all the essential information needed to test and troubleshoot the interior climate control electronic controllers. The system shall be compliant with the J1939 Communication Protocol for receiving and broadcasting of data. The task of the final commissioning shall be included in the Contract price. The HVAC system may use R134a or R407c as refrigerant; the Contractor shall clearly indicate which refrigerant is being used on the Coaches.

3.4.1 Controls

The control of the Interior Climate Control shall utilize hard-wired switches or a display panel with AUTO, A/C, HEAT, and VENT modes located in a place that is convenient to the operator and is approved by the SFMTA.

3.4.2 Air Flow

The ventilation mode of the interior climate control system shall introduce outside air into the Coach at or near the ceiling height at a minimum rate required to maintain 68-72 degrees F. Airflow shall be evenly distributed throughout the Coach.

3.4.3 Air Intakes

Outside openings for air intake shall be at least seven feet above ground level, in a location that minimizes the intake of dust, particulates, and emissions from traffic. All intake openings shall be baffled to prevent entry of water.

Except for roof-mounted ventilators, outside air shall be filtered before discharge into the passenger compartment. The filter shall meet the ASHRAE requirement for five percent or

better atmospheric dust spot efficiency, 50 percent weight arrestance, and a minimum dust holding capacity of 120 gram per 1000-cfm cell. More efficient air filtration may be provided to maintain efficient heater operation. Air filters shall be easily cleaned or removed for service. Moisture drains from air intake openings shall be located to prevent clogging from road dirt.

3.5 ROOF VENTILATORS

At least one roof ventilator shall be provided in the roof of the Coach at location(s) approved by the SFMTA. Each ventilator shall be easily opened and closed manually by one person and shall also function as an emergency exit. When open, with the Coach in motion, these ventilators shall provide fresh air inside the Coach. Each ventilator shall cover an opening area no less than 425 square inches. Each ventilator shall be capable of being positioned as a scoop with either the leading or trailing edge open no less than four inches, or with all four edges raised simultaneously to a height no less than 3-1/2 inches.

3.6 WHEELCHAIR LOADING SYSTEM

An automatically-controlled, power-operated wheelchair loading 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. The wheelchair loading system shall conform to all applicable ADA requirements.

3.6.1 Wheelchair Ramp

The wheelchair ramp shall be a Lift-U LU-18 or approved equal with a flip-out type design and shall be self-contained, electrically powered, fully compliant with ADA and FTA requirements, and shall be provided at the front door of the Coach. The driver shall be able to deploy the ramp from a seated position. In case of a power failure, the driver shall be able to deploy the ramp manually. 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 ramp shall present a 1:6 maximum slope when deployed to the ground. All components of the ramp shall be accessible and serviceable through an interior access panel in the ramp. All drive chains shall be a minimum size #40 and constructed of corrosion resistant material. Ramp shall use only inductive proximity switches where required; the use of mechanical limit switches shall not be allowed. The loading platform shall be covered with replaceable or renewable nonskid material and shall be fitted with devices to prevent a wheelchair from rolling off the sides during ingress or egress. During deployment or stowage, the ramp floor plate shall not present any dangerous moving parts to passengers.

Deployment or stowage of the ramp shall require no more than 15 seconds. The device shall function without failure or adjustment for 500 cycles or 5,000 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, requiring no more than 20 lbs. to manually stow or deploy. The ramp assembly

shall be replaceable within 30 minutes by a mechanic without the need of any special tools or fixtures.

3.6.2 Wheelchair Ramp Controls

The wheelchair ramp controls shall be simple to operate and conveniently located so the driver can operate and monitor the loading operation without leaving the driver's station. Control switches shall be of the momentary type, so that release of the control switch will stop the ramp immediately. All wheelchair ramp controls and their locations must be approved by the SFMTA.

The Coach shall be prevented from moving during the loading or unloading cycle by an accelerator and brake interlock system. The loading system shall be inhibited from retracting or folding when a passenger is on the ramp/platform and shall be equipped with an electronic current limiting feature to minimize damage if the ramp hits an obstruction during the stow/deploy functions. Whenever the ramp system is being deployed or stowed, an audible alarm shall sound, and an LED visual signal shall illuminate. One International Symbol of Accessibility, in blue and white, shall be provided near the ramp signal at the front door opening of the Coach, visible to patrons in the curbside front of the oncoming Coach. All wheelchair ramp maintenance instructions shall be supplied by the Contractor.

3.7 PASSENGER SEATS

A minimum of 32 passenger seats shall be provided in each Coach unless otherwise approved by the SFMTA. The seatbacks shall be contoured to increase passenger knee room and Coach capacity. The aisle between the transverse seats shall be no less than 38.5 inches wide at seated passenger hip height. The Contractor shall be required to present to the SFMTA their proposed seating layout(s); these layouts shall maximize the space in the passenger area while meeting ADA requirements for clearances required for accessible ingress and egress. Seating layout shall be optimized to meet GVWR and GAWR capacities and must be approved by the SFMTA.

All priority seating area seats, including accommodations for wheelchair securement, passengers using crutches, canes, or walkers, or passengers with difficulties walking, shall be installed with blue color seat inserts with the Priority Seating stencil, referred in the latest edition of the SFMTA Vehicle Decal Package.

Powered USB ports shall be provided on the passenger seats. The SFMTA prefers USB hubs with USB 2A and C ports. The Contractor shall propose a USB hub layout that makes USB ports accessible to all seated passengers.

3.7.1 Dimensions

Seats shall have hip-to-knee room measured from the front of one seatback horizontally across the highest part of the seat surface to the seat or panel immediately in front. 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 29 in.

Floor room, measured at the floor forward from a point vertically below the front of the seat surface, shall be no less than 14 inches. Seats immediately behind the wheel housings may have foot room reduced, provided the wheelhouse is shaped so that it may be used as a footrest. Transverse seats accommodating two passengers shall have a minimum width of 35 inches, and seats accommodating one passenger shall have a minimum width of 18 inches.

3.7.2 Design

Passenger seats shall be USSC 4One Gemini seats with stainless steel backing, or approved equal, integrally molded with drain holes. The seat frame structure shall be a cantilever design that is mounted to the Coach wall structure with sufficient strength for the intended service. The rearmost bench seat may be a molded design without individual frames.

The passenger seat frame and its supporting structure shall be constructed and mounted so that space under the seat is maximized to increase wheelchair maneuvering room and is completely free of obstructions to facilitate cleaning. The lowest part of the seat assembly that is within 12 inches of the aisle shall be at least ten inches above the floor. The underside of the seat and the sidewall shall be configured to prevent debris accumulation, and the transition from the seat underside to the Coach sidewall to the floor cove radius shall be smooth. The seatback shall be contoured to maximize knee room. All transverse objects in front of forward-facing seats, including seatbacks, modesty panels, and longitudinal seats, shall not introduce a laceration hazard as a result of structural failure. Flip-up seats shall be securely held in the open or closed position while the Coach is in motion. No seats shall rattle while the Coach is in motion.

3.7.2.1 Transverse Seat

The back of each transverse seat shall incorporate a handhold. The handhold shall extend above the seatback near the aisle so that standees shall have a convenient vertical assist, no less than four inches long, that may be grasped with the full hand. This handhold shall not cause a standee using this assist to interfere with a seated 40th-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 and egress for either transverse seating position. The seatback handhold may be deleted from seats that do not have another seat directly behind them and where vertical assist is provided in accordance with Section 3.9 (Passenger Assists). Armrests shall not be included in the design of transverse seats.

3.7.2.2 Longitudinal Seat

Longitudinal seats shall be the same general design as transverse seats but without seat back handholds. Longitudinal seats may be mounted on the wheelhouses. Folding 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 fixture that adequately performs the function of restraining passengers from sliding forward off the seat. Armrests are not required on longitudinal seats that fold up in the wheelchair parking area when the armrest on the adjacent fixed longitudinal seat is within 1-1/2 to 3-1/2 inches of the end of the seat surface. Armrests shall be located from seven to nine inches above the seat surface. The area between the armrest and the seat surface shall be open. The top and sides of the armrests shall have a minimum width of two inches and shall be free from sharp protrusions.

3.7.2.3 Handholds and Armrest Strength

Seat back handholds and armrests shall withstand static horizontal and vertical forces of 250 pounds applied anywhere along their length with less than ¼-inch permanent deformation. Seatback handholds and armrests shall withstand 25,000 impacts in each direction of a horizontal force of 125 pounds with less than ¼-inch permanent deformation and without visible deterioration.

3.7.3 Structure

The seat assembly shall withstand static vertical forces of 500 pounds applied to the seat surface in each seating position with less than ¼-inch permanent deformation in the seat or its mountings. The seat assembly shall withstand static horizontal forces of 500 pounds evenly distributed along the top of the seatback with less than ¼-inch permanent deformation in the seat or its mountings. Seatbacks shall withstand repeated impact of two 40-pound sandbags without visible deterioration. One sandbag shall strike the front 40,000 times and the other sandbag shall strike the rear 40,000 times. Each sandbag shall be suspended on a 36-inch pendulum and shall strike the seatback 10,000 times from distances of six, eight, ten, and 12 inches respectively. Seat surfaces shall withstand 100,000 randomly positioned 3-1/2 inches drops of a squirming, 150 pounds, smooth-surfaced, buttocks-shaped striker with only minimal wear on the seat surface.

3.7.4 Construction and Materials

The seat shall utilize light weight construction with replaceable inserts for maximum vandal resistance and minimal maintenance. Seats must be modular, allowing each component to be easily replaced if necessary. Back panel shall be stainless steel. Seat surfaces and back inserts shall be blue color consistent with existing SFMTA equipment, or an alternative color as approved by the SFMTA. Priority seats and stroller seats require white stencil on the seat inserts according to the SFMTA Vehicle Decal Standard. Complete seat assemblies shall be interchangeable to the extent practicable. All materials and workmanship shall conform to SPI standards and specifications in testing for plastic materials.

3.7.5 Wheelchair Accommodation

Two forward wheelchair securement positions, at least 60 inches in length and as close to the front door as practical, shall be provided for each Coach in a staggered configuration. Each

wheelchair accommodation shall provide parking space and a securement system compliant with ADA requirements for one passenger in a wheelchair. No portion of the wheelchair or its occupant shall protrude into the normal aisle when parked in the designated wheelchair parking space. The Contractor shall submit wheelchair accommodation options for the SFMTA review and approval as part of the general seating arrangement.

The design and construction of the Coach shall be in accordance with all requirements defined in 49 CFR Part 38, Subpart B: ADA Accessibility Specifications for Transportation Vehicles - Buses, Vans and Systems, the latest approved ADAG Board guidelines, and California Title 13 standards. Space and body structural provisions shall be provided at the front door of the Coach to accommodate a wheelchair ramp that meets these requirements.

3.7.5.1 Maneuvering room

Maneuvering room inside the Coach shall be compliant with 49 CFR Part 38, Subpart B, §38.29 and accommodate easy travel for a passenger in a wheelchair from the loading device and from the designated securement area. The SFMTA prefers the maneuvering room of each Coach to closely resemble the drawing shown in Attachment 5: Wheelchair Maneuvering Room. No width dimensions shall be less than 34 inches; area requiring 90 degree turns of wheelchair shall have a clearance arc dimension of no less than 35 inches; and in the parking area, where 180-degree turns are expected, space shall be clear in a full 60-inch diameter circle. Wheelchair footrest clearance of 12 inches above the floor surface shall be provided on the outside turning radius.

3.7.5.2 Wheelchair Securing Devices

A QPod three-point wheelchair securement device, or approved equal, shall be provided at each wheelchair position. A hand or foot operated release lever shall be conveniently located to release the latching mechanism. The wheelchair latching mechanism shall not interfere with battery-operated wheelchairs. A bumper shall be provided at each wheelchair location. Seatbelts shall be easily accessible for wheelchair users. A belt-type securement system and shoulder strap seat belt shall be included. The wheelchair securing devices configuration and installation must be approved by the SFMTA. The seat belt retraction circuit shall not include an audible alarm.

3.8 PASSENGER STOP REQUEST SYSTEM

A passenger chime and “Stop Requested” signal system that complies with applicable ADA requirements defined in defined in 49 CFR, Part 38.37, shall be provided. It shall be integrated with the Digital Voice Announcement System (see Section 3.13). “STOP REQUESTED” signs shall be illuminated with LEDs. One stop request sign shall be located adjacent to the operator or at a position the operator can clearly see if there is no indication to the operator on the dashboard. The location of each sign must be approved by the SFMTA.

The signs shall remain illuminated until any of the passenger doors are opened, at which point the chime and illumination systems shall reset. Whenever the sign is illuminated, the chime

signal shall be muted, and it shall not disable the “STOP” pushbutton for a wheelchair passenger to request to disembark.

3.8.1 Exit Signal

The exit signal system shall consist of a vandal resistant pull cable, chime, and interior sign message. The pull cable shall be located the full length of the Coach on the sidewall and no higher than the division bar between the upper and lower window sections. Vertical pull cables shall be provided at each window mullion and at each wheelchair user area. Eyelets shall be provided as necessary to prevent the cords from rubbing against the Coach interior. In addition, pushbuttons labeled “STOP” shall be provided on vertical stanchions in a staggered configuration. The Contractor shall submit pushbutton locations for the SFMTA review and approval.

A chime shall announce when the system is activated from any pull cord or any “STOP” button on the vertical stanchion. Simultaneously, all "STOP REQUESTED" signs shall illuminate. The chime shall announce no later than 0.5 second after the cord is pulled or button is pressed.

3.8.2 Mobility Aid Passenger Exit Signal

A “STOP” push button shall be mounted underneath the folding seat or in a position easily accessible to the patron in each of the wheelchair parking areas and shall be no higher than 48 inches and no lower than 15 inches from the floor. A distinct double-chime shall sound anytime the exit signal system is activated from the wheelchair passenger areas.

When the exit signal system is activated from a wheelchair passenger area, a light on the dashboard shall be illuminated to alert the driver that a mobility aid passenger wishes to disembark. This shall also illuminate the “STOP REQUESTED” sign with a message that displays “RAMP REQUESTED”. Configuring the system so that the Coach stop, Coach ID #, and time are announced upon activation is strongly encouraged.

The location and construction of the “STOP” push buttons at the wheelchair passenger areas shall be submitted to the SFMTA for review and approval.

3.9 PASSENGER ASSISTS

Passenger assists in the form of full-grip vertical stanchions or handholds shall be provided for the safety of standees and for Coach ingress and egress. Passenger assists shall be convenient in location, shape, and size for both the 95th-percentile male and 5th-percentile female standees. Starting from the entrance doorway and moving anywhere in the Coach, full-length vertical assists shall be provided so that a 5th-percentile female passenger may easily move from one assist to another without losing support. Vertical assists shall be mounted on the aisle side of the seatback of every transverse seat. These assists shall be functionally continuous with the overhead assist. Stanchions and other assists shall be bolted or pinned at

each end with durable stainless steel mounting hardware and shall not crack or bend in normal service for the lifetime of the Coach.

Excluding those mounted on the seats and doors, the assists shall be between 1-1/4 and 1-1/2 inches in diameter with no corner radii less than 1/4 inch. All passenger assists, including those along edges of modesty panels, shall permit a full handgrip with no less than 1-1/2 inches of knuckle clearance around the assist. In addition, flexible grey PVC straps in yellow metal mounting bracket shall be secured to the overhead assists, allowing passengers a grab handle when not gaining the opportunity for a seat (see Section 3.9.3: Overhead). Each hand strap location shall be stationary by using clamp shell compression parts and the SFMTA prefers not to drill through the assists. The Contractor shall submit the proposed layout of passenger assists and grab handles to the SFMTA approval.

A crash resulting in a 1-foot intrusion into the Coach shall not produce sharp edges, loose rails, or other potentially dangerous conditions associated with a lack of structural integrity of the assist. Any joints in the assist structure shall be underneath supporting brackets and securely clamped to prevent passengers from moving or twisting the assist. All areas of the passenger assists that are handled by passengers, including functional components used as passenger assists, shall be of stainless steel construction. Yellow powder-coating shall be applied to passenger assists directly adjacent to the rear exit door to signal to passengers that it is an exit area. Flat black powder coating shall be applied to any passenger assists in the front of the Coach that could pose a risk of reflecting light into the driver's view. Assists shall withstand a force of 300 pounds applied over a 12-inch lineal dimension in any direction normal to the assist without permanent visible deformation. All passenger assist components, including brackets, clamps, screw heads, and other fasteners used on the passenger assists, shall be designed to eliminate pinching, snagging, and cutting hazards and shall be free from burrs or rough edges.

3.9.1 Doorways

Assists shall be mounted in the doorway and on the doors to aid passengers in boarding and alighting. A 5th-percentile female shall be provided functionally continuous assists from the curb to the assists within the Coach. For design purposes, use a six-inch curb height. These assists shall begin with a vertical element not less than 12 inches long and no more than 4 inches from the outside edge of the exit area tread and continue inward no less than the first inboard stanchion. Assists in the doorways shall be no less than 3/4 inch in width and shall provide at least 1-1/2 inches of knuckle clearance between the assists and their mountings. A full-size vertical assist that is functionally continuous with the overhead assist shall be provided on the aisle side of the modesty panels at the entrance and exit areas.

The SFMTA will review door opening passenger assists and provide final approval during the prototype Coach development to maximize aid to seniors, persons with disabilities, and wheelchair users boarding the Coach.

3.9.2 Vestibule

A horizontal passenger assist shall be located across the front of the Coach to 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 continuous support for a boarding passenger from the front door through the fare collection procedure. Passengers shall be able to lean against the assist for security while paying fares. The assist shall be no less than 36 inches above the floor. The assists at the front of the Coach shall be arranged to permit a 5th-percentile female passenger to reach easily from the door assist to the front assist and then to vertical assists on the operator's barrier or front modesty panel.

3.9.3 Overhead

Except forward of the standee line and at the exit doors, a continuous full-closed-grip, overhead assist shall be provided along both sides of the Coach. This assist shall be located at a height convenient to standees, directly over the aisle-side edge of the transverse seats. The assist shall be no less than 70 in. above the floor. Overhead assists shall be capable of supporting 150-pound loads at 12-inch intervals. No more than five (5) percent of the full-grip feature shall be lost due to assist supports.

3.9.4 Grab Straps

The Contractor shall supply Bentech grab straps (part # SH-21-TP) or approved alternative on the overhead assists. The Contractor shall provide grab straps at 18-inch intervals along the overhead assists; the quantity and location of grab straps shall be approved by the SFMTA.

3.9.5 Longitudinal Seats

Longitudinal seats shall have vertical assists located between each pair of seating positions, except for seats that fold up to accommodate wheelchair securement. Assists shall extend from near the leading edge of the seat and shall be functionally continuous with the overhead assist. Assists shall be staggered across the aisle from each other where practicable and shall be no more than 52 inches apart longitudinally. Vertical assists shall be attached either by stainless-steel receiver cups with isolators welded to the seat grabrail on one end, and bracket attachments to the overhead horizontal assist at the other end.

3.9.6 Divider Panel

A horizontal passenger assist shall be mounted on the top of every divider panel forward of a transverse seat.

3.10 DESTINATION SIGNS

The Contractor shall provide and install on each Coach an automatic electronic sign system by Luminator or approved equal. The system shall conform to all applicable ADA requirements and

shall function seamlessly with the DVAS specified in Section 3.13. All locations and mounting of equipment must be approved by the SFMTA.

The proposed electronic signs and equipment to be installed and integrated by the Contractor are:

Item	Part Location	Part Description	Part Number	Qty.
1	Front	24x200 Spectrum	511305-001	1
2	Curbside	8x96 Amber	511288-A0x	1
3	Streetside	8x96 Amber	511288-A0x	1
4	Rear w/camera	16x48 Amber	511291-A01	1
5	Dash	12x40 amber	511240-A01	1
6	Operator Area	MCU Controller	510632-C44	1

The Master Run Switch shall control power to the sign system. The signs shall operate in all positions of this switch except in “OFF” position.

The system shall be capable of integrating with additional information devices, such as interior information signs, Voice Annunciation devices, and fareboxes. The system shall provide for destination and/or Public Relations (P/R) message entry.

The system shall have the ability to sequentially display multi-line destination messages, with the route number portion remaining in a constant “on” mode at all times. It shall also be capable of accepting manual entry of Route Alpha/Numeric on any/all signs.

The system shall be capable of storing and displaying up to 10,000 message lines. Message memory shall be changeable and sized according to the message listing noted herein. Download via a PCMCIA card or Memory Transfer Unit will not be accepted.

The route profile shall be capable of being uploaded wirelessly.

All sign programming tools shall be supplied by the Contractor. The task of the final commissioning onsite at the SFMTA shall be included in the Contract price.

3.10.1 Display

The displays shall consist of pixels utilizing high intensity LEDs. The LEDs shall be the only means of illumination of the displays. Each pixel shall have a dedicated LED for illumination of that pixel in any lighting conditions. The displays shall adjust intensity level automatically as a function of the ambient light conditions. No fan or special cooling shall be required for the displays. The LEDs shall have a life expectancy of 100,000 hours and each LED shall consume no more than 0.02 watts. The LED’s power circuit shall be protected against normal Coach power surges. The LEDs shall be mounted such as to be visible directly to the observer positioned in the viewing cone, allowing for full readability 65 degrees either side of the

destination sign centerline. Destination readings shall be furnished by the SFMTA. The characters formed by the displays shall meet the requirements of the ADA (reference 49 CFR Section 38.39).

The sign enclosure shall prevent condensation and the entry of dirt, dust, moisture, water, and insects during normal operation or cleaning with a cyclone cleaner. Access shall be provided to clean the inside of destination sign windows and to remove or replace the sign mechanism. The glass used for the destination sign enclosure shall be a glare-resistant type, minimizing the effects of other types of light reflecting on it. The Coach manufacturer shall comply with the destination sign manufacturers recommended mounting configuration and installation procedures to assure optimum visibility of the sign display.

3.10.2 Front Destination Sign

The front destination sign shall be in full color. The front destination sign shall feature 24 rows by 200 columns of LEDs. All service performed on this sign must be done through the sign access door.

3.10.3 Curb Side Designation

The curbside destination sign shall be amber color display and shall feature eight rows by 96 columns of LEDs. The display must be easily read from the sidewalk level.

3.10.4 Street Side Destination Sign

The street side destination sign shall be amber color display and shall feature eight rows by 96 columns of LEDs.

3.10.5 Rear Destination Sign

The rear destination sign shall be amber color display and shall feature 16 rows by 48 columns of LEDs. The rear destination sign shall include an integrated backup analog camera, which will display a view on the driver's integrated dash display when the Coach is shifted into reverse and with a latency of 100 milliseconds or less. The rear designation sign will also integrate with the Kratos digital video recorder (DVR) for the purposes of recording video.

3.10.6 Dash Mounted Run Number Sign

The integrated run number sign shall be amber color display and shall feature 12 rows by 40 columns of LEDs. The display area shall be able to display a minimum of 4 characters and each of the 4 characters shall be capable of displaying all 26 upper case letters as well as numbers 0 through 9. Run numbers to be displayed shall be input directly into the destination sign system's MCU (see Section 3.10.7 Operator Control Unit) and the display shall also receive the run number information through the radio/AVL system via an approved CAN communication

protocol. The sign shall be mounted as low as possible on the dash on the curbside of the Coach.

3.10.7 Operator Control Unit (OCU)

The OCU shall be used to view and update display messages. It shall be recess mounted in an area that is easily accessed by the Coach operator. The make, model, and location of the OCU must be approved by the SFMTA.

The OCU shall utilize a water-resistant multi-key conductive rubber pad keyboard and be designed for transit operating conditions. The OCU keypad shall have a sealed, elastomeric membrane.

The OCU shall contain a color LCD touchscreen display. Programmable multifunction keys shall be used for basic operation while the touchscreen shall be used for more advanced operations. The OCU shall provide audible feedback to alert the operator to view the display for a message, or beeps indicating that a key is depressed. The OCU shall continuously display visual feedback associated with the selected destination code.

The OCU shall be capable of accepting information by interfacing to the radio/AVL system via an approved CAN communication protocol for automated destination code and public relations code selection.

The sign system shall be reprogrammable through the system control console by a standard USB 2.0 thumb drive. An Ethernet connection shall be used to keep sign image transfer times to under 90 seconds for a 10,000-line listing from the on-board computer to the sign system.

3.11 ITS CABINET

An Intelligent Transportation Systems (“ITS”) cabinet shall be provided to accommodate all onboard electronic equipment, including the mobile radio/AVL equipment and third-party auxiliary equipment. The design, contents, and layout of the ITS cabinet shall be presented to the SFMTA for approval during design review.

The cabinet shall have a lockable door. The ITS cabinet shall be supplied with a nominal 12-volt, direct current with positive and negative leads. This service shall be protected by circuit breaker(s) located at the circuit breaker panel sized by the Contractor.

3.12 RESERVED

[RESERVED]

3.13 DIGITAL VOICE ANNOUNCEMENT SYSTEM

The Coach manufacturer shall provide all equipment and a full installation for the Digital Voice Announcement System (DVAS) by Conduent for approval by the SFMTA. The Contractor shall work with Conduent to obtain a full bill of materials for the proposed DVAS and shall submit this bill of materials to the SFMTA for approval. The DVAS shall be incorporated into the current SFMTA radio system specified in Section 3.17. An Ethernet connection shall be used to keep sign image transfer times to under 90 seconds from the on-board computer to the sign system.

The system shall meet or exceed all ADA requirements found in 49 CFR Sections 37.167 and 38.35 and shall provide different, simultaneous audio announcements to riders onboard and waiting curbside. The system shall also provide a control capability for integrating present and future electronics on the Coach. To maximize the system's useful life and to ensure ease of integration with third party electronics on transit Coaches, the system shall provide a robust, open software and hardware architecture. The system shall have the capability of hardware and software extension to include new or additional features. The system shall be simple to update and easy to program.

The DVAS shall include an IVU 4000 capable of providing a single log-on for other in-vehicle electronics systems (e.g., destination / head signs systems, fare collection systems, automatic passenger counters, etc.). The communications protocol to accomplish system integration shall be SAE J1708 and J1939 communication protocols. The vendor shall also broadcast driver identification information, APC data, and route information on the J1939 network to be used by the ViriCiti data monitoring system. Odometer information must be transmitted over J1939 to the IVU 4000. The system shall include an easy-to-use means of specifying whether log-on and/or passwords are required, and what Coach operator ID's and passwords are acceptable for each subsystem. The DVAS shall be capable of playing audio diagnostics for all integrated electronics and provide audio messages describing any failures.

All discrete signals, unless otherwise approved by the SFMTA, shall be transmitted over J1939.

The DVAS shall allow the operator to select the route via the MCU or the MDT for the radio system and shall display the route and the next stop to be announced on the operator control unit. The operator shall have the ability to scroll forward or backward within the selected route's list of announcements. Internal announcements are intended for on-board riders and shall play either by manual activation by the operator or in response to signals received by an on-board Automatic Message Trigger (AMT). The AMT function shall incorporate a GPS receiver and dead reckoning. External announcements shall play automatically when the door is opened for a stop.

The DVAS shall have dual channel audio capable of playing simultaneous internal and external announcements. The Contractor shall provide all database programming and route mapping services necessary for the system to be fully functional.

The system shall include a noise-sensing device, an Automatic Gain Control (AGC) Microphone, for each audio channel and shall automatically and independently adjust each channel's audio volume as appropriate in response to ambient noise.

The Contractor shall also provide real-time driver information, real-time passenger information, and real-time route information through the vehicle J1939 connection or an API from Conduent to the ViriCiti/ChargePoint data monitoring systems.

3.13.1 Programming

Each Coach shall be delivered with a fully programmed, fully functioning voice annunciation system. The programming for the voice annunciation system shall match the current annunciator image deployed on the SFMTA's bus fleet, including all stops on all routes. The trigger points for all voice announcements shall be user programmable. The DVAS system shall include the full feature set as provided by the SFMTA upon request.

The Contractor shall supply the SFMTA with all required software, hardware configuration, and training to maintain and operate the DVAS. The Contractor shall provide the SFMTA with the specifications for all hardware required to operate the DVAS software.

All hardware and software shall be uniquely identified as the SFMTA property with serial numbers.

3.13.2 Sign Requirements

The internal display sign shall display coordinating text for next stop and other audio announcements. The sign shall meet all ADA requirements for internal signage. The sign shall be an LED-type sign with 16 characters per line with bright amber LEDs. The sign shall be no larger than 27" x 2 1/8" x 4 1/8" (single line) / 6 1/8" (double line). Messages can be shown streaming or by any of 3 single frame modes with automatic centering. Speed, delays, and looping shall be programmable. Busy/ready status shall be poll-able. The sign shall have forced reset capability.

The internal LED display sign shall be used to display the words "Stop Requested" and shall be visible to passengers. When the passenger chime is activated and shall remain on until the front or rear door is opened. The internal LED display sign shall also be used to display "Ramp Requested" when the wheelchair passenger stop request is activated.

The sign enclosure shall be approved by the SFMTA and consist of metal construction with welded and sanded seams, black powder coat finish, and an acrylic fascia with matte finish for reduction of glare. The sign shall be constructed to withstand the harsh environmental conditions found in transit applications.

3.13.3 GPS Vehicle Location Message Trigger

The GPS shall be capable of providing its positioning information to other onboard equipment. Such GPS information shall be made available for AVM and AVL applications. The system shall automatically determine adherence to the Coach route and trigger the announcement of the next Coach stop as it is approached. The system shall utilize GPS satellites signals, WAAS satellites, a heading sensor, and an odometer sensor to provide continuous location information and automatic correction.

Once initialized, the automatic announcement system shall not require the operator to intervene in the event of off-route excursions. The system shall detect off-route excursions and remain silent when off route. The system shall detect reacquisition of the route, at any point along the route, and automatically determine and announce the next valid Coach stop.

3.13.4 Data Transfer and Wireless Data Transfer

The DVAS shall be reprogrammable on the Coach. On-Coach reprogramming shall also be accomplished in a single-step process using a 802.11g or faster protocol.

The wireless Upload/Download Automated system shall transfer the new data from a local computer to the on-board memory or vice versa. After the transfer is initiated, the system shall trigger an automated data update followed by “Voice Update Completed” type message on the Signs and the MCU Display. The system shall provide a software application to manage the fleet data deployment update and the update completion status.

The Contractor shall demonstrate to the SFMTA the wireless uploading/downloading and provide necessary training to the SFMTA designated personnel.

3.14 PUBLIC ADDRESS SYSTEM

A public address system that complies with the ADA requirements of 49 CFR Section 38.35 and enables the operator to address passengers either inside or outside the Coach shall be provided in a location approved by the SFMTA.

The public address system shall be activated by a floor-mounted momentary switch to permit the operator to make internal and/or external announcements; volume levels shall remain consistent when switching between speakers. The speaker select switch shall be easily accessible to the operator. Six interior speakers shall be installed. One exterior speaker shall be provider at each set of entrance or exit doors. These speakers shall be terminated at the ITS compartment with a service loop of at least four feet in length. One exterior AGC microphone shall be provided at the front door of each Coach, and one interior AGC microphone shall be provided at the midpoint of each Coach. The Contractor shall work with Conduent to ensure the interior and exterior speakers are integrated and configured with the proper impedance.

All speakers shall broadcast in a clear tone so that all announcements are clearly heard in all passenger locations. Interior speaker grills shall be metallic material and shall be secured by tamper-proof screws or rivets. The PA system shall be muted when not in use. A Stealth Mic hands-free digital microphone system, Digital Recorders Inc., REI, or approved equal shall be provided. The SFMTA must approve all equipment locations and installation plans for the public address system.

3.14.1 Audio Announcement Subsystem

Audio announcements shall be initiated automatically at points along the SFMTA motor Coach routes. Each announcement shall be designated interior and/or exterior. The volume for each announcement shall be automatically set based upon analysis of the ambient noise level (this automatic volume adjustment needs to react within 0.100 seconds to changes in noise level). All volume settings shall be digitally set to ensure consistent volume throughout the fleet. At least 8 exterior and 8 interior preset default settings, each with different volume and ambient AGC choices, shall be provided, as well as enough memory for saving at least 10 additional user-defined volume settings. Exterior volume settings shall be configurable based on the time of day.

An Integrated Public Address (IPA) Subsystem shall use the Coach's interior and exterior public address speakers. This system shall provide the operator the capability to make their own interior and exterior announcements, determined by a driver-controlled switch. The IPA shall override passenger audio announcements and shall have its own gain control independent of the AGC.

3.15 DIGITAL VIDEO RECORDING AND SURVEILLANCE CAMERA SYSTEM

The Contractor shall provide equipment and installation for a digital video recording and surveillance system (DVRS) by RCM Security Inc. or approved equal and shall demonstrate successful operation of the system on each Coach. The DVRS system shall provide full coverage of the interior and exterior of the Coach and will also support two Transit-Only Lane Enforcement (TOLE) cameras. The DVRS shall interface with the CradlePoint router as described in Section 3.17 MOBILE RADIO/AVL SYSTEM, provided by Conduent. The system design shall be reviewed and approved by the SFMTA during detailed design and prototype review.

The DVRS shall be capable of being programmable to automatically tag events and pre-programmed activities.

The system shall be able to retain time, date, and any user programmable data (e.g., Coach number, route, run) without connection to the power source. The system shall have its own power supply connected to the 12 volt or 24-volt power of the Coach and shall include an uninterruptible power source that provides for 30 minutes of system run-time without Coach power. The system must be able to withstand all transients, surges, and dips in power from the Coach's electrical system without any deterioration of system performance. The system shall

not be affected by EMI or RFI. The system shall meet all applicable rules and regulations of the Federal Communications Commission (including FCC Part 15 Rules and Regulations) and the Department of Transportation.

The Contractor shall include in the Coach maintenance manuals wiring diagrams clearly showing the interfacing Coach wiring for the system as well as individual maintenance manuals for each piece of supplied equipment. These manuals shall include schematic diagrams and maintenance procedures for tasks including but not limited to operation, preventive maintenance, and troubleshooting. The task of the final commissioning onsite at the SFMTA shall be included in the Contract price.

At the discretion of the operator, a control event marker (pushbutton or equivalent) shall be available to mark an event in the same manner as specified for the silent alarm in Section 4.1.10.

A suggested Bill of Materials may be found in ATTACHMENT 8: SUGGESTED BILL OF MATERIALS. This Bill of Materials may not include all components required to be installed and integrated by the Contractor. The Contractor shall obtain a final Bill of Materials from RCM Security Inc.

3.15.1 Camera

The Contractor shall provide and install all camera system equipment required for full coverage of the Coach, and two TOLE cameras located as specified by the SFMTA. The brand of cameras used shall be Hanwha, and the specific models shall be subject to approval by the SFMTA during the design review. The camera system must be compliant with the Real Time Streaming protocol.

Exterior cameras shall not make any audio recordings outside of the Coach including in the front or sides of the Coach.

An analog surveillance backup camera integrated with the Luminator rear run sign shall be provided and shall be integrated with the driver's dash for the purpose of displaying live video of the rear of the Coach to the dash display when the Coach is in reverse. In addition, a rear exterior IP camera shall be provided and shall be integrated with the DTI DVR for the purpose of recording video.

Interior analog cameras overlooking the exit door shall be provided and shall integrate with the driver's dash for the purpose of displaying live video to the dash display when the rear door is open. An interior IP camera shall also be provided at the exit door and shall be integrated with the DTI DVR for the purpose of recording video.

The TOLE cameras shall be positioned to capture an identifiable image of the vehicles in front of the Coach, including the license plate, color, and other identifying characteristics of the vehicles. The TOLE cameras shall be positioned to capture the location of the vehicles illegally occupying

the transit-only lanes in front of the Coach. The operator shall be able to manually trigger the creation of a timestamp file corresponding to an incident recorded by the TOLE cameras with a pushbutton located on the dash or driver's side console. The timestamp file format shall be approved by the SFMTA and shall be readily accessible by SFMTA video shop personnel.

The exterior camera outside the Coach shall be pointed towards the rear and at the doors. It shall prevent damage to the lens from the Coach washers or tree branches on the Coach's route.

All cameras supplied shall have an integrated mic and standard IP color signal output. The cameras shall be capable of producing undistorted 150dB or better wide dynamic image, i.e., capable of capturing face images with bright backgrounds within the Coach. The cameras shall have M12 connectors, be Power over Ethernet (PoE) and of 1920 x 1080 or greater resolution. The cameras shall work in all lighting conditions.

3.15.2 Digital Video Recorder

The DVR shall be a DTI MDR-6 Mobile Data Recorder, or approved equal, capable of recording the outputs of the TOLE cameras and video surveillance cameras on internal separately removeable hard drives. The video surveillance camera solid state drive shall provide a minimum of one month video retention with H.264 compression algorithm and shall be a minimum two terabyte capacity SATA drive or an approved equal. The TOLE camera hard drive shall provide a minimum of three days storage capacity and shall be a minimum two terabyte capacity solid state drive, or an approved equal. All drives shall be "Hot Swappable" (i.e., the drives shall be removable without corrupting the data even with the DVR ON). The DVR shall record all cameras simultaneously at a speed of not less than five frames per second each, along with synchronous audio tracks, and shall record time, date, Coach number, GPS location information, and time sync. The GPS information shall be able to relate to an address on a map.

The DVR shall be capable of recording IP audio signal from the interior IP surveillance cameras. The SFMTA shall have the ability to approve which IP cameras' audio feed will be recorded. (See ATTACHMENT 6: CAMERA LAYOUT)

The DVR shall have the ability to automatically download selected video events in user selectable increments via a wireless connection in a manner satisfactory to the SFMTA. The specific Coach and time range shall be selectable.

The DVR shall have the capability to be pre-programmed to download recorded incidents that have not been "tagged" by the operator up to one hour in length from all cameras recorded in the Coach when the Coach returns to the yard in a manner satisfactory to the SFMTA.

The download shall continue until complete even if the Coach is powered down.

The DVR shall have the capability to transmit live video, from inside the Coach, upon demand to a laptop or other mobile device while the Coach is still in revenue service in a manner satisfactory to the SFMTA.

The DVR shall have a shutdown feature where the DVR is powered down after a specified period following the ignition of the vehicle being turned off. The time interval before DVR shutdown shall be adjustable from zero to 30 minutes.

The live video feed shall be transmitted up to a distance from the Coach that shall be determined by the SFMTA.

3.15.3 Health Monitor Tool (HMT)

The Contractor shall provide Health Monitor Tool (HMT) application software for continuous monitoring of the health of remote DVRs. The DVR shall be capable of sending real-time health checks and notification through e-mail or text of any defect noted during Coach operation.

A. The HMT software shall perform the following functions:

- Automatically monitor multiple remote connected DVRs at set intervals.
- Manually poll all DVRs for system health variables.
- Provide an online report of all results.
- Export reporting capability in 3 formats (Excel, HTML, and CSV).
- Email notification of events to multiple recipients.

B. Monitored Events:

- Connection: Network connectivity test.
- Failed Drive Access: Each drive shall be verified.
- Camera Failures during Defined Intervals: Cameras shall be continuously tested to ensure connectivity.
- Reboots anytime a DVR is restarted or shutdown.
- Time Since Recording: Verification that recording is continuing up to current time.
- Protected Capacity Used %: System shall monitor the space remaining for protected video and display the percentage used.
- Days of Storage shall display the number of days currently retained on the DVR for unprotected recorded video.

3.15.4 Downloading Software

The downloading software shall have the capability to be programmed by a maintenance technician at the server to be able to download recently recorded video for QA checks of equipment functionality of each transit Coach on a daily, weekly, and monthly basis. The downloading software shall have the ability to download the error/status log from the DVR every

time the transit Coach is back in the depot yard. It shall include a "GPS Search" feature that will allow the SFMTA staff to search video via GPS map location and time/date pin pointing. Users shall interface with the program through a Graphical User Interface (GUI).

The downloading software shall have fleet-wide software for viewing DVR and camera "health status" that are continuously updated and recorded in a log file accessible to the SFMTA Video Technicians and shall include real time health checks and can send notifications to the SFMTA staff via e-mail/text of any Defect noted during operation.

The system shall have the capability to be pre-programmed to download recorded incidents that have not been "tagged" by the operator, up to one hour in length from all cameras recorded on the transit Coach when the Coach returns to depot yard. The Contractor shall provide all support equipment needed to facilitate this (i.e., antenna, transmitter, receiver, and server).

3.15.5 Wireless System

The wireless system on the Coach shall be a CradlePoint wireless router or approved equal. The Contractor shall supply or use an existing antenna mounted on the roof of the Coach of at least three dBm gain, and if needed per the Contractor's power configuration, an external power supply to power the bridge may be installed. The wireless bridge shall have the capability to turn on and off the DVR via a wireless switch or IP relay.

3.15.6 Security Enclosure

The mobile DVR shall be encased in a vented, rugged metal chassis with shock absorbers to withstand exposure to extreme shocks, vibrations, and temperatures. A system status and event button indicator shall be provided on the outside of the enclosure. A pick-resistant tubular pin tumbler lock or better shall be used. The lock shall be quarter turn lock and unlock. The internal and external assembly of the security enclosure shall be designed for ease of removal and repair of an internal subassembly and of the entire assembly. Ease of use, convenience of maintenance, changing user parameters, and media removal and replacement are also important functional requirements for the system. Design of the security enclosure must be approved by the SFMTA during prototype review.

3.15.7 Viewing Recordings

The viewable and audible data shall meet all applicable requirements for admissibility set forth in the California Evidence Code and the Federal Rules of Evidence. The SFMTA shall be able to view the GPS location of the vehicle for each recorded event and search for recorded events at a specified location.

3.15.8 Documentation and Training

Documentation and training for the surveillance system are referenced in Section 9.1.8 (Surveillance Camera System Training).

3.16 DRIVECAM

The Contractor shall provide a continuous battery powered Lytx DriveCam system on all Coach. The DriveCam system (DriveCam System) shall include the SF300 Cellular Event Recorder (Event Recorder), DriveCam GPS system with GPS antenna (internal or external), and all hardware and equipment required to provide an operational event recorder system that meets the written software and hardware related specifications that DriveCam provided to the SFMTA. The final system design and installation must be approved by the SFMTA. The task of the final commissioning onsite at the SFMTA shall be included in the Contract price.

3.16.1 Hardware

A suggested Bill of Materials may be found in ATTACHMENT 8: SUGGESTED BILL OF MATERIALS. The Bill of Materials may not include all components required to be installed and integrated by the Contractor. The Contractor shall obtain a final Bill of Materials from Lytx.

3.17 MOBILE RADIO/AVL SYSTEM

The Contractor shall provide all equipment for, and fully install, the mobile radio/AVL system by Conduent, subject to approval by the SFMTA. The Contractor shall work with Conduent to verify the suggested bill of materials provided in ATTACHMENT 8: SUGGESTED BILL OF MATERIALS for the proposed radio/AVL system and shall submit a proposed bill of materials to the SFMTA for approval.

The Contractor shall supply an uninterruptible power source as described in Section 3.26 UNINTERRUPTIBLE POWER SOURCE, capable of providing sufficient back-up power for the mobile radio/AVL system and cellular/WiFi access point.

The location of all radio and public address equipment shall be in the ITS cabinet at an accessible location and shall be subject to the SFMTA review and approval. The SFMTA prefers that the operator's handset shall be located on the operator barrier adjacent to the farebox; alternative locations may be submitted for the SFMTA approval.

The task of the final commissioning of the mobile radio/AVL system shall be included in the Contract price.

The suggested Bill of Materials to be installed and integrated by the Contractor can be found in ATTACHMENT 8: SUGGESTED BILL OF MATERIALS. The Bill of Materials may not include all components required to be installed and integrated by the Contractor. The Contractor shall obtain a final Bill of Materials from Conduent.

3.17.1 Radio Antenna

The Contractor shall provide and install all antennae for the SFMTA radio system specified in Section 3.17. The Contractor shall provide and install coaxial cables from the ITS compartment to each antenna location.

The Contractor shall provide 3/4-inch conduit and pull wire from each antenna mounting plate to the ITS compartment. The conduit shall not have sharp bends.

3.17.2 Discrete Signals

The Contractor to provide the following discrete signals:

Item	Signal Name	Method
1	Wheelchair Deploy	J1939
2	Wheelchair Stow	J1939
3	Stop Request	J1939
4	Stop Request ADA	J1939
5	Stop Request Clear (Cleared by either front door open or rear door enabled)	J1939
6	Odometer In	J1939
7	Bike Rack Deploy	J1939
8	Rear Door Open	J1939
9	Front Door Open	J1939

3.18 FARE COLLECTION

Provisions for mounting a Genfare Odyssey fare box with transfer ticket printed technology shall be provided as far forward and as deep into the floor as practicable. The location of the fare box shall not restrict traffic, including wheelchairs, in the vestibule and shall allow the operator to easily reach the fare box operational buttons and to view the deposited fares. The fare box shall not restrict access to the operator's area and shall not restrict operation of operator controls. The passenger side of the fare box will face the front door of the Coach, so there shall be sufficient clearance for easy access to the cash box/receiver system. The fare box must have sufficient clearance for easy removal of the coin and bill modules, as well as the Master Controller Card. Meters and counters on the fare box shall be easily readable. The location of the fare box shall comply with ADA requirements. Wiring and mounting shall meet all clearance and access requirements. The farebox system shall be capable of communicating with the IVU via the J1708 protocol. The task of the final commissioning shall be included in the Contract price.

3.18.1 Electrical

A 10-amp maximum, 24-volt, direct current protected circuit shall be used to power the fare box. This circuit shall be composed of three wires, +24VDC wire, 24VDC return, and a ground lead all enclosed in a protective flexible conduit. All wires are 14 AWG, stranded, and oil/grease/abrasion resistant (Reference ATTACHMENT 10: POWER CABLE, FAREBOX). Where applicable, the Contractor shall install circuit breakers. A power-disconnect switch shall be provided inside the fare box for maintenance purposes.

3.18.2 Fare Box Mounting

The Contractor shall utilize a reinforcing mounting support plate with nuts welded onto it. The support plate shall be mounted to the top surface of the farebox pedestal (Reference ATTACHMENT: 11: FAREBOX MOUNTING SUPPORT PLATE). The Contractor shall place emphasis on the proposed placement of the fare box in order to meet space and maneuverability requirements for wheelchairs and to minimize the possibility of injury to the operator. The location of the fare box and installation procedures must be approved by the SFMTA.

3.19 CLIPPER®

Each Coach shall be provided with wiring provisions and mounting locations for a Clipper® 2.0 system. The Clipper® system shall consist of one Onboard Validator (OBV) for each door, a CradlePoint router, a 4G cellular antenna, and associated cables and hardware. Cables shall not be exposed and accessibility to wiring shall be a primary design consideration for ease of maintenance. The mounting locations of the routers, antennae, and each OBV must be approved by the SFMTA. The task of the final commissioning onsite at the SFMTA shall be included in the Contract price.

The Clipper on-board equipment requires either 12VDC or 24VDC power from protected sources with voltage variations from 9VDC to 32VDC. The protection shall be a 5A manual resetting circuit breaker that visibly identifies an open circuit in the tripped state.

3.20 AUTOMATIC PASSENGER COUNTING (APC) SYSTEM

The Contractor shall furnish, install, and demonstrate successful operation of the APC system with the IRMA sensor installed on each door. The APC system shall communicate with the radio system. The system shall be capable of generating reports on the passenger load with bus stop information at the discretion of the user. Cables shall be mounted so as not to interfere with the operation and maintenance of the wheelchair ramp, or other Coach systems. The installation will be heavy duty and able to withstand the stresses of urban transit operation in the SFMTA environment. Accessibility of wiring and ease of maintenance shall be primary design considerations. The APC shall be able to count wheelchair users, as well as ambulatory passengers. The APC system design and location must be approved by the SFMTA.

The APC system shall have the following features and capabilities:

A. Acquisition of passenger counts by means of sensing devices at each Coach door opening.
B. Fully adjustable detection zones that meet the requirements of the Coach design.
C. Bicycle rack and wheelchair ramp switches that tabulate bicycle rack and wheelchair ramp users.
D. 95% counting accuracy that is unaffected by normal variables, including but not limited to:

- The reasonable speed at which someone passes by sensors.
- Passengers carrying items such as backpacks, boxes, briefcases, etc.
- Obstructions to the sensors, such as passengers remaining immobile within the sensor field.
- The difference between passengers boarding and exiting the Coach.
- Variations in light and temperature.

All specialized tools for the APC system shall be supplied by the Contractor. The task of the final commissioning onsite at the SFMTA shall be included in the Contract price.

3.20.1 Electrical

The APC system shall operate in all positions of the master run switch. Power shall be provided to the APC system at all times, except when the battery has been shut off; this is to enable the wireless download to operate at all times, as explained in Section 3.15.2 (Digital Video Recorder). Power may be provided through the mobile radio/AVL system and uninterruptible power supply.

The APC system shall have a very small current draw. When powered, it shall not drain the Coach's low voltage batteries below vehicle starting level (as applicable) for at least four full days.

The APC system shall have its own circuit breaker, and it shall be internally protected against voltage transients and RF interference to ensure proper operation in the SFMTA operating environment.

3.20.2 System Enclosure

The APC system shall be housed in a sturdy vandal-resistant enclosure that includes a tamper- and pick-resistant lock. The unit shall be installed in an area approved by the SFMTA. This area must be easily and safely accessible to authorized personnel.

3.20.3 GPS (Global Positioning System)

The APC system shall log an accurate location of the Coach while passengers board and exit. Location information will include but not be limited to route and Coach stop/car stop identification.

3.20.4 Computer Data Logging System

The Computer Data Logging System shall be a proven device supplied by a well-established company specializing in APC. It shall consist of an onboard microcomputer that gathers and stores at least 10 days of typical Coach/route data that can be wirelessly downloaded to a local server via an RF wireless system. Data shall also be stored on a non-volatile medium for onboard retrieval.

The system shall communicate with an RF wireless receiver system, stationed at each facility where the Coaches reside. The system shall possess self-diagnostic capability.

Microcomputer gathered data should consist of but not be limited to:

A. Route ID
B. Coach ID
C. Time and date stamp
D. Stop ID
E. GPS stop coordinates
F. Direction of travel
G. Minimum and maximum passenger numbers
H. Number of passengers boarding and exiting at each stop ID/GPS location
I. Passenger load count at any time
J. Bicycle rack user and wheelchair lift user data.

The above data and other variants shall be used with software described below in Section 3.20.5 Computer Data Analysis Software).

3.20.5 Computer Data Analysis Software

The APC Vendor shall offer complete data analysis software for use on a laptop PC with downloaded APC computer-logged data to generate summaries, reports, analyses, plots, and graphs such as, but not limited to, the following:

A. Route Summary Report
B. Route Productivity Plot
C. Trip Summary Report
D. Trip Report: Bus/Car Stop Summary
E. APC Mapping
F. Schedule Adherence Summaries and Reports

The software shall have the ability to adjust the parameters of the Reports and Summaries, such as dates, routes, addition of external data, etc. The Contractor shall provide pricing information for APC software for converting the compiled data into useful information as outlined above**.**

The Data Analysis Software will be part of the proven APC system supplied by a well-established APC company specializing in APC systems. The APC data/software shall be fully compatible with the Plan module of the Trapeze scheduling system.

3.21 PASSENGER INFORMATION HOLDER

Two frames shall be provided on the ITS cabinet enclosure to retain information sized 17 inches wide and 11 inches high posted by the SFMTA, such as routes and schedules.

Three “take-one” boxes shall be mounted inside the Coach. The SFMTA prefers that two boxes on the street side shall be mounted on the window pillars: one half-way between the operator’s area and the space across from the rear door and one half-way between the rear door and the rear of the Coach. One box shall be mounted on the rear door pillar. The "take-one" boxes shall be aluminum or stainless steel and shall retain a 1-1/4 inches stack of 4-1/4 inches-wide media. The boxes shall be four inches deep.

Locations and placement of the passenger information holders are subject to SFMTA review and approval.

3.22 NUMBERING AND SIGNING

Coaches shall have four-digit fleet numbers counting upward in sequence with Coach serial numbers. The SFMTA will inform the Contractor of the fleet numbers. The SFMTA logo and serial numbers shall be decals. The SFMTA common carrier number “CA 49819” shall be on decals in three-inch high numbers on both the curbside and the streetside of the Coach. The Contractor shall provide the Coach number on a 48 inch high decal on the roof of the Coach. A Coach fleet number plate shall be installed on the panel behind the operator seat. All fleet number designs and locations shall be subject to approval by the SFMTA.

The interior of the Coaches shall have the four-digit fleet number in three-inch block style decal located on the panel or access door above the operator’s head and centered vertically from the windshield to the ceiling and horizontally between the Coach interior walls. In addition, on the panel behind the operator’s station, a Braille Vehicle number sign will be placed in accordance with ADA height and size requirements listed below.

Signing shall be applied to the inside and outside of the Coach in compliance with the ADA requirements defined in 49 CFR Section 38.27. Signs shall be durable and resistant to fading, chipping, and peeling; they may be painted signs, decals, or pressure-sensitive appliqués. All decals shall be sealed with clear, waterproof sealant around all exposed edges if required by the decal supplier. Signing listings are included in ATTACHMENT 2 Decal Listing. The Contractor

will be supplied with a sample of all decals and decal drawings at design review. Sign materials, location and placement shall be subject to approval by the SFMTA.

3.23 RESERVED

3.24 CHASSIS MOUNTED PEDESTRIAN BARRIER (S1 GARD)

The Contractor shall provide a chassis mounted S1 Gard pedestrian barrier on the curbside in front of the rear axle wheel. The pedestrian barrier shall be designed to push pedestrians away from the curbside rear wheel. The pedestrian barrier as installed shall not reduce the Coach breakover angle.

3.25 TELEMATICS

The Contractor shall provide a data monitoring system by New Flyer Connect, or approved equal. The Contractor shall add provisions for ViriCiti hardware.

The Contractor shall provide a 12-year subscription for New Flyer Connect.

3.26 UNINTERRUPTIBLE POWER SOURCE

The Contractor shall supply a 12VDC Lithium-Ion uninterruptible power source after the ignition is shut off capable of providing sufficient back-up power for the mobile radio/AVL system, the Digital Video Recording and Surveillance system, and Cradlepoint router. The back-up power shall provide a minimum of 90 minutes for the mobile radio/AVL, 30 minutes for the Digital Video Recording and Surveillance system, and 240 minutes for the Cradlepoint router. The power source and controller design shall be approved by the SFMTA.

4 OPERATOR'S AREA

The objective of designing the operator's area is to provide an environment for the driver to operate the Coach safely and efficiently for long periods of time without injury and with minimal fatigue. The operator's area shall also be designed to minimize glare to the extent possible; no mirrors or viewing areas shall be unusable due to glare under normal day or night operation. The use of polished metal and light-colored surfaces within and adjacent to the operator's area shall be avoided. To the extent practicable, areas that are visible from outside the Coach in the vicinity of the dash panel and cowl shall be configured to preclude use for storage of items. The Contractor shall present the complete detailed layout of the operator's area at the design review for approval by the SFMTA.

The Contractor shall construct a mock-up of the operator's area or provide an electronic mockup for approval of the operator's area by the SFMTA prior to the manufacture of each prototype Coach.

The operator's area shall comply with the following SAE recommended practices (or with an approved alternative set of recommended practices):

TABLE 4.0

SAE J287	Driver Hand Control Reach
SAE J680	Location and Operation of Instruments and Controls in Motor Truck Cabs
SAE J833	Human Physical Dimensions
SAE J941	Motor Vehicle Driver Eye Range
SAE J1050	Driver's Field of View
SAE J1052	Motor Vehicle Driver and Passenger Head Position
SAE J1516	Accommodation Tool Reference Point
SAE J1522	Truck Driver Stomach Position
SAE J1834	Seat Belt Comfort, Fit and Convenience

4.1 CONTROLS

All switches and controls shall be in convenient and accessible locations for the operator and shall either be marked with easily read backlit identifiers or shall be easily legible at night. All panel-mounted switches and controls shall be replaceable, and the wiring at these controls shall be serviceable from the vestibule or the operator's seat. Switches, controls, and instruments shall be dust and water resistant, consistent with the Coach washing practice described in Section 2.3, INTERIOR TRIM, PANELING AND ACCESS unless otherwise approved by the SFMTA. All operator controls shall be in positions where the operator can activate and deactivate them without reaching below the dash level and shall be in a position that the operator's body cannot contact them while entering and existing the control station, or while operating the Coach.

4.1.1 Operator Control

The SFMTA Operations personnel will be heavily involved with the final approval and Acceptance of the operator's area. All controls shall be identifiable by shape, touch, and permanent non-wear or fading identification markings. Specific requirements for operator controls are summarized in Table 4-1 (Operator Control Requirements). All required switches and controls are included in Table 4-2 (Operator Switches and Controls) and shall be rated for heavy duty automotive applications. The kneel switch, hill holder switch, and wheelchair ramp switch shall be military grade.

No wiring, equipment or housings shall interfere with the operation of foot-controlled switches or pedals. Controls and all dash features shall be designed so that the operator or passengers may not easily tamper with them. The layouts of all control areas must be approved by the SFMTA.

4.1.2 Instruments

Coach speed, indicator lights, and air pressure gauges for primary and secondary air tanks shall be located on the front cowl immediately ahead of the steering wheel and may be either analog or displayed on a digital screen. Illumination of the instruments shall be simultaneous with the marker lamps. Glare or reflection in the windshield, side window, or front door windows from the instruments, indicators, or other controls shall be minimized. All instruments and indicators (including those shown on the LCD screen) shall be easily readable in direct sunlight. Instrument and indicator light readability in all conditions will be approved by the SFMTA during prototype evaluation.

The instrument panel shall include a speedometer with a maximum possible indicating speed of no less than 80 mph that is arranged in increments of five mph. The speedometer is preferred to be a rotating pointer type, with a dial deflection between 200 and 270 degrees and with 40 mph being near the top of the dial. The speedometer shall be approved by the SFMTA and shall meet size and accuracy requirements found in either SAE J678 or J1226.

The instrument panel shall display the fuel level gauge, air pressure gauge with the indicators for the primary and secondary air tanks, the voltage of the 12 volt and 24 volt batteries, and if space is available, the ESS state of charge and. The Coach shall report ESS SoC as 100% when the bus is fully charged. A display in the instrumental panel or on the dash shall be able to show exit door activities via the surveillance camera system when the exit doors are open. The same display shall also show a view behind the coach via the rear exterior surveillance camera when the coach is in reverse. The latency of the backup camera and exit door camera displays shall be less than 50 milliseconds.

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

TABLE 4-1 – Operator Control Requirements

SUBJECT	SPEC/DESIGN
Steering wheel adjustment	2.5" vertical minimum; 6" horizontal steering, or as otherwise approved by the SFMTA
Steering wheel	18" to 20” diameter unless otherwise approved by the SFMTA
5th percentile acc. pedal angle at rest	Conform to SAE J287-J941-J1052 and J1522
5th percentile brake pedal angle at rest	Conform to SAE J1516
95th percentile acc. pedal angle at rest	Conform to SAE J1516
95th percentile brake pedal angle at rest	Conform to SAE J1516
Turn signal controls left foot	35 - 45 degrees from horizontal
Control accessibility – side	Conform to SAE J287
Control accessibility – front	Conform to SAE J287
Seat height adjustment	13” – 19” from floor to top of uncompressed seat
Seat adjustment forward	Min. 9"
Object detection	42” height at 24” in front of Coach
Horizontal view	Min. 90 degrees
Obstruction – divider	Less than 3 degrees obstruction to field of view
Obstruction – pillar	Less than 10 degrees of binocular obscuration
Upward view	15 degrees minimum
Brake	Range of resistance: 10 – 50 lbs. Angle from horizontal: 45 degrees. Free play: 1.2 degrees. Pedal travel: 0.5” – 2.5”. Height above accelerator: 1.2”.
Accelerator	Range of resistance: 4 – 10 lbs. Angle from horizontal: 45 degrees. Free play: 5 degrees. Maximum travel: 20 degrees

TABLE 4-1 – Operator Switches and Controls

SWITCHES
Master run switch
Start button (if applicable)
Kneel switch (with cover)
Over raise switch
Hill holder switch
Interior lighting switch
Wheelchair ramp switch
Power door switch
Operator area lighting switch
Hazard light inidicator
Pedal adjustment
Silent alarm switch
Speaker selection switch
Hazard warning switch, with extension arm
Diagnostic light panel test switch
Rear door override switch
Foot-controlled turn signal switches
Horn button in steering wheel hub
Foot-controlled headlight dimmer switch
Fire suppression system manual activation switch
Temporary interior lighting switch (“sweeper switch”)
Event marker button
High beam switch
Propulsion override switch (with cover. See Section 4.1.4.3)
Electric-only mode switch

CONTROLS
Accelerator pedal
Brake pedal
Door controller
Windshield wiper control
Windshield washer control
Interior climate control
Defroster control
Operator’s heater controls
Parking brake control (also acts as direction control neutral actuator)
Harris radio MDT
Destination sign controls
Exterior side mirror adjustment controls
Instrument panel lighting intensity controls

4.1.3 Indicators

Critical systems or components shall be monitored by a built-in diagnostic system with visible and audible indicators. The diagnostic indicator lamps shall be in clear sight of the operator. The intensity of indicator lamps shall permit easy determination of “on”/”off” status in bright sunlight but shall not cause a distraction or visibility problem at night. All analog indicators shall be illuminated using backlighting. Whenever possible, sensors shall be of the closed-circuit type so that failure of the circuit or sensor shall activate the malfunction indicator. Sensors shall be accurate to +/- two percent of the manufacturer’s specified value. 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. Diagnostic indicators are listed in Table 4-3 (Onboard Diagnostic Indicators). Space shall be provided on the panel for future additions of no less than five indicators.

TABLE 4-3 ONBOARD DIAGNOSTIC INDICATORS

VISIBLE INDICATOR	AUDIBLE ALARM	FUNCTION
Low fuel	No	Clean diesel fuel level at or below 25 gallons
Low oil	Yes	Engine oil pressure low
How engine	Yes	Engine coolant temperature high
Low air	Yes	Air system low in primary or secondary reservoir
Alternator stop	No	Alternator not charging
Kneel	Yes	Kneeling system activated
Wheelchair ramp	Yes	System activated
Fire	Yes- 75 dB (min)	Over critical temperature in service compartment
Low hydraulic fluid	Yes	Hydraulic fluid low fluid level
Traction motor	Yes	Over speed and/or overheat
Check system and stop system indicator	Yes	Check System and Stop System indicator.
Mobility aid passenger exit signal	No	Mobility aid passengers want to get off
High headlamp	No	High headlamp is on
Right and left turn	Yes, with disable switch	Indication of left turn or right turn
Hazard warning	No	Warning signal to other drivers (may be common with turn indicators)
Rear doors open or enabled	No	Rear doors are opened
Parking brake not applied	Yes- 75 dB (min)	Parking brake is not applied and master run switch is at “OFF” position
Parking brake applied	No	Parking brake is applied
Seat belt	Yes	Warning signal to operator for not wearing seat belt
Interlock is off	Yes	Interlock is turned off
Service brake applied	No	Service brake is applied (may be common with parking brake indicator)
Energy storage unit temperature	Yes	Warning of high temperature and/or fire and/or smoke condition
Energy use	No	Dynamic energy usage efficiency indicator(s)
Low HV isolation	Yes	voltage system
Controller	Yes	Overheat
Low State of Charge (SOC)	Yes*	Progressive low power indicator(s). *Indicator at 20%; audible alarm at 5%. Final configuration to be approved by the SFMTA.
Door obstruction sensor	Yes	Indication of rear door sensitive edge activation
High voltage system fault	No	Progressive indicator of excessively high current condition within the high voltage system
ABS failure	No	Detects failure in ABS system
HVAC failure	No	Detects failure in HVAC system
Electric-only mode	No	APU manual off condition

4.1.4 Door Controls

Controls for the front entrance and rear exit doors shall be either a single 5-position master door switch, conveniently located and operable in a horizontal plane by the operator's left hand. The setting of this control shall be easily determined by position and touch. The 5-position master door switch shall also activate the hazard light whenever the switch is not in the "centered" position. The 5-position master door switch shall have the following settings:

TABLE 4-4

Switch Position	Door Function
Second position forward	Front door open and rear doors enabled
First position forward	Front door open and rear doors disabled
Centered	Front door closed and rear doors disabled
First position rearward	Front door closed and rear doors enabled
Second position rearward	Front door open and rear doors enabled

Contractor shall provide Proof-Of-Payment (POP) push buttons on the outside of the Coach on each exit door. While the rear exit doors are enabled to open, passengers on the outside of the Coach shall be able to push either POP button to open the door.

The Contractor shall provide the complete door control design for the SFMTA approval.

4.1.4.1 Door Operations

The door design, configuration, locations, operation, and mounting installations must be approved by the SFMTA.

A separate switch, convenient to the operator, shall convert the rear doors to power doors with simultaneous opening and closing of both door valves controlled by the operator.

Doors shall open or close completely within 2 – 4 seconds from the time of actuation and shall be subject to the adjustment requirements of Section 3.2.6 (Actuator).

The rear exit door panels shall include a sensitive edge for the purpose of alerting the operator and reversing door operation in the event an individual or object gets caught between the doors on closure. The sensitive edge will activate a toned alarm in the operator's area, and immediately open the exit door. Once the obstruction is cleared, the operator will be required to recycle the door controller to the open position before being able to again activate closure of the doors. Detailed specifications are listed in 3.2.8 (Sensitive Edges).

4.1.4.2 Interlock

When any door controls are activated, an accelerator interlock shall inhibit the acceleration of the Coach, and a braking interlock shall engage the rear axle service brake system once the

Coach is stopped. The interlocks shall not release until the front and rear doors have closed and the operator has positioned the door control to the “all doors closed” position. If the Coach is not stationary when the interlock is engaged, a loud, momentary alarm will sound. Reference Section 6.1.2 (Propulsion System Interlocks).

4.1.4.3 Interlock Override Switch

An interlock override switch, enclosed in the front destination sign compartment or located on the street side overhead panel above the operator, shall, when set in the disable position, release and deactivate the door interlocks, allowing the release of the inhibited throttle, and enabling the front and exit doors. An audible alarm shall be activated when the override switch is in the disable position. The design, terminology, and location of the interlock override switch must be approved by the SFMTA during design review.

4.1.5 Steering Wheel and Horn Button

The steering wheel shall last the life of the Coach, and shall be constructed of a hard, smooth black material impervious to, diesel or gasoline fuel, cleaning fluids, and body acids. The steering wheel shall be no less than 18 inches in diameter and shall be shaped with a soft rim grip for 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 J1050, Sections 4.2.2 and 4.2.3). The steering column shall be capable of a minimum six inch horizontal adjustment and a three-inch vertical adjustment from the operator seat. Clearance requirements shall be met in all positions; reference Section 5.2.2 (Turning Effort).

Dual electric horns shall be provided and be mounted to prevent entry of water and dirt into the horn trumpets. The horns shall sound high and low notes that match the SFMTA’s existing bus fleet and are clearly audible over 80 dBA traffic noises from 300 feet away. The horn button shall be in the steering wheel hub and shall be protected from debris accumulation and shall not incorporate any manufacturers’ logo.

The steering wheel shall be Vehicle Improvement Products BKBL1824D4V, or approved equal and the horn assembly shall be a Vehicle Improvement Products HB9T, or approved equal.

4.1.6 Accelerator and Brake Pedal

The Contractor shall install an adjustable pedal system by Kongsberg or approved equal. The adjustable pedal system shall permit the brake and accelerator pedals to simultaneously slide three inches forward or rearward. The adjustment shall be made via a dash mounted toggle or rocker switch. The switch shall be clearly labeled to identify it as pedal adjustment and shall be within easy reach of the operator. The design and locations shall be determined during the design review process.

Accelerator and brake pedals shall be designed for ergonomic use and shall meet the recommendations in SAE J1516. Foot surfaces of the pedals shall be faced with wear-resistant, nonskid, replaceable material. Force to activate the brake pedal control shall be an essentially linear function of the Coach deceleration rate and shall not exceed 50 pounds at a point seven inches above the heel point of the pedal to achieve maximum braking. The heel point is the location of the driver's heel when foot is rested flat on the pedal and the heel is touching the floor or heel pad of the pedal. Brake and accelerator design shall refer to Table 4-1 (Operator Control Requirements).

4.1.7 Master Run Switch

Controls for propulsion operation shall be closely grouped within the operator's area. These controls include a separate master run switch and a start switch or button. The master run switch shall be a four-position (Stop Propulsion/Day Run/Night Run/Accessory Park) rotary switch located conveniently to the operator's left.

The "Accessory Park" mode shall enable the operator to keep critical systems active while keeping the Coach parked. The Contractor and the SFMTA shall determine which systems are powered while "Accessory Park" mode is enabled.

4.1.8 Hill Holder

The Contractor shall provide an automatic hill holding system, but if manual control is necessary, the hill holder switch shall be military grade and be conveniently located to the operator's left. Reference Section 5.3.8 (Hill Holder).

4.1.9 Turn Signal

Turn signal controls shall be foot-controlled, waterproof, heavy-duty momentary contact switches, floor-mounted on a platform inclined at an angle between 35 and 45 degrees in a manner that precludes confusion between the left turn, right turn, and high-beam switches. Whenever a turn signal control is activated, an external audible warning shall sound to warn other drivers that the Coach is preparing to make a turn. The external audible curbside turn signal alarm, a Mallory Sonalert SC628JR, or approved equal, shall be located on the exterior of the Coach in an optimal audible location, and shall sound whenever the turn signal is activated.

The Contractor shall install two independent override toggle switches, one for the left turn beeper and one for the right turn beeper, in the ITS cabinet, only accessible by mechanics (see Table 4-2 Operator Switches and Controls). The location shall be reviewed and approved by the SFMTA.

4.1.10 Silent Alarm

The Contractor shall install a robust silent alarm switch. Switches should meet IP68 water and dust resistance requirements. The switch shall be located in an approved location below the

operator seat cushion level on the side console of the operator's area and shall be protected from accidental activation by a guard. When the silent alarm switch is activated, the following events shall occur:

- The DVR shall produce a time stamp corresponding to the emergency event marking a window of recorded data that extends beyond the beginning and ending of an event.
- SFMTA Central Control shall be alerted through the AVL system.

4.2 OPERATOR SEAT

The operator seat shall be a USSC 9100 ALX, modified to meet the specifications listed below in Section 4.2.1, Dimensions and Adjustability, or approved equal. It shall be easily removable from the Coach for service or repair. A headrest is required; however, it shall be easily removed and installed by a mechanic. Installation must be approved by the SFMTA.

The Contractor shall install a parking alert alarm on the Coach. The alarm shall sound if the operator unbuckles the seatbelt and leaves the operator seat without engaging the parking brake. The Contractor may utilize the seat belt fastening as the sensing element; however, the SFMTA prefers that a switch or sensor in the seat itself be used to sense the operator's presence. The Contractor is required to submit their proposed parking alert alarm methodology to the SFMTA for review and approval.

4.2.1 Dimensions and Adjustability

The operator's seat shall be adjustable so that persons ranging in size from the 95th percentile male to the 5th percentile female may safely and comfortably operate the Coach. A footrest shall be provided for the operator's left foot. The operator's seat cushion shall have a minimum width of 18 inches, a depth of 16 inches and a rearward slope with a total range of adjustability of 10 degrees. The operator seatback height, measured from the point of intersection of the uncompressed seat cushion with the seatback to the top of the back, shall be a minimum of 23 inches. The angle formed between the seat back and the seat cushion shall be adjustable in the range of 95 to 120 degrees. The height of the seat shall be adjustable so that the distance between the top of the uncompressed seat cushion and the floor shall vary between 12 and 20 inches. The height of the lumbar support from the seat shall vary between 9 and 12 inches. The seat shall be adjustable forward and rearward for a minimum travel of 12 inches and shall provide a minimum of 33.5 inches of horizontal distance between the seat reference point and heel of the driver on accelerator pedal. While seated, the operator shall be able to make all adjustments by hand, easily and conveniently. Adjustment mechanisms shall hold the adjustments and shall not be subject to inadvertent changes.

4.2.2 Structure and Materials

The operator's seat shall be contoured to provide maximum comfort and safety for extended periods of time. Cushions shall be padded with at least three inches of closed cell molded self-skinning polyurethane on the seat cushion and seat back and shall comply with FMVSS fire and

smoke requirements. Supplementary cushioning shall be provided by air suspension of the seat assembly. The spring rate of the supplementary suspension and the seat height shall be independently adjustable by the operator. Seat suspension shall effectively dampen road shock, so the seat shall not oscillate excessively during normal driving conditions, including passing over potholes. Upholstery shall be H012 Hampton Black Vinyl, or approved equal, and must be approved by the SFMTA during prototype review.

All exposed metal on the operator seat, including the pedestal, shall be aluminum or stainless steel. The seat shall be adjustable without unfastening the seat belts. The seat shall be supplied with a belt assembly and a lap belt system and shall accommodate all drivers in all positions of the seat. Seat belts shall be stored in automatic retractors. The color of the operator seat shall be black, and the seat belt shall be orange.

4.3 OPERATOR'S VENT AND HEATER/DEFROSTER

A dedicated operator-controlled heater and blower shall be provided to heat the operator area and defrost the windshield. The unit shall be sized and designed to operate in the San Francisco environment while providing a comfortable work area during normal transit operation. The blower shall have at least two speeds. Adjustments shall permit variable distribution or shutting off the airflow. The SFMTA prefers to have a manually opened vent door. This vent door shall provide unfiltered outside air to the lower portion of the operator area. The windshield defroster unit shall comply with the SAE recommended practices J381 and J382. Placement and modes of operation for the ventilation system must be approved by the SFMTA.

The Contractor shall demonstrate the operator's area heating and ventilation system's compliance with the specification.

4.4 OPERATOR WINDOWS

4.4.1 Windshield

The windshield shall permit an operator's field of view as specified in SAE Recommended Practice J1050. The vertically upward view shall be at least 15 degrees, measured above the horizontal and excluding any shaded band. The vertically downward view shall permit detection of an object 42" high at no more than 24" in front of the Coach. The horizontal view shall be a minimum of 90 degrees above the line of sight. Windshield pillars shall not exceed 10 degrees of binocular obscuration. The windshield shall be designed and installed to minimize external glare as well as reflections from inside the Coach.

The windshield shall consist of 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. The windshield shall be easily replaceable by removing zip-locks from the windshield retaining moldings. Bonded-in-place windshields shall not be used. The glazing material shall have single-density tint. The upper portion of the windshield above the operator's field of view may have a dark, shaded band with a minimum luminous transmittance of 6 percent when tested according to ASTM D-1003. The SFMTA prefers windshields with flat glass.

4.4.2 Side Window

The operator's side-window shall consist of ¼ in. nominal thickness laminated safety glass conforming to the requirements of ANSI Z26.1-1996 Test Grouping AS-2 and the recommended practices defined in SAE J673. The entire side window area shall contain a two-section sash. The front and rear sections shall slide horizontally and be glazed with float-type, single-density, tinted safety glass that is neutral gray with approximately 76 percent light transmittance. The assembly shall have a ratchet mechanism to prevent uncontrolled sliding. The window tracks, channels, and seals shall be designed to last the service life of the Coach. The Contractor shall provide glass dimensions and specifications. The side window shall be equipped with a visor or approved equal. The design of the operator's side window and locking arrangement must be approved by the SFMTA.

4.5 MIRRORS

4.5.1 Exterior

The Coach shall be equipped with a pair of corrosion-resistant exterior rearview mirrors mounted to each side of the exterior of the Coach. Both mirrors shall be Hadley or an approved equal. Both mirrors shall be remote adjustable. The mirrors shall be separately adjustable and replaceable. The mirrors shall permit the operator to view the highway along both sides of the Coach, including the rear wheels. The exterior rearview mirrors should have turn signals embedded to the mirror lens. Both mirrors shall be mounted on swivel arms with their lower edges no less than 80 inches above the street surface.

Mirrors shall be firmly attached to the Coach to prevent vibration and loss of adjustment, but not so firmly attached that the Coach or its structure is damaged if the mirror is struck, and the mirrors shall retract or fold sufficiently to allow Coach-washing operations. Wiring for the exterior mirrors shall utilize Quick Disconnect Connectors located as close as possible to the mirror for ease of maintenance or replacement. The mirrors shall be mounted on spring-loaded brackets and be guarded from hitting the Coach sides in the retracted position. Mounting arms shall not protrude beyond the outside mirror edge. The mirrors, mirror bracket construction, mounting locations and installation must be approved by the SFMTA.

4.5.2 Interior

Rear view and step well mirrors shall be provided and arranged so that the operator can observe passengers throughout the Coach without leaving the operator's seat and without shoulder movement. With a full standee load, including standees in the vestibule, the operator shall be able to observe passengers in the entrance and exit door areas, anywhere in the aisle, and in the rear seats. Interior mirrors shall not be in the line of sight to the exterior curbside mirror. Mountings shall be designed to resist flexing, vibration, and vandalism.

Interior observation shall be accomplished by a swivel-mounted flat rear-view mirror of 8 inches by 15 inches attached above and to the right of the operator's head. The locations of mirror

mountings must be approved by the SFMTA, and the Contractor shall demonstrate that the step well mirror does not encroach upon passenger doors during ingress/egress.

4.6 PUBLIC ADDRESS SYSTEM

The public address system shall be activated by an easily accessible floor-mounted momentary switch to permit the operator to make internal announcement and/or external announcement; switching from inside to outside speakers shall not require volume adjustment. The Contractor shall provide a Stealth Mic hands-free digital microphone system by Digital Recorders Inc., REI, or approved equal for the public address system. Reference Section 3.14 (Public Address System).

4.7 OPERATOR'S AREA LIGHTING

The operator's area shall have a light to provide general illumination, and it shall illuminate the half of the steering wheel nearest the operator to a level of 10 to 15 foot-candles. This light shall be controlled by a switch convenient to the operator.

A high-intensity bullet light mounted in the ceiling shall spotlight the money receptacle of the fare box when the front door is open and the master run switch is set to permit the Coach to drive.

4.8 OPERATOR BARRIER

An operator barrier in the operator's area shall be provided on all Coaches. The barrier shall be designed to have no glare, reflection, and rattle during use. The barrier shall be an Arow Global sliding barrier with an extended slider to provide added protection to the operator. Where visibility is required, clear Lexan type material or laminated safety glass can be used to comply with all FMVSS visibility and safety requirements. The barrier shall extend to within one inch of the floor, ceiling, and walls. The design of the operator barrier must be approved by the SFMTA during the design review and shall comply with all applicable regulations. The barrier color should be flat black or gray in color. The barrier shall meet the strength requirements described in Section 2.3.1 (Divider and Side Trim Panel). The latching mechanism shall be easily accessible to operators of all heights. The Contractor shall review the barrier on the latest procured Coaches in the SFMTA fleet prior to submitting a proposal for the SFMTA to review and approve.

4.9 TRASH RECEPTACLE

The Contractor shall provide and install a trash receptacle. The proposed design and location of the receptacle shall be submitted to the SFMTA for review and approval during the design review.

4.10 SUN VISOR

The Contractor shall provide an adjustable sun visor for use on the operator's side of the windshield and side window. The windshield visor shall be a black scissor type roller blind with 20 inches of travel. The side window visor shall be a combination of a black scissor type roller blind with 20 inches of travel and black padded visor which shall not obstruct the street side exterior mirror. Scissor type roller blinds shall not be mesh. The visors shall be shaped to minimize light leakage between the visor and windshield pillars. The visors shall store out of the way and shall not obstruct airflow from the climate control system or foul other equipment, such as the destination sign control. Deployment of the windshield visor shall not restrict vision of the rearview mirrors. Visor adjustments shall be made easily by hand with positive locking and releasing devices and shall not be subject to damage by over tightening.

Sun visor construction and materials shall be strong enough to resist breakage during adjustments. The visor, when deployed, shall be effective in the operator's field of view at angles more than 5 degrees above the horizontal. A spring-loaded clip not less than 3 inches wide shall be securely riveted to each side of the sun visor to retain the operator's run sheet. Covering on the visor shall be black vinyl like that of the operator's seat.

4.11 STORAGE LOCKER

The Contractor shall furnish and install one storage locker with latch on the curbside wheel well or in the operator area. The locker shall be at least four cubic feet. Location, design, and materials must be approved by the SFMTA.

4.12 OPERATOR’S PLATFORM

The operator’s platform shall be finished with no sharp edges and shall not interfere with or impede wheelchairs or other mobility aids. The SFMTA prefers that the Contractor provide operator’s platforms similar in construction to those on the SFMTA’s existing motor coaches.

The floor in the operator's area must be capable of being easily cleaned and shall be arranged to prevent debris accumulation. Floor covering shall be Altro Transflor TFFG2704F “Rocket” or approved equal.

5 CHASSIS

5.1 SUSPENSION AND AXLES

5.1.1 General Requirement

All axle suspensions shall be pneumatic type and shall have a load rating compatible with that of the axles. The Coach should be equipped with an anti-sway bar or other equipment approved by the SFMTA to limit Coach sway. The basic elements of the suspension system shall last the life of the Coach without major overhaul or replacement. Suspension beams, weldments and structural members shall be considered as parts of the basic body structure. Items such as bushings and air springs shall be easily and quickly replaceable by a mechanic in 30 minutes or less. Suspension pivots shall be replaceable. Bushings shall be permanently lubricated and interchangeable at all positions. Adjustment points shall be minimized and shall not be subject to a loss of adjustment in service. Necessary adjustments shall be easily accomplished with minimum disassembly or removal of components. Caster and toe-in adjustments shall be possible without removal of any component. The Contractor shall provide axle tool kits which contain specialty tools required for servicing or installing axle nuts, flanges, bearings, seals, service brake lines, etc.

5.1.2 Axles

All axles shall have a minimum load rating sufficient for the Coach loaded to GVWR and shall operate for 300,000 miles on the design operating profile without repairs. The axle gearing shall be easily accessible for lubrication and the axle make and model must be approved by the SFMTA.

The front axle suspension system shall be independent type M.A.N., Rockwell, Meritor, ZF, or approved equal.

The rear axle shall be heavy-duty full-floating type by M.A.N., ZF, or an approved equal. End tubes shall be removable and shall be threaded to allow for adjustment of wheel bearing nuts. The lubrication drain plug shall be magnetic type.

Reusable axle hub bolts are preferred.

Minimum axle load ratings are encouraged to be rated so that GVWR is maximized.

5.1.3 Wheel Bearings

Wheel bearings shall provide smooth, low friction rotation of the wheels under all operating conditions. The wheel bearings shall be easily accessible, maintainable, and replaceable. All bearings shall be sealed properly to prevent leakage of lubricant and shall not leak or weep lubricant when operating on the design operating profile for the duration of the initial manufacturer's warranty. The non-drive axle bearings shall be grease unitized bearings by Fuchs, or approved equal.

5.1.4 Air Bellows

The air suspension system shall consist of at least two, and preferably four, air bellows per axle. The system shall use leveling valves and bellows to maintain constant spring characteristics and Coach body height, regardless of Coach loading. Leveling valve exhaust ports shall be guarded to avoid plugging with road dirt.

Air bellows shall be removable, replaceable, and serviceable without removal of any wheels while the Coach is on standard in-ground hoists, above ground hoists or in a pit area. The make and model of the air bellows shall be approved by the SFMTA.

5.1.5 Travel

The suspension system shall permit a minimum wheel travel of 2.75 in. jounce (upward travel) of a wheel when the Coach hits a bump (higher than street surface), and 2.75 in. rebound (downward travel) when the Coach 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 Coach 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 the Coach cannot be impacted by ride height up to 1 in. from design normal ride height.

5.1.6 Damping

Vertical damping of the suspension system shall be accomplished by hydraulic shock absorbers mounted to the suspension arms or axles and attached with replaceable bolts and nuts to appropriate locations on the chassis. Damping shall be sufficient to control Coach motion to two cycles or less after hitting road perturbations. The damper shall incorporate a secondary hydraulic rebound stop.

Shock absorbers shall maintain their effectiveness for at least 50,000 miles and each shock absorber unit shall be individually replaceable by a mechanic in less than 15 minutes. Variations in passenger loading shall not adversely affect the handling characteristics of the Coach sufficient to classify it as dangerous, unsatisfactory, or uncontrollable.

5.1.7 Kneeling

The Coach must kneel evenly on both sides. The operator-actuated kneeling device shall lower the step at the front door to a height of no more than 10 inches, measured at the longitudinal centerline of the front door to the ground. Brake and throttle interlocks shall prevent movement when the Coach is kneeled. The kneeling control shall be disabled when the Coach is in motion. The kneeling controls shall not be operational while the wheelchair ramp is deployed or in operation. A three-position, spring-loaded, normally centered switch located in the operator's area shall control kneeling of the Coach. A downward force on the switch shall activate the

kneeling function. The Coach shall complete kneeling in a maximum of four seconds from the time the switch is activated. During the lowering and raising operations, the maximum acceleration shall not exceed 0.2g, and the jerk shall not exceed 0.3g per second, when measured on a front step tread.

An indicator, visible to the operator, shall be illuminated whenever the Coach is too low for safe street travel and the interlocks are engaged. An audible alarm and visual signal mounted near the door pillar shall operate when the Coach's kneeler is in motion. The audible alarm shall be a different frequency than other alarms and beeper. The sound and operation of this alarm must be approved by the SFMTA at the design review. A exterior 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.

The Coach shall remain kneeled when the control switch is released. An upward force on the switch shall be required to raise the Coach. The Coach shall rise to the correct operating height within seven seconds regardless of load up to GVWR.

5.1.8 Over-Raise Feature

Due to the topography of the SFMTA Coach routes, the Contractor shall provide an over-raise switch on the side-panel console of the operator platform. The over-raise feature shall be activated and shall sustain its raised height while the Coach is within a predetermined speed range. The over-raise feature shall be deactivated once the Coach speed exceeds the allowable speed limit. The SFMTA prefers that the over-raise feature have the capability to activate while the Coach is in motion during low-speed operations. The design and operation shall be determined and approved by the SFMTA at the design review.

The over-raise feature shall allow the Coaches to traverse all routes in the SFMTA service areas without scraping the pavement.

5.1.9 Lubrication

All elements of steering, suspension, and drive systems requiring scheduled lubrication shall be provided with grease fittings conforming to SAE Standard J534. These fittings shall be located for ease of inspection and shall be accessible with a standard grease gun with flexible hose ends, from a pit or with the Coach on a hoist. Each element that requires lubrication shall have its own grease fitting with relief path. The lubricant specified shall be standard for all elements on the Coach to the greatest extent possible. The manufacturer shall supply the SFMTA with a maintenance schedule and protocol.

5.2 STEERING

Electro-hydraulic power steering shall be provided to reduce steering effort. The steering column shall have telescoping and tilt column adjustments. The steering gear shall be an integral type with the number and length of flexible hydraulic fluid lines minimized. Fatigue life of all steering

components must exceed 1,000,000 miles. No element of the steering system shall sustain a Class 1 failure when one of the tires hits a curb or strikes a severe road hazard at 40 MPH or slower.

Alternative power steering systems submitted as approved equals must have similar performance, durability, housing size, height, and telescoping range. System shall be wired so that the controlling ECU correctly recognizes straight wheel position even after the Coach has been shut off.

5.2.1 Strength

Fatigue life of all mechanical steering components shall exceed the service life of the Coach. No element of the mechanical steering system shall fail before suspension system components when one of the tires strikes a severe road hazard. The mechanical steering system shall be considered as part of the basic body structure.

The manufacturer shall provide the SFMTA with certificates that validate the strength and security of the suspension and steering system, along with any test documentation for tests that have been conducted.

5.2.2 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 Coach in operation, the steering effort shall not exceed 55 pounds at the steering wheel rim, and perceived free play in the steering system shall not materially increase because of power assist failure. Gearing shall require no more than seven turns of the steering wheel lock-to-lock.

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

5.3 BRAKES

5.3.1 Description

The Coach shall have air actuated disc brakes. The disc brake system and replacement parts shall be commercially available in North America.

5.3.2 Actuation

Service brakes shall be compressed air operated and controlled with a single actuator at each wheel. Force to activate the brake pedal shall be as specified in Section 4.1.6 (Accelerator and Brake Pedal).

Disc brakes shall have either axial or radial air actuation with a single floating caliper operation.

5.3.3 Friction Material

The entire service brake system, including friction materials, shall be designed to have an overhaul or replacement life of 30,000 miles with brake retardation through regenerative braking. Disc pad friction material shall be non-asbestos and be bonded directly to the pad. Brake pads shall meet all requirements for sale in California.

5.3.4 Rotors

Brake rotors shall be sized to the Coach weight and wheel diameter and meet all FMVSS requirements. The brake rotors shall be able to be resurfaced in the field and have the minimum thickness size stamped in the casting.

Wheel bearing seals shall run on replaceable wear surfaces. Wheel bearing and hub seals shall not leak or weep lubricant for 50,000 miles when running on operating profile.

5.3.5 Brake Adjustment

Disc brakes shall not require in-service adjustment and have mechanical or electronic brake wear indicators for lining thickness on each brake assembly.

5.3.6 Parking Brake

The parking brake shall be spring-applied and air-released, controlled by manual valve (Bendix or approved equal), and shall be mounted on the left side of the operator's seat. The design and location must be approved by the SFMTA.

The parking brake system shall hold the Coach loaded to GVWR in both forward and rearward directions on a 23 percent grade. This brake shall comply with FMVSS-121 requirements. A separate "Parking Brake Applied" (see Section 4.1.3: Indicators) indicator with audible alarm shall be provided on the panel and it shall:

- Activate an interior audible warning alarm and blinking warning lights if the parking brake is not applied and the Master Run Switch is set to the "Off" position (see Section 4.2: OPERATOR SEAT). A visual message on the dash may replace the alarm if approved by the SFMTA.
- Illuminate the "Parking Brake Applied" indicator upon activation of the control.

5.3.7 Anti-Lock Braking System with Traction Control

The Coach shall be equipped with an all-wheel anti-lock braking system (ABS) with traction control by Rockwell, Wabco, Bendix or approved equal. The Contractor shall provide complete performance data and system design of the brake system with ABS. The design must be approved by the SFMTA. ABS brake diagnostic cartridges, if required, shall be supplied by the Contractor. All essential information and equipment needed to test, troubleshoot, and repair the brake system controller shall be provided to the SFMTA by the Contractor. This information and equipment shall encompass the system on the Coach and the repair of the individual sub-assemblies down to the components on the printed circuit boards of the sub-assemblies.

5.3.8 Hill Holder

A hill holder system shall be incorporated into the braking system. If configured for manual operation, control of the hill holder shall be via a momentary toggle switch located to the left of the operator. The hill holder may also function automatically via application of the brake pedal while the Coach is stopped. Activation of the hill holder system shall engage the same rear service brake system as the interlock system described in Section 4.1.4.2 (Interlock). The hill holder shall hold the Coach loaded to GVWR in both forward and rearward directions on a 23 percent grade. Regardless of whether the hill holder is configured for automatic or manual operation, accelerator operation shall not be affected by activation of the hill holder. Activation of the hill holder shall light the brake lamps and prevent roll back.

5.3.9 Anti-Rollback System

The Contractor shall provide a system for preventing the Coach from rolling backwards on hills if the operator does not manually apply the brakes. The function and design of this system shall be approved by the SFMTA during the design review period.

5.3.10 Brake Jerk

Jerk, the rate of change of acceleration measured at the centerline at the floor level of the Coach, shall be minimized throughout acceleration and regenerative braking or other methodologies of auxiliary braking and shall be no greater than 0.3 g/sec for the duration of a quarter-second or more.

5.4 REGENERATIVE BRAKING

In addition to traditional mechanical friction service braking, the Coach shall be equipped with regenerative braking designed to improve energy efficiency and extend brake lining service life. The application of regenerative braking shall be smooth and shall not cause jerking or sudden changes in acceleration of the Coach. Actuation of ABS and/or automatic traction control (ATC) may override the operation of the regenerative brake. Energy regeneration shall not cause the driver to lose control of the Coach regardless of the surface coefficient (μ) that the Coach is being operated on.

Brake lights shall illuminate when regenerative braking is activated.

The SFMTA prefers that regenerative braking shall become engaged (with a resulting deceleration of no greater than 0.03 g) when the accelerator pedal is completely released. When the brake pedal is depressed to engage the service brakes, the resulting maximum deceleration from regenerative braking shall be 0.13 g. The resulting deceleration specified shall include the effects of regenerative braking, wind resistance and rolling resistance.

The Contractor shall ensure that the regenerative braking functionality is not impacted by the state of charge of the ESS.

Braking effort derived from energy regeneration or dynamic braking shall be smoothly blended with the standard air braking system such that the braking response of the Coach is like that of a conventional diesel coach and requires no additional driver skill or training to operate beyond that of a conventional diesel coach.

Regenerative braking force shall remain consistent and predictable to the operator. The system shall be designed in a manner to effectively dissipate excess energy while providing consistent auxiliary braking.

5.5 AIR SYSTEM

The Coach air system shall operate all accessories and the braking system with reserve capacity. New Coaches shall not leak down more than five psi as indicated on the instrument panel mounted air gauges, within 15 minutes from the point of governor cut-off. The air system shall be equipped with check valves and a pressure protection relief valve to assure partial operation in case of line failures. Load and demand calculations shall be submitted to the SFMTA for approval.

Provision shall be made to apply shop air to the Coach air systems through Amflo CP2 female charging ports or approved equal. ¼" Amflo CP2 or approved equal plugs shall be conveniently located in the motor compartment and behind the front bumper. The Contractor may submit alternative locations for air plugs for approval by the SFMTA. Metal identification plates shall be placed near the plugs to identify the connections. Final locations of the plugs must be approved by the SFMTA during prototype review.

5.5.1 Air Compressor

The air compressor shall be a direct coupled scroll compressor from Powerex, or an approved equal. The air compressor shall have the capacity to charge the air system from 40 psi to the governor cutoff pressure in less than three minutes. The compressor output rating shall be sized accordingly for normal transit operation including but not limited to braking, door operation, air suspension and all other components requiring pneumatic power. The output rating shall be explained and presented to the SFMTA for approval during design review.

5.5.2 Air Lines and Fittings

Air lines, except necessary flexible lines, shall conform to the installation and material requirements of SAE Standard J1149 for copper tubing with standard, brass, flared or ball-sleeve fittings, or SAE Standard J844 for nylon tubing if not subjected 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. Air lines shall be cleaned and blown out before installation and shall be installed to minimize air leaks. All air lines shall be sloped toward a reservoir and routed to prevent water traps.

Nylon tubing shall be installed in accordance with the standard color coding in Table 5.5.2. If the Contractor has different color coding other than what is listed in Table 5.5.2, then the Contractor shall submit the alternates to the SFMTA for approval.

TABLE 5.5.2

GREEN	Indicates primary brakes and supply
RED	Indicates secondary brakes
BROWN	Indicates parking brake
BLACK	Indicates accessories
BLUE	Indicates suspension
YELLOW	Indicates compressor/governor

Nylon lines may be grouped and shall be continuously supported to prevent movement, flexing, tension strain, or vibration. Copper lines shall be supported by looms at intervals of no greater than five feet to prevent movement, flexing, tension strain, and vibration. Copper lines shall be prevented from touching one another or any component in the Coach. To the extent practicable and before installation, the copper lines shall be pre-formed 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, to avoid fatigue of the tubing.

Flexible hoses shall be as short as practicable and individually supported. They shall not touch one another or any part of the Coach except for the supporting grommets. Flexible lines shall be supported at 24” intervals or less. Grommets for bulkhead fittings shall protect the air lines at all points where they pass through under structure components.

The compressor discharge line between the air compressor and the bulkhead shall be flexible convoluted copper or flexible Teflon hose with a braided stainless steel jacket. The line between the bulkhead and the air dryer shall be rigid copper. These lines shall have a minimum inside diameter of one (1) inch. End fittings shall be standard SAE or JIC brass or steel flanged, reusable, swivel-type fittings.

All hoses and lines shall contain adequate separation to ensure no contact between lines.

5.5.3 Air Reservoirs

Air reservoir tanks shall supply air for the Coach's air suspension system, door operating mechanism and brake system. These air tanks may be mounted in the ceiling behind the interior LED lights or underneath the Coach, easily accessible for inspection and maintenance. The number of tanks required with a 25% reserve, sizes, mounting and final locations must be approved by the SFMTA.

All air reservoirs shall meet the requirements of FMVSS Standard 121 and SAE Standard J10. The air tanks shall include drain valves that are easily accessible. Major structural members shall be provided to protect these 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.

5.5.4 Air Dryer

A QBA series air dryer from Wabtec, Bendix or approved equal, shall meet the following salient characteristics:

A. Dryer shall be sized for the air system volume and compressor capacity.
B. Continuous flow capacity based on continuous inlet temperatures of 200°F.
C. Twin tower desiccant style dryer capable of switching towers for regeneration.
D. Dryer shall have an ambient operating temperature range from -40°F to 150°F
E. Dryer shall have a filtration package that conditions the air before the towers. This includes a pre-filter for bulk carbon, oil and water removal and a coalescing filter with a 99.9% efficiency rating for the removal of water and oil aerosols down to .03 micron and dirt and carbon down to .3 micron.
F. An automatic discharge for accumulated contaminants.

5.6 HYDRAULIC SYSTEM

All hydraulic systems shall demonstrate a mean distance between repairs greater than 50,000 miles. 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. A priority system shall prevent the loss of power steering during operation of the Coach if other devices are powered by the same hydraulic system.

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

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

The hydraulic system shall be pressurized by means of an electric motor located near the front of the Coach or at another approved location. If required, a cooling system may be employed to keep the hydraulic fluid at a safe working temperature. The SFMTA expects the hydraulic pump to be automatically switched on and off so that it is only operated when the hydraulic system requires charging. Interior passenger compartment noise shall not vary more than 5 dB between the hydraulic pump being on or off. If the noise contains an audible discrete frequency that can easily be heard in the passenger compartment the design will be deemed unacceptable. The design is subject to the SFMTA approval and must be submitted during the design review.

Filtering shall be provided as recommended by the manufacturers of the hydraulically powered units. Spin-on filters are preferred. Filters shall be provided to protect the hydraulic systems down to 10-micron from contamination. Indicators on the reservoirs shall allow visual detection of low hydraulic fluid level. Permanent diagnostic quick-coupler ports, or approved equal, shall be installed at all locations necessary to provide complete troubleshooting of all hydraulic systems. The filtering system must be approved by the SFMTA.

5.6.1 Hydraulic Lines

Flexible lines shall be minimized in quantity and length. Flexible hydraulic lines shall be Aeroquip, or approved equal. Equator 1 (EQ1), Equator 2 (EQ2), 2807 PTFE, GH100, or approved equal shall be used to accommodate the different ratings as required. Lines of the same size and with the same fittings as those on other piping systems of the Coach, but not interchangeable, shall be tagged or marked for use on the hydraulic systems only. It shall not be possible to connect the input lines to the output lines.

Hydraulic lines shall be individually and rigidly supported to prevent chafing damage, fatigue failures, and tension strain on the lines and fittings. Underbody lines shall be 304 stainless steel, rigidly mounted and routed separate from all other lines. Rigid tubing lines shall be continuous from the forward most bulkhead or cross member to rearmost bulkhead or cross member. Welded unions shall be permitted at maximum intervals of 20 feet for lines longer than 20 feet.

5.7 FLUID LINES

Fuel and oil lines within the engine compartment shall be rigidly and independently supported and shall be composed of steel tubing, where practicable. Flexible fluid lines shall be kept at a minimum and shall be as short as practicable. Flexible lines shall be Teflon hoses with braided stainless-steel jackets, except in applications where premium hoses are required, and shall have standard SAE or JIC brass fittings. Hoses shall be individually supported and shall not touch one another or any part of the Coach. High-pressure hydraulic lines shall be Aeroquip, or approved equal.

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.

All hoses, pipes, lines, and fittings shall be specified and installed per the manufacturer's recommendations. Cooling system piping shall be stainless steel or brass. Where practicable, rubber hoses shall be eliminated.

Hoses shall be silicone or EPDM rubber type or approved equal that are impervious to all Coach fluids. All hoses shall be as short as practicable. All hoses shall be secured with stainless steel or coated for corrosion resistance clamps that provide a complete 360-degree seal. The clamps shall always maintain a constant tension, expanding and contracting with the hose in response to temperature changes and aging of the hose material.

5.8 WHEELS AND TIRES

5.8.1 Wheels

Wheels and rims shall be hub piloted and shall be aluminum one piece, Alcoa Dura-Brite or approved equal. All wheels shall be machine finished and stamped with the following markings a) unique serial number, b) "Property of SFMTA" on a non-stressed area. All wheels shall be interchangeable 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 spin balanced as an assembly utilizing weights specifically designed for aluminum wheels with disk-lock non-loosening fasteners. Front wheels and tires shall be provided in accordance with the SFMTA's requirements listed in Section 5.8.2.

The Contractor shall provide 30 spare wheels upon delivery of Coach.

5.8.2 Tires

Transit-type tires, leased by the SFMTA, will be furnished to the Contractor by the SFMTA. Arrangements will be made for tire delivery directly to the Contractor's plant. The Contractor shall mount and balance these tires and shall pay any transportation, duty, or other charges. The Contractor shall provide "plain" valve stem caps with each mounted tire. No valve stem tool will be permitted on the valve stem cap. Tires may come equipped with an external air pressure monitoring system.

5.9 FIRE DETECTION / SUPPRESSION

The Contractor shall furnish and install a fully automatic fire detection and complete dry chemical fire suppression system by Amerex,or approved equal.

The automatic detection and activation system shall provide 24-hour fire protection for the propulsion compartment and areas of the Coach to be wetted by leaking flammable fluids,

including the house battery compartment. Detection of a fire may be by means of infrared detection, temperature, or rate of temperature change. Detection system must be capable of operating without false detection from normally occurring drive temperatures, any source of light, or steam cleaning. It shall be impervious to oils, fuels, and chemicals normally found in a garage environment, and to UV light. It must provide detection capability to all risk zones, including at all ESS battery storage areas, exhaust stack, and air conditioner area.

The system shall also provide both a manual and automatic means to actuate the fire suppression system. The fire detection layout and the location of the manual actuation switch must be approved by the SFMTA.

Contractor shall supply all equipment required to test the fire suppression system, if applicable.

The system shall be able to data log and report to a depot via the CAN/J-1939 network. The system shall also have the following features:

- Compatible with all previous version Safety Net Systems
- Provides Safety Net diagnostic messages to vehicle CAN/J-1939 network
- May be used for system maintenance and safety system diagnostic review
- Two separate part numbers for 250k and 500k baud rate vehicle CAN networks
- Coordinates Safety Net internal clock with vehicle CAN controller

Fire suppression material shall have a chemical composition that does not initiate or accelerate metal corrosion.

Two or more linear detection wires shall be installed in the Coach. The Contractor shall install a sensor with an audible alarm to detect approaching combustion temperatures in the catalytic convertor area. The system shall monitor the heat levels and activate an overheat warning light in the driver's compartment; when the temperature returns to normal, the overheated alarm shall be deactivated. The system will also provide appropriate status and warning lights on the driver's dashboard and provide an audible fire detection warning. This alarm shall sound in both fire and fault conditions. The system shall be immune to false alarms from sunlight, flashlights, lightning (excluding a direct hit), and welding arc. The monitoring system shall have a method to determine that each individual component is correctly installed and functioning. The system control module shall be fully programmable via a personal computer. Programming features shall include, at minimum, the time delay cycles from fire detection to Coach shutdown and from Coach shutdown to fire suppression system actuation. If a fire is detected, the detection/suppression system shall automatically:

- Activate an audible warning alarm and warning lights.
- Shut off and close off the ventilation system.
- Shut off the engine fan.
- Shut off the flow of hydraulic fluids.
- Reduce propulsion and disconnect propulsion battery power to slow the Coach.
- Flood the propulsion system with sufficient dry chemical agent to extinguish the fire when either the Coach speed falls below 15 mph or after certain time delay, adjustable between zero and 15 seconds.
- Commence Event Recording & Data Logging

5.10 RESERVED

6 PROPULSION SYSTEM

6.1 PROPULSION SYSTEM DESCRIPTION

The Coach shall be powered by a hybrid-electric diesel propulsion system. Function and operation of the Coach shall be transparent to the Coach operator and passengers. The Contractor shall assure that the Coach structure is sufficiently robust to handle the loads from the propulsion system and be operated on a San Francisco duty-cycle for a period of 12 years without a structural failure. At a minimum, APU shall comply with CCR, Title 13, section 1956.1 for both emissions and useful life requirements. The engine shall comply with 40 CFR section 86.094-25 (maintenance) and other applicable sections. The engine shall meet all requirements of the Technical Specifications. Durability of the propulsion system and its components shall not be compromised, and the performance requirements shall be met. The propulsion and energy storage systems shall be presented to the SFMTA for approval during design review.

The drivetrain and all other related components shall communicate through the SAE J1939 protocol. Data communication components shall be compatible with the ViriCiti DataHub onboard vehicle telematics device and with version 2.0 or later of the Open Charge Point Protocol (OCPP) standard.

The energy storage and propulsion systems shall have on-board diagnostic capabilities and be able to monitor functions, store out-of-parameter conditions in memory, and communicate faults and vital conditions to service personnel. A diagnostic reader device connector port, suitably protected against dirt and moisture, shall be provided in the operator's area. The on-board diagnostic system shall trigger a visual alarm to the operator when the electronic control unit detects a malfunction. The energy storage system shall contain built-in protection software to guard against severe damage.

All motor controllers, power inverters, DC-DC converters, and energy storage containers shall be removable as units and shall be interchangeable between similar Coaches. Should any of these units require software or firmware reconfiguration the contractor will provide the necessary software and programming tools.

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 Coach, and a detailed wiring diagram and/or electrical schematic for the high-voltage system. The Contractor is required to provide a list of applicable industry standards that the proposed propulsion system meets.

6.2 PROPULSION SYSTEM SERVICE

The drive system controller, power inverters, DC-DC converters, and ESS components shall be removable and interchangeable between similar Coaches. Should any of these units require software or firmware reconfiguration, the Contractor will provide the necessary software and programming tools.

The propulsion system shall be arranged so that accessibility for all routine maintenance is assured. No special tools, other than dollies and hoists, shall be required to remove the propulsion system or any subsystems. Any other component requiring service or replacement shall be easily removable. The Contractor shall provide all special tools and diagnostic equipment required for maintaining the propulsion system.

6.2.1 APU Generator and Traction Motor

The engine generator and traction motor may be configured in a variety of methods dependent upon type of drive, series or parallel. The definition of motor in the context of this specification assumes the devices can provide or consume electrical energy as well as either can provide or retard mechanical motion. An independent fresh air plenum is required for providing air to the generator.

6.2.2 Energy Storage and Controller

The energy storage system shall include a voltage equalization system designed to provide automatic real-time equalization of voltage between individual battery cells within each module. This equalization function shall be accomplished automatically and shall not require manual intervention by the Coach operator or maintenance personnel. Design and performance must be approved by the SFMTA.

Energy storage shall be of a commercial design capable of operating in the San Francisco transit environment. Charging of the energy storage device shall be accomplished by on-board engine-generator, external charging stations and regenerative braking.

6.2.3 Propulsion Controller

The hybrid system controller shall monitor system inputs and execute outputs as appropriate to control the operation of all hybrid devices. This controller may include or directly control power electronics necessary for operation of the engine, generator, traction motor, energy storage and other related hybrid devices. The controller shall be capable of storing multiple (minimum 3) configuration/calibration files in an effort to facilitate optimizing drive parameters to a variety of route profiles. The configuration default file shall be based upon operator route selection via destination sign code and further optimization “on the fly” by toggling between parameters in an effort to optimize via changing route duty cycle profiles.

6.2.4 Operating Range

The operating range of the Coach in revenue service or equivalent operating cycle shall be in excess of 400 miles on a full tank of fuel (example: operating on the 38 GEARY).

6.3 HYBRID SYSTEM

Coaches shall have a hybrid system, designed to last the life of the Coach, which, coordinated with the engine and the rear axle drive ratio, enables the Coach to achieve the required top speed, acceleration and gradeability requirements while still maintaining passenger comfort and providing a smooth ride. The hybrid system input torque rating shall exceed the engine output torque. The hybrid system shall be rated to operate at a minimum the GVWR of the Coach.

The Contractor shall provide design and performance data for the hybrid system to the SFMTA.

Thermal management will be provided to ensure optimal life and performance of the hybrid system over the environmental operating range.

The Coach body shall be designed and constructed to ensure passengers and the operator will not be exposed to electrical current either in normal operation or in the event of a Coach accident. Analysis to validate the design and test data shall be provided to the SFMTA. The hybrid system shall be designed and constructed to prevent gas or fumes from the energy storage system from entering the interior of the Coach.

6.4 ENGINE

The Coach shall be powered by an engine to meet or exceed the performance requirements of this technical specification for the strenuous service requirements of public transportation in San Francisco. The engine shall be optimized for use in the hybrid system arrangement as well as in the areas of reliability, emissions, audible noise, and vibration.

The engine shall have diagnostic capability via a laptop computer. Remote communication is encouraged (Reference Section 9.3, VEHICLE SUB-SYSTEMS INTEGRATION AND DIAGNOSTIC TESTING REQUIREMENTS).

Piping or hoses containing fuel, oil, or other flammable liquid shall not be routed through wheel housings or bundled with electric wires.

The Contractor shall provide all special tools required for maintaining and rebuilding the engine.

An engine oil pressure gauge and coolant temperature gauge shall be provided in the engine compartment for ease of maintenance.

The ECM shall be capable of being programmed for shut down in the event of extended idle periods. The SFMTA will supply the Contractor with the time in minutes at the design review, which shall be programmed in the ECM to shut the engine off after extended idle.

6.4.1 Emissions

The Coach shall meet or exceed all appropriate emission standards for use in transit service in the State of California, according to date of delivery, including any special circumstances requiring alternative regulatory compliance and/or testing. Complete Coach or systems certification documentation shall be provided to the SFMTA, based on the CCR, Title 13, section 1956.1. This documentation will specify the role and regulatory responsibilities of the Coach manufacturer and subsystem manufacturer(s). Any requirements must be approved by the SFMTA. Responsibility for all emissions and useful life requirements shall be provided by the Coach manufacturer or subsystem manufacturer(s) unless specifically detailed in the compliance plan and approved by the SFMTA.

The Contractor shall provide a CARB approved exhaust emission control system. The exhaust outlet shall be roof mounted and not increase the overall height of the coach. Exhaust gases and waste heat shall not be discharged on the curbside and shall be directed vertically away from the Coach. Termination of the exhaust pipe shall comply with FMVSS 108. Regeneration shall be approved by the SFMTA.

6.4.2 Engine Firewall

A fireproof bulkhead (firewall) shall separate the passenger and propulsion compartments. The bulkhead shall preclude or retard propagation of an engine compartment fire into the passenger compartment. Any passageways for the HVAC system air shall be automatically separated from the engine compartment by fireproof material when a fire is detected. All piping, connectors, fittings, engine access panels, fasteners shall be fabricated of fireproof material. These panels, their fasteners, and the firewall shall be constructed and reinforced to minimize warping that would compromise the integrity of the firewall during a fire.

6.4.3 Mounting

All propulsion system mountings shall be mechanically isolated to minimize transfer of vibration to the body structure and mounted in a failsafe manner that eliminates the opportunity for a catastrophic failure in the event of a structural failure. No special tools, other than dollies and hoists, shall be required to remove the APU sub-systems. Two mechanics shall be able to remove, replace, and prepare the engine, traction motor and traction generator assembly for service in less than 30 total combined hours. Such an installation shall incorporate quick-disconnects for wiring, piping, and all mounting hardware for ease of removal.

6.4.4 Engine Protection

All components specified within this section shall be housed within a weatherproof box. The engine shall be protected by an electronic control system recommended by the engine and hybrid system manufacturers.

The ECM shall be equipped with a self-diagnostic system as well as engine system protection and engine performance diagnostic as a minimum. The ECM shall retain/record an engine failure and which can be uploaded to a laptop or a DR for evaluation/analysis. Two DR plug-ins shall be provided. One shall be at the operator's dashboard and the second shall be at the rear engine run control box. Locations shall be approved by the SFMTA. Both plugs shall be permanently affixed to the coach for ease of plug-in. The option to include remote diagnostic communication is encouraged. All coaches shall complete all ECM programming prior to delivery.

6.4.5 Propulsion System Interlocks

The propulsion system interlocks shall disable propulsion when:

- Any door of the Coach is activated by the operator door control (4.1.4.2 Interlock).
- The Coach kneeling system is activated.
- The wheelchair ramp is deployed or otherwise not stowed and locked completely.
- As otherwise required by Federal or California State Regulations.

The Coach shall not be capable of operating while parked. The propulsion system interlock arrangement and control must be approved by the SFMTA.

6.4.6 Engine Override Switch

If the propulsion system cannot operate without the engine running, a stop engine override switch shall be provided which enables the operator to move the Coach in 30 seconds before the engine shutdown will occur. If the operator needs additional time, the override system shall be capable of operating at least a second time after this. The override system shall reset within 30 minutes. This override switch (with red cover) shall incorporate a momentary switch that shall automatically return to the off position when released, or approved equal.

The SFMTA prefers that the Coach be capable of returning (without passengers) to an SFMTA maintenance division without the use of the engine. The ability for the Coach to operate in engine-off mode shall be appropriately optimized and subject to the SFMTA approval.

6.4.7 Starter

The starter switch shall be an electric push button and shall only be activated when the Master Run Switch is in the DAY RUN or NIGHT RUN position. If a conventional engine starter is used, the SFMTA requires an electric starter system; the starter shall have a pre-engaged drive, which

will engage into the ring gear before the motor begins to turn. The electric start system shall be warranted for thre years or 150,000 miles, whichever occurs first. All mounting and cables locations shall be approved by the SFMTA.

6.4.8 Cooling System

The cooling system shall be lead free and shall operate using water-based fluids only. The cooling system shall be designed to maintain the radiator top tank inlet temperature below 205°F under the following combined-circumstances: a) the Coach loaded to GVWR and ambient temperature up to 115°F, b) Maximum heat rejected from the engine, traction motor and traction generator, and all other liquid cooled subsystems, c) The radiator is 15% clogged. The pressure type cooling system shall not permit boiling or coolant loss during the operations described above. The Contractor shall submit an analysis verifying cooling system capabilities to the SFMTA. Design and locations shall be approved by the SFMTA. The cooling system shall include but not be limited to the following requirements:

- Engine thermostats shall be easily accessible for replacement.
- Low coolant level sensor shall be Veritech Stainless Steel.
- Equipped with a properly sized water filter with a spin-on, disposable, borate element filter.
- All shutoff valves shall be ¼ turn.
- Filter replacement without coolant loss.
- Valves shall permit complete shutoff of lines for both the heating and defroster units.
- All low points in the water-based cooling system shall be equipped with drain cocks.
- All high points in the cooling system shall be vented to the surge tank.
- If an air to air after cooler is required, SFMTA specifies a side by side with the radiator design.
- Coolant shall be propylene glycol.

6.4.8.1 Radiator

The radiator shall be an EMP cooling system with full diagnostic capabilities or approved equal. Drain cock location shall be such so that it will not sustain damage by road hazards while being easily accessible by a mechanic.

The radiator top and bottom brass (stress relieved) or stainless-steel tanks shall be bolted using one-piece gaskets and finish with high heat prime & enamel paint. The radiator shall be of durable corrosion-resistant construction. An identification tag with the manufacturer’s name, part number, and date of manufacture must be soldered to the face of the radiator core.

The radiator piping shall be seamless stainless steel or brass tubing, and hoses, if absolutely necessary, shall be silicone. A tight fit between fins and tubes are required, zero clearance between the outer wall of the tube and elongated fin holes.

6.4.8.2 Surge Tank

A stainless-steel surge tank with a sight glass shall be mounted above the radiator. The surge tank shall include a manual pressure relief valve, an automatic cooling system pressure control system, coolant filler, a low coolant sensor, and provisions for adequate de-aeration of the cooling system. A spring-loaded, push-button type valve to safely release pressure or vacuum in the cooling system shall be provided. The sight glass, coolant fill location, and the valve shall be accessible and clearly visible from the exterior of the Coach through a separate access door without opening the main engine compartment door. The bottom of the surge tank shall be above the rest of the cooling system. The surge tank shall be certified by the engine manufacture.

6.4.8.3 Cooling Fan

A thermostatically controlled electric cooling fan shall be installed. The cooling fan and control system are subject to the SFMTA review and approval.

6.4.8.4 Cooling System and Charge Air Hoses

Hoses shall be premium silicone-rubber type and impervious to all Coach fluids. Hoses shall be secured with heavy- duty Oetiker clamps, Breeze, or approved equal, with one (1) or two (2) clamps per connection.

6.4.9 Engine Piping

Stainless steel piping shall be provided throughout the cooling and exhaust system. Aluminized steel piping shall be provided throughout the air intake charger system. All piping shall have adequate separation so as to not have chaffing or rubbing.

6.4.10 Service

The muffler, exhaust system, air cleaner, air compressor, starter (if used), alternator, radiator, cooling system surge tank, all accessories, and any other component requiring service or replacement shall be identified at the design review. Each Coach shall be designed to facilitate the disassembly, re-assembly, servicing or maintenance by use of tools and items, which are normally available as commercial standard items. Any special tools must have the approval of the SFMTA.

6.4.10.1 Fillers

Engine oil and coolant filler caps shall be hinged to the filler neck and closed with spring pressure or positive locks. All filler locations shall be approved by the SFMTA and shall be properly labeled. All fillers shall be accessible with standard funnels, pour spouts, and automatic dispensing equipment. All lubricant sumps shall be fitted with Femco dripless drain plug or approved equal.

6.4.10.2 Filters

The engine, traction motor and traction generator shall be equipped with sufficient heavy-duty fuel and oil filters for efficient operation and protection between recommend filter changes. The filters shall be of the spin-on, disposable type. All filters shall be easily accessible, and the filter bases shall be plumbed to assure correct reinstallation. The secondary fuel filter housing shall be fitted with a pipe plug to check the fuel pressure. The plug shall have an external hex head of standard size.

The engine air intake shall be equipped with a dry type air filter. The filter and housing shall be sized to meet the engine manufacturers recommendations for air volume in CFM. The housing shall have a one-way vented port to allow for the drain of moisture. The housing shall be isolator mounted and utilize a minimal number of bends and angles either on the inlet or outlet hose and piping. A manually re-settable filter restriction gauge shall be mounted per the engine manufacturers recommendations in the delivery pipe. The pipe shall have a threaded boss welded in to accommodate the replacement of the threaded indicator.

The engine coolant system will have a coolant filter meeting the requirements of the engine manufacturer.

6.4.11 Accessories

Whenever appropriate, all engine-driven accessories shall be gear-driven, without adapters, directly from the engine and shall be unit-mounted for quick removal and repair. Accessory drive systems shall operate without failure or unscheduled adjustment for 50,000 miles. These accessories shall be driven at speeds sufficient to assure adequate system performance during extended periods of idle and low route speeds typical of the SFMTA operation. Belt guards shall be provided for all belts.

6.5 TRACTION MOTOR

The hybrid system traction motor shall meet or exceed the performance requirements of this specification for the strenuous service requirements of public transportation in San Francisco. The traction motor should be optimized for use in the hybrid system as well as in the areas of reliability, audible noise, and vibration.

A. The traction motor shall have diagnostic capability via a laptop computer. Remote communication is encouraged. Reference Section 9.3 (Vehicle Subsystems Integration and Diagnostic Testing Requirements.)
B. Contractor shall provide all special tools required for maintaining and rebuilding the traction motor, if applicable.
C. “Check motor” and “stop motor” lights and an audible alarm shall be provided at the operator’s dashboard area.

6.5.1 Traction Motor Protection

All components specified within this section shall be housed within a weatherproof enclosure. The traction motor shall be protected by an electronic control system recommended by the motor manufacturer.

The motor controller shall be equipped with self-diagnostic system as well as system protection and performance diagnostic as a minimum. The controller shall retain records of motor failure which can be uploaded to a PC, laptop, or a diagnostic reader for evaluation/analysis. Two ports shall be provided for the diagnostic reader; one shall be at the operator's dashboard and the second shall be at the motor compartment. The locations of the diagnostic reader ports must be approved by the SFMTA**.**

6.6 ENERGY STORAGE SYSTEM (ESS)

The Coach hybrid system shall make use of an ESS composed of battery cells using lithium battery or an approved alternative battery chemistry, along with associated power electronics interface and controls, diagnostic systems, and environmental controls. The ESS shall comply with UN/DOT 38.3 requirements for lithium batteries or with similar standards for non-lithium batteries, as appropriate.

The energy storage devices used, and their arrangement shall be selected and sized to meet coach performance specifications and design goals, including: vehicle reliability, reduced exhaust emissions, improved vehicle fuel economy, long cycle life, low life-cycle cost, safety, maintainability, durability, and simple, robust diagnostics. The design and projected unit life of the ESS shall be optimized in order to reduce life cycle costs to a minimum while maintaining full system reliability throughout.

The ESS shall be designed to provide a load-leveling function for the engine/generator in the hybrid propulsion system. It shall also be designed so that the required maintenance tasks can be accomplished with minimal labor, and without requiring a mechanic to open the energy storage module enclosures or handle individual battery modules or cells.

The battery cells within the ESS shall be packaged into modules and mounted into enclosures which allows for ease of servicing. These enclosures shall be designed to minimize shock hazard to maintenance personnel and to prevent any leaked substance from escaping. Access to individual devices within each module shall be through two covers or panels. Hazard warnings shall be visible on the inner cover or panel and hazard warnings shall remain visible with both covers open. Individual devices within a module, or the entire module, shall be replaceable within 1 hour. The Contractor and the SFMTA shall perform a hazard assessment and develop a procedure to replace individual devices within a module and entire modules.

The propulsion control system shall include a management system to monitor and control the operating conditions within each energy storage system module, including voltage, current, and

temperature. This system shall include an over-current and an over-temperature protection feature that disconnects flow of current to and from the energy storage modules in the event of an over-temperature or over-current condition. The provided ESS and drive unit diagnostics software shall provide real time data for all sensors in the ESS (voltage, current, temperature, etc.)

6.7 RESERVED

6.8 RESERVED

6.9 DRIVE SHAFT

Any drive shaft and universal joints shall be a heavy-duty type. 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. Universal joints and drive shaft slip joints shall have separate grease fitting accessible by a standard grease gun. The drive shaft assembly, mounting and components are required to be approved by the SFMTA.

6.10 GEAR RATIO

The gear ratio shall provide the Coach with the ability to maximize acceleration and climbing while still meeting the performance requirements specified in Section 1.3, (Propulsion System Performance). The final drive gear ratio requires the SFMTA review and approval.

6.11 LUBRICATION

The engine, traction motor, and generator shall have an oil sampling device compatible with the Probalyzer system or approved equal. The location of the sampling plug requires the SFMTA review and approval.

7 ELECTRICAL

The Coach shall be equipped with a Programmable Logic Control (PLC) system that is computer-based and completely modular. All electrical components or equipment shall comply with all the following subsections.

7.1 POWER REQUIREMENT

The electrical power system shall supply a nominal 12 and 24 volts of direct current (DC). Consumable items such as, but not limited to, light bulbs and headlamps shall be supplied at a nominal 12 volts DC. An isolated and dedicated control circuit and line feed circuit with a continuous load rating of at least 150% of the engine and propulsion system control system current demand shall be provided. Precautions shall be taken to minimize hazards to service personnel. Startup and normal operation of the Coach shall not result in dangerous or damaging voltage fluctuations.

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

The Contractor shall supply an additional 20% spare circuit breakers for future equipment installations.

The Contractor shall provide a 120VAC, 5A outlet in the ITS cabinet.

7.2 CIRCUIT PROTECTION

Manual reset circuit breakers or fuses shall protect all circuits, except for those involved in propulsion system start-up. Fuses shall be used only where it can be demonstrated that circuit breakers are not practicable, such as areas where the current exceeds 80 amps, and they shall be easily accessible for replacement. This requirement applies to inline fuses supplied by either the Contractor or a supplier. All fuses and circuit breakers shall be easily accessible for replacement or reset by being in areas where special equipment (ladder or hoist) is not required for access. Precautions shall be taken to minimize hazards to service personnel. All manual reset circuit breakers shall provide visual trip indicators and manual on/off trip functions to aid in isolating circuits for troubleshooting.

All circuits and circuit branches (except starter solenoid, headlamp and battery 12 & 24-volt feeds to the driver's apparatus panel) shall be protected by manual reset circuit breakers, soft fuses, fusible links, or other approved protective devices. Manual reset circuit breakers that are critical to the operation of the Coach shall be mounted in a convenient location with 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. Circuit breaker connections shall be crimped and soldered on both sides of the breaker with rosin core electrical solder, or a Weather Pack connector may be used. Other methods of connecting circuit breakers must be approved

by the SFMTA. All high voltage control (600 VDC) and power (1000 VDC) wiring shall have insulation protection rated for utilization in environments up to 125 degrees C.

All electrical equipment shall be internally protected against voltage transients and RFI interference to ensure proper operation in the SFMTA operating environment.

7.3 GROUNDING

Redundant grounds shall be used for all electrical equipment, except where it can be demonstrated that redundant grounds are not feasible or practicable. Grounds shall not be carried through water piping, hinges, and bolted joints (except those specifically designed as electrical connectors). Batteries shall be grounded to the Coach 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 Coach 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. Insulation of grounds shall in no way conflict with other Coach operations.

7.4 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 Coach bar or chassis. A shield shall be connected at one location only, typically at one end of the cable, to avoid forming a ground loop. However certain standards or special requirements, such as SAE J1939 or RF applications, have separate shielding techniques that shall also be used as applicable.

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

7.5 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 Coaches or design specifications for an equivalent environment. All electrical components, unless otherwise specified by the SFMTA, shall meet all relevant MIL-SPECS requirements. These components shall be commercially available, designed to last the service life of the Coach, and be easily replaceable by a mechanic. Electrical equipment shall not be in an environment that will reduce the performance or shorten the life of the component or electrical system.

Unless otherwise approved by the SFMTA, all electric motors shall be heavy-duty brushless type, with a continuous duty rating of no fewer than 240,000 hours. Electric motors shall be located for easy replacement and shall be replaceable in less than 15 minutes by a mechanic.

Electronic circuit protection for the cranking motor shall be provided to protect engaging of the motor for more than 30 seconds at a time.

7.6 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. All electrical and electronic devices, subsystems, and components shall be repairable and maintainable by the SFMTA. Each module, except the main body wiring harness, shall be removable and replaceable in less than 30 minutes by a mechanic. ESS wiring shall be an independent wiring module. Replacement of the engine compartment wiring module(s) shall not require pulling wires through any bulkhead or removing any terminals from the wires.

7.7 WIRING AND TERMINALS

All wire sizes and insulation shall be based on the current carrying capability, voltage drop, mechanical strength, temperature, flexibility, and fire resistance requirements for vehicle applications. All power and ground wiring shall conform to specification requirements of SAE J1127, J1128 and J1292. All high-voltage power and ground wiring shall conform to specification requirements of SAE J1763, J1654 and J2910.

All lamp sockets shall be of two-wire design with Cannon-Shearson, Weather-Pak, Deutsch, or equal disconnects to eliminate corrosion or ground problems. To facilitate servicing, all lamp wires shall have leaders of at least six inches.

All wiring between major electrical components and terminations shall have double electrical insulation and be waterproof. Except as interrupted by the master battery disconnect switch or a junction box, battery and starter wiring shall be continuous cables grouped, numbered, and/or color-coded with connections secured by bolted terminals. Wherever there is a possibility of interference, wiring and interconnecting cables shall be properly shielded.

Wires shall be uniformly color-coded and tagged. The SFMTA prefers that a minimum of eight colors be used and that no one color be repeated within a single harness. Wiring numbers shall be labeled via ink-jet or hot-stamped every six inches. Installation shall permit ease of replacement.

Wiring shall be prefabricated into standardized harnesses and wrapped and tied with “all weather UV type” nylon ties. Where possible, all wiring harnesses over five feet long and containing at least five wires shall include 15% excess wires for spares that are the same size as the largest wire in the harness, excluding the battery cables. Wiring harnesses shall not contain wires of different voltages unless all wires within the harness are sized to carry the current and insulated for the highest voltage wire in the harness. Ground harnesses, except for battery cables, shall be neutral or off-white in color.

Double insulation shall be maintained as close to the terminals, junction box, or electrical compartments as possible and is only applicable to wiring outside the electric panels. The requirement for double insulation shall be met by sheathing all wires and harnesses with nonconductive conduit.

Where possible, strain-relief fittings shall be provided at all points where wiring enters electrical components. Protective plastic or rubber grommets must be installed in every hole that provides passage for conduit or wiring to avoid chaffing or cutting of the conduit or wiring. Any clamps used throughout the electrical system shall be stainless steel and shall be "dipped". Wiring supports shall be nonconductive.

Major wiring harnesses shall not be located under the Coach floor, and under-floor wiring shall be eliminated to the extent practicable. Wiring necessarily located under the Coach shall be contained in sealed conduit.

Precautions shall be taken to avoid damage from heat, water, solvents, or chafing. Wiring length shall allow replacement of end terminals twice without pulling, stretching, or replacing the wire. Except for large wires such as battery cables, terminals shall be crimped to the wiring and may be soldered only if the wire is not stiffened above the terminal and no flux residue remains on the terminal. Terminals shall be corrosion-resistant full ring type from Faston, or interlocking lugs with insulating ferrules where appropriate. "T" splices may be used when there are less than 25,000 circular mils of copper in the cross-section; a mechanical clamp is used in addition to solder on the splice; the wire supports no mechanical load in the area of the splice, and the wire is supported to prevent flexing. Connectors shall be Weather Pack, Deutsch, Metri, or approved equal.

7.8 JUNCTION BOXES

All relays, controllers, flashers, circuit breakers, and other electrical components shall be grouped according to voltage and, if appropriate, mounted in easily accessible junction boxes. Exterior boxes shall be sealed to prevent moisture from normal sources, including propulsion compartment cleaning, from reaching the electrical components and shall prevent thermal or arc events inside the box from propagating outside the box. The components and circuits in each box shall be identified and their locations shall be permanently recorded on a schematic drawing glued to or printed on the inside of the box cover or door. The drawing shall be protected from oil, grease, fuel, and abrasion. The front junction box shall be completely serviceable from the street side exterior of the Coach, or from inside the header over the operator's seat. Other arrangements may be approved by the SFMTA. It shall be replaceable as a unit in less than 15 minutes by a single mechanic.

A rear start and run control box shall be mounted in an accessible location in the engine compartment. The run control box shall contain: 1) a starter pushbutton, 2) engine oil pressure gauge, 3) traction motor oil temperature gauge, 4) traction generator oil temperature gauge 5) coolant temp gauge, 6) sealed, coach data port connector, 7) ignition switch (front/rear/disable options). The control box shall be stainless steel and waterproof. The rear control box and its location shall be submitted to the SFMTA for approval at the design review.

7.9 MULTIPLEXING SYSTEM

The electrical system shall be controlled by multiplexing PLCs made by I/O Controls, Vansco, or an approved equal and shall be located in a sealed compartment. The Contractor shall provide complete details of the design of the multiplexing system during the design review. The multiplexing system shall provide and distribute power to ensure satisfactory performance of all electrical components. The system shall be capable of monitoring and recording all Coach systems including, but not limited to, passenger counts, door operation, ramp operation, vehicle accessories, engine, the ESS, the traction motor, and traction generator; reference Section 7.6 (MODULAR DESIGN). The system shall store and retrieve data for the mechanical and electrical functions of the Coach. All electrical and all electronic devices sub-systems and components shall be repairable and maintainable by the SFMTA. The SFMTA shall be granted no-cost licenses to utilize all software for interfacing with the multiplexing system for as long as the Coaches remain in service.

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. Each module shall be shielded to prevent interference by EMI and RFI and may utilize LEDs to indicate circuit integrity and assist in rapid circuit diagnostics and verification of the load and wiring integrity. Each circuit shall be capable of providing a current of no less than 2 amps.

Protection to each individual circuit in the multiplexing system shall be provided. A single test button or switch mounted on a panel at the driver's compartment area, upon activation, will provide a system check of the circuits. Failure points will be indicated by corresponding LED lights on the appropriate PLC. Technicians shall be able to use a laptop or a handheld field diagnostic unit to read data from and interface with the multiplexing system.

The Contractor shall provide the SFMTA with all essential information and identify all equipment needed to test and troubleshoot the multiplexing system. This information and equipment shall encompass the system on the Coach and the repair of the individual sub-assemblies down to the components on the circuit board of the sub-assemblies. Any software required for interfacing with the multiplexing system shall be listed in the list of tools furnished per the Contract.

7.10 LOW-VOLTAGE BATTERIES

At least two DEKA 8A8D Absorbed Glass Mat (AGM) MagnaPower or approved equal batteries shall be provided. Batteries shall be of premium construction and shall be fitted with threaded side-mounted stud terminals. They shall bear an initial warranty date no earlier than 60 days prior to the manufacture date of the Coach. In the event of a temporary failure of the battery charging system, the low voltage batteries shall be able to operate the low voltage control system and the interior lighting system for a minimum of two hours.

The Coach shall be equipped with a low voltage battery management system to prevent deep discharging and to protect the battery from operating outside of the manufacturer's safe operating area. The system shall protect the battery from overcharging by limiting the current and/or voltage to prevent electrolyte degradation. The battery management system shall be capable of monitoring the voltage, temperature, SOC, and health of the battery when compared to its original capacity. Once the batteries have discharged to a predetermined SOC (approved by the SFMTA), the batteries will be disconnected after a period of three minutes, leaving only the fire suppression and other critical systems on. The batteries shall be sufficiently protected from over temperature or meltdown.

The Coach shall keep the low voltage batteries charged whenever the Coach engine is running. The SFMTA prefers that a resettable low voltage disconnect system be implemented to disconnect loads from the low voltage batteries when they drop below 23V.

Positive and negative terminals shall have different size studs, or the battery terminals and cables shall be arranged to prevent incorrect installation. Battery terminals shall be located for access in less than 30 seconds with jumper cables; Anderson SB350 connectors (part number 6322G1) shall also be provided for the purpose of jump starting the vehicle. Battery cables shall be flexible and sufficiently long to reach the batteries in the extended tray position without stretching or pulling on any connection. Cables shall not lie on top of the batteries and shall be sheathed and wrapped to prevent corrosion. The battery terminals and cable-ends shall be color-coded with red for the primary positive and black for the negative. Batteries shall be stamped with the date of manufacture.

Batteries shall not be jumped, quick-charged, or otherwise abused before delivery to the SFMTA. Regardless of the battery configuration, the Contractor shall be responsible for analysis and selection of a battery configuration of adequate capacity to supply the required load.

Battery cables shall be a minimum 4/0 or sized accordingly to handle the load from the battery. The battery cable terminal connections shall be capable of withstanding the mechanical stress and vibrations commonly experienced during Coach revenue service.

7.10.1 Battery Tray

The battery tray shall be made of stainless steel. The design of the battery tray shall pull out easily and properly support the batteries during service. In the normal position, the battery tray shall not be supported by rollers. A positive lock shall retain the battery tray in the normal position. Batteries shall be easily accessible for inspection and serviceable only from outside the Coach. The battery containment area shall be vented to the outside allowing for the mitigation of fumes from gassing batteries and provisions made for the drainage of cleaning liquid. The containment area access door shall be able to be opened without the use of a special key.

A polarized lug mating with Anderson power products #632062 or approved equal and manual release #919 shall be provided inside the battery compartment and adjacent to, but no further outboard than, the batteries. The plug shall be wired with 3/0 cable.

7.11 LOW VOLTAGE MASTER BATTERY SWITCH

A master battery switch shall be provided for complete disconnection from all Coach electrical systems except systems that require 24/7 power supply. The master battery switch shall be in an outside compartment which requires no tool(s) to access. The location of the master battery switch shall be clearly identified on the access panel and be accessible in less than 10 seconds for activation. The master switch shall be capable of carrying and interrupting the total circuit load. Using the master battery switch shall not damage any component of the electrical system.

7.12 ELECTRICAL AND ELECTRONIC NOISE

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.

The Coaches shall meet all applicable FCC and FTA requirements in addition to the latest revisions of the agreed upon standards and guidelines listed below:

- CISPR 12 – Vehicles, Boats and Internal Combustion Engines – Radio Disturbance Characteristics – Limits and Methods of Measurements for the Protection of Off-Board Receivers
- MIL-STD-461 - Requirements for the Control of Electromagnetic Interference Emissions and Susceptibility
- American Conference of Governmental Industrial Hygienists (ACGIH) (See ATTACHMENT 4)
- UMTA-MA-06 0153-10 (DOT-TSC-UMTA-88-1) Radiated Interference in Rapid Transit Systems Volume I: Theory & Data
- UMTA-MA-06-0153-11 (DOT-TSC-UMTA-87-4) Radiated Interference in Rapid Transit Systems, Volume II: Suggested Test Procedures
- SAE J551 Performance Levels and Methods of Measurement of Electromagnetic Compatibility of Vehicles, Boats (up to 15m), and Machines (16.6 Hz to 18 GHz)
- SAE Recommended Practice ARP 1393: “Electromagnetic Compatibility and Interference Control for Rapid Transit Vehicles”

The Contractor shall develop and submit an EMI/EMC Control Plan for the SFMTA review and approval prior to submittal of final drawings. The plan shall delineate the manner in which EMI and EMC will be mitigated and meet the requirements in this section.

8 MATERIALS AND OVERALL WORK QUALITY

8.1 MATERIALS

All materials used in the construction of the Coach and its parts shall be in accordance with the stated specification or description unless written approval for substitution is obtained. All materials shall comply with the standards established by ASTM, SAE, or similar association standards. Materials used shall be consistent in manufacture, design, and construction on each Coach and be marked to be readily identified.

Whenever under the Contract Documents it is provided that the Contractor shall furnish materials or manufactured components or shall do Work for which no detailed specifications are set forth, the Work performed shall be in full conformity and harmony with the intent to secure the best standards of manufacture in the Work as a whole or in part. The Contractor shall not take advantage of the omission of any part or detail which goes to make the Coach complete and ready for service, even though such part or detail is not mentioned in the Specifications or in the Contractor's approved design.

Prior to Conditional Acceptance, foreign matter such as shavings, chips, etc., shall be completely removed from all parts of the Coach whether hidden or exposed.

A. All painted aluminum sheets shall be thoroughly cleaned and coated on the inside and outside with zinc-chromate or zinc-phosphate protective paint prior to assembly in Coach.
B. All joints shall be protected by application of a zinc-chromate metallic compound, Sikaflex 221, or approved equal adhesive at assembly.
C. All bolts, nuts, washers, and exposed linkage shall be stainless steel or zinc plated (where applicable) to prevent corrosion. The SFMTA prefers that all bolts on the Coaches are in compliance with SAE Standard J429.

8.1.1 Hazardous Materials

It shall be the design objective to eliminate from the Coaches all materials that are or may become hazardous to passengers, operators, or maintenance personnel. Of particular concern are materials that produce toxic smoke or gases when heated, possibly due to an accidental fire or when bodywork using welding equipment or cutting torches is necessary. No parts on the Coach shall contain lead, asbestos, or polychlorinated biphenyls. The Contractor shall provide for the SFMTA approval of the material safety data sheets (MSDS) of any hazardous materials or fluids that must be used in the construction, operation, or maintenance of the Coach.

The SFMTA has the option to reject the use of any hazardous materials proposed for use on the Vehicles.

8.1.2 Consumables

All required consumable items shall be available in the United States from U.S. manufacturers, including:

- Engine air filters
- Ventilating air filters
- Coolant, fuel, and oil filters
- Belts
- Lamps
- Fuses
- Brake lining material
- Hoses and lines – air, coolant and hydraulic
- Wire terminations and connectors
- Air bags
- Brake Rotors
- Suspension components
- Wiper blades
- Exhaust after treatment filters

Any similar items shall also meet the above requirements. Any exceptions require the prior approval of the SFMTA.

8.2 OVERALL WORK QUALITY

Overall work quality shall be of the best grade and shall conform in all respects to the best practice in the industry.

Material and equipment shall be new and of a quality equal to that specified or accepted as the best industry practice. Mechanical, electrical, and electronic equipment and components shall be products of manufacturers of established good reputations regularly engaged in the fabrication of such equipment and components.

All work shall be executed in conformity with the best-accepted standard practice of the trade to contribute to maximum efficiency if operation, accessibility, pleasing appearance and minimum cost of maintenance.

The fit and finish of the exterior and interior components shall be to the best of the automotive industry standards.

8.2.1 Welding

Welding procedures, welding materials, and qualifications of welding personnel shall be in accordance with the current standards of the ASTM and AWS. All welding work must conform to U.S. welding standards as approved by the SFMTA.

Where metal is welded, the contact surfaces shall be free of scale, grease, and paint.

8.2.2 Mechanical Fastening

No protruding screws, bolts, or similar items shall be permitted in the interior or the exterior of the Coach. Wherever exposed to passengers or otherwise possible, interior fasteners shall be stainless steel or zinc-plated steel. Where possible, all fasteners used in the Coach body exterior shall be of stainless steel except where mechanical requirements necessitate graded steel fasteners, or to minimize galvanic corrosion. These fasteners shall be zinc-plated as per specification, with treatments to prevent hydrogen embrittlement if required. Where non-anodized metal is riveted or bolted to metal, contact surfaces shall be thoroughly cleaned and properly primed. The use of stretch to torque fasteners is discouraged.

8.2.2.1 Rivets

Rivets shall completely fill the holes. No blind rivets shall be used. External rivet heads shall be concentric with the body of the rivets and free from rings, pits, burrs, and fins. Surfaces exposed to passengers, operator, or maintenance personnel shall be smooth and free of burrs, fins, sharp edges, and dangerous protrusions.

8.2.2.2 Screws

On the Coach interior, all screws exposed to passengers shall be stainless steel with a flat or oval head. Exposed screws shall be of an approved tamper-proof type except for the glazing mounting screws. Self-tapping screws shall not be used in areas requiring dismantling for servicing. At least 1-1/2 screw threads shall be visible beyond all nuts.

8.2.2.3 Bolts

All bolts or rods passing through composite flooring or exposed to the elements shall be an approved grade stainless steel or, with SFMTA pre-approval, be zinc plated. All nuts and bolts exposed to passengers shall be an approved grade stainless steel unless otherwise specified.

The design strengths for Grade 2 bolts and Class A nuts shall be used in sizing the mounting and attachment bolts for under floor mounted equipment, support structures, or brackets. However, all structural or load carrying bolts shall be of domestic manufacture and grade 5 or better. Bolts or screws used for structural connections shall have full-size bodies in areas subjected to bearing and/or shear loads. All structural or load carrying bolts shall be specified and installed appropriately for their intended loads.

For bolted joints subject to steady vibration, bolts with appropriate locking arrangement may be used. Nuts shall be of a self-locking type where appropriate. Wherever possible, bolts smaller than 1/4 inch shall not project more than 1-1/2 threads plus 1/4 inch, and bolts 1/4 inch or larger shall not project more than eight threads. All hardware is to be installed and torqued per ANSI guidelines.

8.2.3 Finishing

Special care shall be taken with the outside sheathing, roof, roof bonnets, and interior finish so that all kinks and wrinkles are removed before assembly to present a true and smooth finish. This shall be accomplished without excessive grinding, which may weaken the structure material. All painted surfaces shall have a true and smooth surface that will not show sanding or grinding marks after painting. All steel and aluminum body parts that are to be painted shall be thoroughly cleaned and treated before priming with a primer compatible with the paint system.

8.2.4 Electrical

All electrical connections shall be of the locking type. All electrical wiring harnesses should be tie-wrapped and supported at regular intervals. When wires, cables, hoses, or tubes go through walls or panels, the bulkhead holes shall have protective grommets/molding and the wires, cables, hoses, or tubes shall be clamped on both sides of the bulkhead hold. A 1/4-inch minimum clearance is required. All electrical wires shall be installed to as not to have any chaffing or rubbing with other components. Reference Section 7.7 (WIRING AND TERMINALS) for additional requirements.

8.3 PROOF OF COMPLIANCE WITH CONTRACT

In order that the SFMTA may attempt to determine whether the Contractor has complied with the requirements of the Contract Documents not readily determinable through inspection and testing of equipment, components or materials utilized in the Work, the Contractor shall, at any time when requested, submit to the SFMTA Project Manager properly authenticated test results, design documents or other satisfactory proof as to its compliance with such requirements.

8.4 DEFECTIVE WORKMANSHIP AND MATERIALS

When and as often as the SFMTA determines that the Work done or being done under the Contract, or the kind or quality of components, equipment or materials supplied in connection therewith, is not fully and completely in accordance with any requirement of the Contract Documents, it may give notice of such noncompliance to the Contractor in writing and the Contractor shall immediately upon receipt of such notice do all things required to remedy such noncompliance at no additional cost to the SFMTA.

9 TRAINING, PUBLICATION, DIAGNOSTICS TESTING SOFTWARE

9.1 TRAINING

Training shall be designed and presented to ensure that each participant will be able to perform specific tasks or be able to demonstrate specific knowledge in his/her working area. Training shall provide specific course goals and objectives outlined in the lesson plans with pre-course tests and post-course tests. Dates, hours, and locations of training shall be at the discretion of the SFMTA. The training starting days and completion days shall refer to Section 13.1 PREFERRED DELIVERY SCHEDULE.

All manuals and lesson plans shall be provided electronically and with hard copies to all participating trainees. All computer software programs must be approved by the SFMTA.

The SFMTA reserves the right to copy all computer information for future use. Copies of all training aids (such as videos, slides, and audiotapes) shall be provided to the SFMTA Maintenance Training Department.

The Contractor shall submit its recommendations for training hours and categories for review and approval by the SFMTA.

9.1.1 Training Plan

Contractor shall submit a training plan per the schedule in Section 13.1 (Preferred Delivery Schedule). The training plan shall delineate the way the Contractor plans to meet the requirements of this specification. The plan shall include:

- Specific trainee performance objectives
- Draft lesson plans
- Attendee's basic require knowledge if any
- Specific topics to be covered, including subsystem groupings for mechanics and electronic technicians
- Probable training aids and materials
- Training schedule
- Training facilities required

9.1.2 Training Materials and Personnel

The Contractor shall provide detailed instructional guides, outlining training philosophy, and weighted areas of instruction based on the Contractor's understanding of the complexity of the equipment from a maintenance performance standpoint. In addition, the Contractor shall identify recommended course lengths with basic electrical/electronic knowledge-driven instruction leading to a proficiency level suitable for new Coach maintenance.

Instructors shall be totally familiar with the technical information being taught, shall use instructional materials properly, and shall possess the skills required to make effective presentations. Safety must be an integral part of all instruction. Instructors must be transit literate and factory certified to teach the specific system being taught. The SFMTA prefers that all training instructors are employees or technical representatives from the maker of the equipment being trained on.

Upon commencement of classroom instruction, instructor shall be dedicated to the task of teaching without a break in the continuity of the instruction to perform other duties. Instructor shall be fluent in English.

The Contractor shall provide all handouts, training aids, audio-visual equipment, and visual aids for each class. Training materials, including audio-visual hardware, slides, view graphs, mock-ups, charts, and other aids, will become the property of the SFMTA upon the completion of the training course. The SFMTA or its designee may use such materials in subsequent training sessions for any other purposes. A training manual shall be prepared for each personnel classification and distributed to personnel in training prior to or at class start up.

9.1.3 Operations Instructors, Maintenance Instructors, Street Operations, and Managers

The purpose of these training sessions shall be to provide the necessary information to the SFMTA's operations instructors, maintenance instructors, and training management and operations managers so that they may train the SFMTA’s operators, transit inspectors and maintenance personnel. This training shall cover all operational and maintenance aspects of the Coach, with emphasis on features of the Coach that are unique or may not have been encountered by SFMTA personnel. Separate training sessions shall be provided for street operation inspectors.

9.1.4 Maintenance Manager Training

These training sessions shall acquaint maintenance superintendents, general foremen, and foremen with the design, use, limitations, preventive maintenance, warranty periods, and special features of the Coach. This training can be included in the general orientation or be part of specific in-depth training time.

9.1.5 Service Personnel Training

Service personnel shall be trained in basic daily servicing requirements, including cleaning, inspection, towing, and routine servicing and the preventive maintenance inspections.

9.1.6 First Responder Training

First responder personnel, including firefighters, EMS, and law enforcement, shall be trained in best practices for interfacing with the Coach during emergency situations.

9.1.7 Mechanic Training

These sessions shall provide the mechanics with the basic knowledge necessary to utilize the maintenance manuals and to safely perform preventive maintenance, troubleshooting, repairs, and overhauls. Sessions shall concentrate on individual subsystems and components, such as body, doors, propulsion, suspension, brakes, and operator controls. The Contractor shall include, as part of the training plan, a list of proposed subsystem groupings. Training shall include demonstrations of Time to Repair and Accessibility of Coach components and subsystems. Training for shop technicians will cover test equipment and subassembly bench repair and calibration.

Maintenance engineer training shall focus on overall system design, maintainability, computer diagnostic techniques, control systems, data collection and retrieval, life cycle predictions, optimization programming, electronic maintenance techniques, and special tools.

The Contractor shall provide to the SFMTA sufficient training and documentation needed to test, troubleshoot, maintain, and repair all electronic systems and subsystems.

The training shall review all electronic schematic diagrams and shall provide troubleshooting flow charts and block diagrams.

Road Call sessions shall provide the mechanics with knowledge necessary to troubleshoot and fix, if possible, subsystems which may fail and cause service interruption. Mechanics shall be made to understand how to proficiently use all necessary troubleshooting equipment. Mechanics shall be provided with both hands-on and classroom training.

9.1.8 Surveillance Camera System Training

The Contractor shall provide training classes on how to operate and maintain the surveillance camera system (the number of classes and hours are subject to the SFMTA approval, which may be based on the Contractor’s recommendations).

A list of test equipment and special tools required to maintain the system shall be provided by the Contractor. The Contractor shall provide pricing for a test fixture which duplicates an entire Coach system. The test fixture shall easily allow for the substitution of individual components of the system for test and repair purposes.

9.1.9 Videos

The SFMTA may require digital recordings of any or all the Contractor’s training sessions, at the SFMTA’s discretion, or at least one session of each discrete training class. These recordings will be provided electronically by the Contractor for distribution within the SFMTA. The

Contractor shall provide a list of videos for the SFMTA to review and approve prior to production of the videos.

In addition, the Contractor shall be required to provide a complete set of training videos for each classroom training session on a specific topic and a video for each Coach "hands-on" training session on a specific topic. Videos shall be no longer than 30 minutes in length. Topics requiring more time to cover in complete detail shall be segmented into sub-30 minute modules. A single compilation videos incorporating all the training sessions shall also be produced. At minimum, Contractor shall cover the following topics:

- Basic Coach introduction including startup, charging, and shutdown procedures
- Propulsion and energy storage systems
- Axle and suspension systems
- Auxiliary electrical system
- Wheelchair ramp assembly
- Air and brake systems
- Door system
- Power steering system
- Heating and ventilating system
- Vehicle body components & repair techniques (e.g., special welding, interior panel replacement)
- Preventive maintenance practices for all preventive maintenance required on each Vehicle

The Contractor shall submit a complete set of master recordings to the SFMTA in an approved electronic format, along with a complete set of training media.

The Contractor shall maintain a complete set of reproducible recordings on file for a period of 12 years for use by the SFMTA.

The Contractor shall provide a digital copy of the draft training plan, including representations of classroom instruction and "hands-on" instruction. These sample training documents shall be submitted for the SFMTA's approval and shall be representative of the level of quality of the product that the SFMTA can expect for the balance of the training documents to be delivered.

9.1.9.1 Video Quality

The Contractor shall have in-house capability, or subcontract with a company approved by the SFMTA, for the following requirements:

- All work associated with video recording and production shall be performed by the Contractor or subcontractor approved by the SFMTA.
- The Contractor shall have script writing capabilities and be experienced with transit organizations and issues.
- Studio and/or field acquisition capabilities.
- Production of digital files for wide distribution in an industry accepted format.

The Contractor may elect to use its own actors, or the SFMTA's employees in actual classroom and Coach "hands-on" sessions. Video files shall be professionally edited to eliminate unnecessary and irrelevant sections that are common to live, on-location filming.

9.1.10 Training Charts

The Contractor shall provide a physical and a digital copy of the following schematic charts used for training and working reference: (a) the electrical system, (b) the air and brake system (c) the door system, and (d) battery cooling systems. Charts shall be consistent with those provided in the Maintenance Manual and subject to the SFMTA approval, and available for use at commencement of the training course.

9.1.11 Interactive Multimedia Training

The Contractor shall provide a proposal and pricing for a series of interactive training modules as part of the training line item in the Schedule of Prices in the Contract. This training must be specific to the Coach for this procurement, and to maintenance practices that are used by the SFMTA. The interactive training should be electronically formatted computer-based training (CBT) or approved equal, and compatible with all modern computer windows-type operating systems, office programs, and latest multimedia software. The files shall include video clips of component operation and critical adjustments.

Interactive Multimedia Training milestones shall consist of the following:

- Detailed design document, to be developed with the SFMTA participation and completed 10 months prior to delivery of first production Coach.
- Video production
- Completion and review of video editing
- Prototype module delivery (test, review, and feedback of first module)
- Pre-production module delivery (test, review, and feedback of all modules)
- Delivery of completed program, including Trainer's Manual and Guide shall be completed per the schedule in Section 13.1 (Preferred Delivery Schedule). (The delivery must include system setup and troubleshooting, program administration guidelines, and answers to test questions.)

9.1.11.1 Training Module

The training module shall have on screen text as well as voice over descriptions of the procedure being demonstrated. The module shall have a complete demonstration of the maintenance procedure followed by a self-paced post examination of the student. Only the student and the Training Manager shall have access to the scores for each training module. In addition, the SFMTA shall have all licensing rights to unlimited reproduction of the electronic training module. The Contractor shall have the responsibility for providing all updates and revisions to the electronic training modules until all engineering modifications and final engineering changes have been approved and all Coaches have been accepted.

The training modules shall address the most critical systems pertaining to Coach Maintenance. One module shall be produced on each of the following systems:

- Programmable logic controller system
- Ramp installation and maintenance
- Door system control maintenance
- Electrical and electronics systems control maintenance, including multiplexing

- Disc brake installation and maintenance
- Energy Storage System (ESS)
- Propulsion system
- HVAC system

Each module shall include the following program elements as appropriate:

- Overview on system components, operations, and relationship with other relevant systems
- Step-by-step video demonstration of maintenance procedures (not more than 50 steps in the process), with random access to each step and multiple-choice quiz questions on critical steps
- Interactive job simulation exercises using three-dimensional solid modeling to graphically represent job setting and function on critical steps
- Built-in user performance tracking for confidential review by Maintenance Training Supervisor
- Visual-based parts identification and ordering information system (using three-dimensional solid model and/or stills)
- The Contractor shall demonstrate the ability to produce interactive multimedia training that contains each of the program elements for the critical subsystems as described above.

9.2 PUBLICATIONS: MAINTENANCE MANUALS, ILLUSTRATED PARTS MANUALS, OPERATOR'S MANUALS, & VEHICLE RECORD BOOKS

The Contractor shall provide maintenance, illustrated parts and operational manuals for each of the Coach type according to the schedule in Figure 9-1.

The Contractor shall provide all electronic copies of the Coach drawings as necessary for the pre-production process approvals. These drawings include Major components layout, Brake and Air system schematic layout drawing, Cooling system drawing, HVAC system layout, Seating Layout Drawings, Dash layouts, Camera Layouts, AVA AVL drawings, Paint Scheme, APC layout, Fleet Management system drawings, Antenna layouts, Clipper location, Radio provisions layouts and all electrical system schematics. The Contractor agrees to share additional drawings as they are needed by the SFMTA (ex. vehicle frame drawings) in PDF format.

The intent and purpose of all maintenance and operating documents provided to the SFMTA by the Contractor shall be to facilitate the safe and reliable operation of the Coach by the SFMTA during the entire expected operational life of the Coach. Using the information provided in the Contractor's maintenance documentation, the SFMTA itself must be able to perform all procedures necessary to ensure the safe and reliable operation and maintenance of the Coach during its service lifetime. The Contractor shall submit a draft copy of each of the manuals for review and approval by the SFMTA before or upon receipt of the first Coach.

Release copies of the manuals shall reflect the most recent information available at the time of their release and shall be delivered to the SFMTA on or before delivery of the last production Coach. Manuals need to be updated in a timely manner whenever there is a FSRP issued.

FIGURE 9-1

Manuals	**Quantity / Vehicle type**	**Maintain up to date after the date of acceptance of the Coaches**
Contractor Maintenance Manual	10	12 years
Contractor Parts Manual	10	12 years
Coach System Drawings	10	12 Years
Contractor Operator's Manuals	40	6 years

The supplied manuals shall provide complete, concise, and clear documentation for all equipment ordered on the Coach and shall not include superfluous documentation for equipment that was not provided with the Coach. In addition to the printed copies of the manuals specified above, all maintenance operations and illustrated parts manuals shall be provided in digital format.

All such electronic documentation shall be viewable using common office and multimedia software such as Adobe Acrobat, Microsoft Office, and Windows Media Player. Contractor Published Coach Manuals can be supplied without security after the SFMTA signs a limited copyright agreement form. Within the relevant Coach warranty period provided for by the Contractor, the SFMTA will make no changes to the Contractor-provided documentation where such changes would compromise the intent of the Contractor's original documentation with respect to the safe operation or reliability of the Coach, unless such change is agreed to in writing by both the SFMTA and the Contractor. Where such changes are made, both the SFMTA and the Contractor shall maintain coordinated records of the changes, including the SFMTA contract number, manual part number, title, page number(s), date the change was made, who authorized the change, why the change was made, and before-and-after copies of the change. The Contractor will provide such changes in the same digital format as used for the initial delivery of the manuals. At the expiration of the time periods specified above for the Contractor maintenance of the documentation, or upon default of the Contractor in providing such document maintenance, the SFMTA shall have the right to reproduce copies of such documentation for internal use only, subject to the warranty concerns expressed herein.

The Contractor and sub-supplier maintenance documents shall be supplied in an integrated electronic format and shall be generated for best readability on a current computer monitor. The default page setup for all printed maintenance and parts manuals shall be standard U.S. letter

size (8.5" by 11") in portrait mode with a gutter suitable for use in a standard 3-ring binder. Wherever feasible, printed manuals shall be organized so that updates or corrections to the manuals can be made with minimal impact to the overall document. Where drawings or other documents are too large to be easily legible in the default page size, such pages may be provided either as 11" tall by 14" (or longer) pages, or as 22" tall by 16" "four-up" pages. In both these cases of oversized pages, the printed page shall be capable of being neatly folded up into the default page size and shall have suitable reinforcement at the 3-hole edge of the page.

Major sections of the maintenance manuals shall be separated by 1/3- or 1/5-cut tabbed and labeled, reinforced index dividers. The printed Operator's Manual shall be a single softbound volume; with at least medium-weight, glossy-stock covers for durability, and may be smaller than the default 8.5" by 11" size, as dictated by the best compromise of readability and portability. Coach Electrical, Air, Hydraulic, PLC, HVAC, cooling system schematics and diagrams are all output in a convenient 11”x17” format and included in a separate sturdy 3-hole plastic binder and not within the Coach Service Manuals. An emphasis shall be placed on durability and portability. In the interest of readability and clarity, the SFMTA may dictate that the Operator's Manual be printed in color.

9.2.1 Maintenance Manuals

The Contractor maintenance manuals shall be integrated so that all subsystems of the Coach are contained in a logically indexed, contiguous series of chapters and/or volumes. Sub-supplier maintenance manuals shall be supplied and referenced in the contractor’s manuals for ease of access. Manual organization must be approved by the SFMTA before work begins on the manuals.

All standard and specialized maintenance or overhaul procedures that involve potential health and safety issues for the repair technician shall be clearly noted in the documentation with the international safety warning symbol appropriate to the level of potential danger involved. Procedures where the proper performance of the task is critical to the safe operation of the Coach shall also be clearly marked for emphasis. Maintenance manuals shall contain the complete data required for routine and periodic maintenance of all parts of the Coach.

At the beginning of each manual, it shall contain a table of contents, a list of abbreviations, instructions on how to use the manual, special safety precautions for maintenance and/or overhaul procedures, a general overview/introduction to the Coach and its systems, subsystems, and recommended required and/or specialized maintenance and overhaul tool lists, including electronic test equipment where appropriate. Main components of the manual shall include, but are not limited to, the following:

A. Detailed theory/principles of operation of each primary system (e.g., the braking system) on the Coach and its relationship to and interactions with other primary systems on the Coach and, where applicable, to any off-board systems.
B. Detailed theory/principles of operation of each subsystem (e.g., ABS) within its primary system, and the relationship and interactions of the subsystem to other

subsystems within the primary system, and, where applicable, to other primary systems or the subsystems of those other primary systems.

C. Field and shop troubleshooting procedures for all systems and subsystems using a combination of text, flowcharts and images as best suits the procedure.
D. Shop overhaul procedures for all rebuildable or repairable systems on the Coach.
E. Recommended preventive maintenance (e.g., lubrication and adjustment) requirements and schedule. Reference Section 9.2.1.1 (Preventive Maintenance).
F. Schematic and wiring location diagrams (including wire and cable size and rating schedules, where appropriate) for all electrical systems and subsystems on the Coach.
G. Air and hydraulic system diagrams showing locations in the Coach of air and hydraulic components.
H. Detailed, illustrated procedures for component change-out, and run-in information as required.
I. Body and structural information and materials specifications for major accident repairs.
J. Electronic systems and subsystems documentation including schematics and diagnostic procedures, where applicable. Reference Section 9.2.4 (Electronic Systems Documentation.)

9.2.1.1 Preventive Maintenance

The Contractor shall provide a Preventive Maintenance (PM) section within the maintenance manuals specifying the recommended preventive maintenance procedures and the scheduling of those procedures. The manual shall provide an outline PM program with checklist, which can be used to perform PMs. The PM checklist pages shall be formatted so that copies can be made to stand as individual SFMTA documents, including lined space at the end of the document for additions and notes. The preventive maintenance manual shall also include recommendations for the scheduled overhaul of major systems above and beyond the normal maintenance procedures, where such overhaul is known to significantly improve the long-term reliability, maintainability and/or useful life span of the Coach.

In addition to the above requirements, the structure of the PM schedule must include at least the following elements for each required maintenance procedure within an overall PM program:

A. the interval between each procedure (any combination of calendar based, mileage based, and/or hours based intervals); the SFMTA strongly prefers mileage-based intervals wherever appropriate. The Contractor shall also provide the following items, but may choose to do so in documents separate from the preventative maintenance manual:
B. List of parts (Manufacturer Part #, Description, Quantity, UOM) required or recommended for each procedure.
C. Estimated hours to perform each procedure.

9.2.2 Illustrated Parts Manual

The Illustrated Parts Manuals shall be designed so that all systems and subsystems of the Coach are broken down to the component level in a logically indexed, contiguous series of chapters and/or volumes. Illustrations and their corresponding parts lists shall be arranged as to minimize the amount of cross-searching necessary to locate a part in the parts list from its drawing reference, or to locate the part on an illustration from its entry in the parts list. The parts list shall include the following data:

- Drawing reference (locator)
- Manufacturer's part number
- Part description, including type, size or value, or reference to another drawing where such reference contains a more useful description of the part.
- Quantity used in the currently illustrated system or subsystem.

Illustrated parts manuals shall be arranged so that part numbers can be readily found and identified in the illustration for each system, subsystem, assembly, subassembly, or component part from an orderly breakdown of the complete Coach. The manual shall contain a convenient alphanumeric part number index listing the Contractor’s part number against the page in the illustrated manual where it appears. In no case may any replaceable part remain unidentified.

Isometric exploded views or two-dimensional drawings that are detailed enough to show the relative location of each part shall be used to identify all Coach systems and subsystems. The technique to be used in the rendering of these two-dimensional drawings must be approved by the SFMTA before the draft manuals are created.

The Supplier shall supply a separate price list showing the Contractor’s part number against the current net price (including freight) to the SFMTA of all non-generic parts used in the Coach at the time of delivery of the manuals.

Refer to Section 10.3.3 (Database Information) for data formatting requirements.

9.2.2.1 Parts Tables in Electronic Format

The Contractor shall supply parts data in a file format such as MS Excel with a complete listing of all parts as they appear in the Parts Manual (logically structured by Section, System, Assembly, and Sub-assembly) and as specified under 10.3.3.2 (Illustrated Parts Catalog Master File). The listing shall include.

- Coach system or subsystem containing the part
- Contractor part number
- Part description
- Vendor name
- Vendor part number

- OEM name, if different than vendor name
- OEM part number, if different than vendor part number
- Illustration number in parts manual
- Page number in parts manual
- Identification of special restrictions or hazards
- Identification of which buses contain the part

The purpose of these tables shall be to provide system and component parts data that is readily suitable for loading into the SFMTA's EAM data processing system. The tables should include all information that is presented in the illustrated parts catalog.

At the highest level, the tables should make it possible to identify by serial number all the major assemblies installed on each individual Coach and thereafter all major sub-assemblies that are installed in each major assembly down to the lowest serialized sub assembly. The Contractor may use their own internal part numbers for this information.

9.2.3 Operator's Manuals

The operator's manual shall completely, clearly, and concisely illustrate the recommended procedures for the safe and efficient operation of the Coach, including but not limited to pre-service and in-service check-outs, response to safety alarm systems, control of lighting and auxiliary Coach systems, Coach mechanical operation, maintenance checks, turning characteristics of the Coach, and emergency actions.

9.2.4 Electronic Systems Documentation

Where an electronic system is an intrinsic part of the Coach, and where the contract for Coach specifies that an electronic system is field-repairable or shop-repairable, the Contractor shall at a minimum identify these components by part number, circuit or schematic diagrams, voltage, method of diagnosis and replacement procedure as part of the service and/or parts manuals in keeping with the requirements of Section 9.2.1 (Maintenance Manuals). The information within the multiplexing system user guides, Coach service and parts manuals, and Coach electrical schematics will provide the information necessary to maintain and service the equipment. Other data control modules such as battery unit ECUs would also be covered within the OEM manuals and Coach manuals and schematics.

9.2.5 Vehicle Records

The Contractor shall provide a Vehicle record book to be included in each Coach upon its arrival at the transit property. Vehicle record books are to include as a minimum the following:

- Vehicle release/shipping approval certificates
- VIN sheet
- Vehicle Weight Scale slip

- Major Component & Subcomponent serial numbers for all major systems
- Test records, including alignment test, break test, water test, OEM benchmark tests
- Inspection records and resident inspector defect sheets
- Calibration records, including steering alignment and ABS verification
- Vehicle weight record

Each book shall be indelibly marked with the serial number of the Coach it accompanies. Vehicle record books must be approved by the SFMTA or the designated SFMTA Resident Inspector before shipment. This information must also be provided electronically upon request by the SFMTA.

9.2.6 Computerized Maintenance, Preventive Maintenance, and Illustrated Parts Manual System

The Contractor shall supply the parts lists as detailed in MS Excel as per 10.3.3.2 Illustrated Parts Catalog Master File. The Contractor shall supply Parts Manual illustrations in compressed JPG file format, whichever works better for the SFMTA.

The Contractor will supply its published Coach Maintenance Manual content in Adobe PDF format to allow the SFMTA to incorporate into its asset management system software. These files will be supplied with the draft Coach Manual delivery (with First Coach delivery) and again with the Final Coach Manual delivery (30 Days after receipt of the SFMTA comments).

9.3 VEHICLE SUBSYSTEMS INTEGRATION AND DIAGNOSTIC TESTING REQUIREMENTS

The Contractor shall integrate all electronic systems on the Coach that can communicate using the latest data link protocol as well as the Coach multiplex system. The integration shall include software and hardware that collects and stores all available data in a logical manner. The software shall automatically generate an event log of all data and shall incorporate data from, but not limited to, the propulsion, energy storage unit, traction motor, ABS brakes, multiplexing, video surveillance system, destination sign, farebox, automatic passenger counter, and fire detection/suppression systems. The integration shall provide for a minimum storage time of two weeks. The Contractor shall provide system integration details at design review. Function and suitability of design must be approved by the SFMTA.

The Contractor shall provide Self-Diagnostic Testing Software (SDTS) that analyzes the stored data for irregularities or failures to the maximum extent possible. At a minimum, the SDTS shall provide:

- A visual status indicator that all systems are functioning properly
- Trouble-shooting capability to locate trouble areas down to the circuit level (for example, a PCB or module in the ABS System) for each component or sub-component on the Coach.
- Flexibility to allow the SFMTA to select or de-select the data to be stored

The software shall be user-friendly, simple to operate, and able to function without affecting the integrity of the data from each of the other systems. The Contractor shall provide sufficient training and manuals for the SFMTA personnel to operate the diagnostic testing software. All software shall be compatible with any PC laptop or desktop computer and must be approved by the SFMTA.

The integration shall also include the ability to retrieve this data through rugged, environmentally protected ports located strategically in the Coach. One data port shall be installed in the motor compartment and one in an easily accessible location at the front of the Coach. The SFMTA will work with the Contractor to determine the optimum locations for the data ports. The Contractor shall provide details of all required equipment to retrieve diagnostic data and/or event logs from these ports during the design review and the data ports shall have the capability to access and download all information as specified in this section.

10 WARRANTY AND SPARE PARTS

10.1 BASIC PROVISIONS

10.1.1 Warranty Requirements

Warranties in this document are in addition to any statutory remedies or warranties imposed on the Contractor. Consistent with this requirement, the Contractor shall warrant and guarantee to the SFMTA each complete Coach and specific subsystems and components according to the provisions listed in this section.

The Contractor shall ensure in its procurement arrangements that the warranty requirements of this Contract are enforceable through and against the Contractor's suppliers, vendors, and subcontractors. Any inconsistency or difference between the warranties extended to the SFMTA by the Contractor and those extended to the Contractor by its suppliers, vendors, and subcontractors, shall be at the risk and expense of the Contractor. Such inconsistency or difference will not excuse the Contractor's full compliance with its obligations under the Contract Documents.

Upon request of the SFMTA, the Contractor promptly shall provide to the Project Manager complete copies of written warranties or guarantees and of documentation of any other arrangement relating to such warranties or guarantees extended by the Contractor's suppliers, sub suppliers, vendors, and subcontractors covering parts, components, and systems utilized in the Coach. If any vendor/supplier to the Contractor offers a warranty on a component that is longer or more comprehensive than the required warranties stated in Figure 10-1, the Contractor shall inform the SFMTA of this additional warranty and pass it through to the SFMTA at no additional cost to the SFMTA.

The Contractor shall ensure that such suppliers, sub suppliers, vendors, and subcontractors satisfactorily perform warranty-related work.

10.1.1.1 Complete Coach

The Coach shall be warranted and guaranteed to be free from Defects and related Defects for two years or 100,000 miles, whichever comes first, beginning on the date of Conditional and/or Final Acceptance of each Coach. During this warranty period, the Coach shall maintain its structural and functional integrity. The warranty shall be based on regular operation of the Coach under the operating conditions prevailing in the SFMTA service area.

10.1.1.2 Subsystem and Components

Specific subsystems and components shall be warranted and guaranteed to be free from Defects and deficiencies. The Contractor shall provide the respective warranties to meet the times or mileages given in Figure 10-1 (Component Warranty), beginning on the date of Acceptance of each Coach. If a component, system, or piece of equipment is added to or

integrated into the Coach after the Coach is Conditionally Accepted, the warranty for that item will commence on the date of Acceptance of that item.

The basic body structure is composed of all components that are welded, riveted, or otherwise bonded together to form the main frame and body construction, including exterior panels, interior panels, roof, ceiling, and driver's barrier. Suspension beams, weldments, and structural members shall be considered as parts of the basic body structure. Bolted-on components and operating hardware are considered add-ons and therefore are not a part of the basic body structure.

Primary load carrying members of the Coach structure, including structural elements of the suspension, shall be warranted against corrosion failure and/or fatigue failure for a period of 12 years or 500,000 miles, whichever comes first.

The ESS shall be warranted and guaranteed to be free from Defects and related Defects for a period of 5 years or 300,000 miles, whichever comes first. The ESS warranty shall cover the replacement of any ESS modules.

10.1.2 Voiding Of Warranty

The warranty shall not apply to any part or component of the Coach that has failed as a direct result of misuse, negligence, or accident, or that has been repaired or altered in any way to affect adversely its performance or reliability, except insofar as such repairs were in accordance with the Contractor's maintenance manuals and the workmanship was in accordance with recognized standards of the industry.

The warranty on any part or component of the Coach shall also be void if the SFMTA fails to conduct normal inspections and scheduled preventive maintenance procedures on the same part or component substantially as recommended in the Contractor's maintenance manuals, and such failure by the SFMTA is the sole cause of the part or component failure.

FIGURE 10-1 HYBRID BUS SUBSYSTEM AND COMPONENT WARRANTY

Items	Description	Years*	Mileage*
1	Engine and all items supplied by its manufacturer	2	Unlimited
2	Emission Control System	5	100,000
3	Greenhouse Gas Emission related parts and systems	5	100,000
4	Traction Motor and control system	5	300,000
5	Traction Inverter and control system	5	300,000
6	Energy Storage System and control system	5	300,000
7	Drive and non-Drive Axles	5	300,000
8	Suspension	2	100,000
9	Brake System (excluding friction material)	3	150,000
10	Basic Body Structure	3	150,000
11	Structural Integrity and Corrosion Protection	12	500,000
12	Cooling System including electric fans	3	150,000
13	Heating, Ventilation, and Air Conditioning System	3	Unlimited
14	Power Steering System	3	150,000
15	Wheelchair Ramp System	3	150,000
16	Voice Annunciation System	3	150,000
17	Destination Signs	6	Unlimited
18	Door System	3	150,000
19	Air System, not limited to Compressor, Dryer, Tanks, Valves	3	150,000
20	Air Compressor	3	Unlimited
21	Air Dryer	3	150,000
22	Engine Starting System	3	150,000
23	Engine Power Supply (alternator)	3	150,000
24	Flooring	12	Unlimited
25	Sub Flooring	12	Unlimited
26	Electrical System (PLC)	3	150,000
27	LED Headlights	6	Unlimited
28	OEM Telematics	12	Unlimited
29	Paint	5	Unlimited
30	Tires	2	24,00
31	Road Calls	2	100,000

*Whichever Occurs First

10.1.3 Exceptions to Warranty

The warranty shall not apply to scheduled maintenance items and items furnished by the SFMTA, except insofar as such equipment may be damaged by the failure of a part or component for which the Contractor is responsible.

10.1.4 Detection of Defects

If the SFMTA detects a Defect within the warranty periods defined in Section 10.1.1, it shall notify the Contractor's representative within a reasonable time after discovery of the Defect. Within five working days after receipt of notification, the Contractor's representative shall either agree that the Defect is in fact covered by warranty, or reserve judgment until the subsystem or component is inspected by the Contractor's representative or is removed and examined at the SFMTA property or at the Contractor's plant. At that time the status of warranty coverage on the subsystem or component shall be mutually resolved between the SFMTA and the Contractor. Work necessary to commence the inspection or repairs, under the provisions of Section 10.2 (REPAIR PROCEDURES), shall commence within two working days after receipt of notification by the Contractor, unless such time is extended by the SFMTA, and shall be conducted in accordance with Section 10.2.1 (Repairs by Contractor). Specific detail about a manufacturer repair shall be reported to the SFMTA within 24 hours of said repair.

If the SFMTA and the Contractor are unable to agree whether a Defect is covered by the warranty provisions, the SFMTA may direct the Contractor to commence repairs in accordance with Section 10.2.1 (Repairs by Contractor), pending agreement by the SFMTA and Contractor whether the repairs are covered by the warranty provisions. The Contractor shall promptly comply with such a request by the SFMTA.

10.1.5 Fleet Defects

A "Fleet Defect" is defined as the failure of identical subsystems or components on at least 20 percent, but not less than two, of the Coaches ordered by the SFMTA in any calendar year, where such failure occurs prior to the expiration of the of the Fleet Defect warranty period applicable to the last such Coach accepted by the SFMTA.

Where, in the SFMTA’s opinion, such failure on multiple Coaches creates a safety hazard or may result in damage to the Coach, such failure may, at the SFMTA’s discretion, be considered a Fleet Defect, regardless of the proportion of such Defects identified.

For the purposes of identifying and addressing Fleet Defects, identical items include Major Components and subsystems purchased by the Contractor as complete units and/or serviced as complete units, such as the power train. If it can be demonstrated to the SFMTA’s satisfaction that only a component of a complete unit or subsystem needs to be changed or replaced to correct the problem, then changing or replacing such component in all Coaches may be acceptable. If it can be demonstrated to the SFMTA’s satisfaction that Defects can be isolated to a specific production batch, then changing or replacing components or subsystems of the specific production batch may be acceptable.

The Fleet Defect warranty shall not apply to normal wear and tear items (including, but not limited to, consumables such as tires, brake pads or components supplied by the SFMTA).

Where a Fleet Defect of a Major Component is not recognized by the applicable Major Component manufacturer or supplier as a Fleet Defect or to be covered under a fleet defect warranty of such manufacturer or supplier, the Contractor shall assume responsibility for the defect and make all commercially reasonable efforts to assist the SFMTA with obtaining a remedy from the Major Component manufacturer or supplier.

10.1.5.1 Repair Procedure and Corrective Action Plan

Following written notification of a Fleet Defect, it shall be the Contractor's responsibility to investigate and provide a permanent resolution regardless of failed component origin. This includes the management, notification, and communications with all suppliers, sub-suppliers, and/or subcontractors. The resolution shall be inclusive of all parts and materials used in the manufacture and delivery of an Acceptable Coach.

Within 10 working days of receipt of notification of a Fleet Defect (unless the SFMTA grants an extension), the Contractor shall provide the SFMTA with a corrective action plan, subject to review and approval by the SFMTA, which shall be applied to all past, pending, and future Coach orders under this Contract. After a corrective action plan has been established and approved by the SFMTA, the Contractor shall specify how and when all Coaches shall be corrected. After approval of the final work plan and schedule, the Contractor shall promptly undertake and complete the work program within the timeline established in the approved corrective action plan. The corrective work shall be reasonably designed to prevent the occurrence of the same Defect (including Related Defects) on all other Coaches and spare parts purchased under this Contract. Any proposed changes to a corrective action plan or program must be submitted to the SFMTA for its approval.

The SFMTA reserves the right to suspend delivery or acceptance whenever a Fleet Defect has been identified and the contractor is not meeting its obligations with respect to warranty service.

10.1.5.2 Responsibility for Corrective Work

The Contractor shall pay for all necessary labor and material to affect all repairs or modifications to all Coaches, including Coaches for which the warranty had expired. If one or more of the Contractor's suppliers do not honor these Fleet Defect provisions, the Contractor shall bear full responsibility for the repair of all Fleet Defects.

10.1.5.3 Warranty after Replacement or Repair of Fleet Defects

The warranty on parts or components used to remedy Fleet Defects shall begin when the retrofit parts are installed and shall be extended for the time and/or miles remaining on the original Coach warranty or the part manufacturer's warranty, whichever is first.

10.1.5.4 Supply of Parts

If a retrofit requires the Contractor to supply parts to the SFMTA, the Contractor shall ship the parts in individual kits, each kit consisting only of all the parts necessary to complete the repair/retrofit on one Coach. If retrofit parts are delivered to the SFMTA in any form other than individual kits, the Contractor shall undertake all work necessary to assemble parts into individual kits or shall reimburse the SFMTA (through the warranty claim process) for the cost of labor and materials required to do so.

Should the retrofit or redesign necessitated by a Fleet Defect render parts in the SFMTA's inventory obsolete, the SFMTA will return the obsolete parts to the Contractor for a full refund of their original cost, with no restocking fee or shipping cost, or, to the extent feasible, require the Contractor to supply new parts to replace the obsolete parts.

10.1.5.5 Failure to Comply -- Corrective Action Plan

If (a) Contractor does not provide a plan for correction within the time specified above (or as extended by the SFMTA); or (b) a specific declared Fleet Defect is not fully corrected within the time specified in the plan; or (c) the remainder of the Coaches are not corrected in accordance with the Contractor's work program; the SFMTA may begin assessing liquidated damages in accordance with Article 4.7 Liquidated Damages of the Contract 15 days after providing written notice to the Contractor.

10.1.5.6 Voiding of Warranty Provisions

The Fleet Defect provisions shall not apply to Coach Defects solely caused by noncompliance with the Contractor's recommended normal maintenance practices or by abuse of the equipment.

10.1.5.7 Exceptions to Warranty Provisions

Fleet Defect warranty provisions shall not apply to damage that is a result of normal wear and tear in service. The provisions shall not apply to the SFMTA-supplied items.

10.1.6 Contractor's Representative

The Contractor shall, at its own expense, provide qualified factory authorized service personnel at the SFMTA facilities from the time the first Coach is delivered until 60 days after the last Coach is accepted. The Contractor's service personnel shall be available on request to assist the SFMTA in the solution of engineering or design problems that are within the scope of the Technical Specifications and that may arise during the warranty period. Maintenance or repair instructions or suggestions from these representatives affecting warranty shall be in writing and directed to the SFMTA Project Manager. The Contractor's service personnel shall have authority to accept and approve warranty claims and make timely decisions affecting the repair of Defects.

On a daily basis, the Contractor shall supply a record of the Contractor's personnel working within the SFMTA property to the SFMTA supervisor or superintendent on site.

The record shall contain the following information: Date, Name, and the SFMTA Coach ID number being worked on. The Contractor shall inform the SFMTA in advance of any modifications proposed on the Coach during the warranty period.

The SFMTA will work with the Contractor's representatives as much as possible to minimize the costs and time involved in conducting warranty repairs; however, due to space constraints and labor agreements, the SFMTA cannot guarantee that any Contractor work will be performed on the SFMTA property.

10.2 REPAIR PROCEDURES

The Contractor shall be responsible for all warranty-covered repair work. The Contractor or its designated representative shall secure parts and perform all affected warranty repair work. At its discretion, the SFMTA may perform such work if it determines it needs to do so based on transit service or other requirements. The Contractor shall be responsible, and shall reimburse the SFMTA, for all costs for warranty work performed by the SFMTA personnel or by any contractor(s) hired by the SFMTA to perform warranty work, as described in Section 10.2.2, Repairs by SFMTA.

10.2.1 Repairs by Contractor

When the SFMTA requires the Contractor to perform warranty-covered repairs, the Contractor's representative must begin work necessary to effect repairs in a proper and timely manner within 10 working days after receiving notification of a Defect from the SFMTA. Whenever the Contractor makes warranty repairs, the Contractor shall use new parts, subcomponents, and subsystems, unless the repair of original parts is authorized in writing by the SFMTA. The SFMTA shall make the Coach available to complete repairs timely with the Contractor's repair schedule.

The Contractor shall provide, at its own expense, all spare parts, labor, tools, and space required to complete repairs. The Contractor shall reimburse the SFMTA for all expenses incurred, including labor for driving Coaches, or towing charges for Coaches transported, between the SFMTA's facilities and the Contractor's service center or the facilities of its subcontractors or suppliers for the warranty period as specified in section 10.1.1.1 Complete Coach and Figure 10-1 HYBRID BUS SUBSYSTEM AND COMPONENT WARRANTY. The Contractor may use the SFMTA shop space for repairs if approved by the SFMTA. If the SFMTA does not approve shop space the supplier shall use their own offsite location to repair the Coach. If the Coach is removed from the SFMTA property, the Contractor's representative shall diligently pursue the acquisition of parts and repair procedures. The schedule and scope of the repairs must be approved by the SFMTA and performed within 10 working days unless otherwise approved in writing by the SFMTA.

10.2.2 Repairs by SFMTA

If the SFMTA elects to perform, or procure a contractor to perform, the warranty-covered repairs, the requirements of this section shall apply.

10.2.2.1 Parts Used

The SFMTA shall use new parts, subcomponents, and subsystems that the Contractor shall provide specifically for this repair. The Contractor shall stock most required parts, including those of its sub-suppliers. All parts shall be stamped or permanently marked with the OEM part number, and serial number if applicable. Warranties on parts used shall begin once the Coach has been repaired. The OEM warranty will apply to the newly installed part with the manufacturer acknowledging the passed-through warranty.

The SFMTA shall use parts or components available from its own stock only on an emergency basis. Monthly reports, or reports at intervals mutually agreed upon, of all repairs covered by warranty will be submitted by the SFMTA to the Contractor for reimbursement or replacement of parts or components. The Contractor shall provide forms for these reports.

10.2.2.2 Contractor-Supplied Parts

The Contractor shall furnish parts for all warranty work, whether the warranty labor is performed by the Contractor or by the SFMTA. The Contractor shall deliver prepaid warranty parts for repairs within 72 hours of notification from the SFMTA. If longer than 72 hours, the Contractor must provide justification.

10.2.2.3 Defective Parts Return

The Contractor may request that Defective parts or components covered by warranty be returned to the manufacturing plant. The Contractor shall pay the total cost for this action. Materials will be returned in accordance with the Contractor's instructions. The Contractor shall provide such instructions to the SFMTA Project Manager at the beginning of the project.

The Contractor's representative shall meet with an SFMTA representative on a monthly basis to determine which parts need to be returned to the manufacturer for evaluation, or which parts may be discarded.

10.2.2.4 Reimbursement for Labor

The Contractor shall provide reimbursement for warranty labor hours to the SFMTA. The amount shall be determined by multiplying the number of man-hours required by a qualified

mechanic to correct the defect. The warranty labor rate charged to the Contractor will be the day shift hourly wage rate of a Mechanic. Unless otherwise agreed by the SFMTA and the Contractor, the warranty labor rate charged to the Contractor will be the current fully burdened hourly wage rate of a 7381 Automotive Mechanic. As of March 2023, the warranty rate is $179.96 per hour, based on the Mechanic wage rate of $51.74 per hour. The labor rate shall be agreed to, in writing, at Conditional Acceptance of the pilot Coach, and is to be fixed for a period of one year. The warranty labor rate may be adjusted each year to match the current fully burdened hourly rate; the yearly rate adjustment must not exceed the Producer Price Index (WPU1413 - Truck and Bus Bodies) for that year. The labor hours spent on diagnostic time will not be included in the warranty claim.

The Contractor shall reimburse the SFMTA for approved warranty claims within 60 Days after the date that the Contractor has received the failed components. If the SFMTA does not receive payment within 60 Days, the SFMTA may deduct the amount of the approved claim from the progress payments due to Contractor.

10.2.2.5 Reimbursement for Parts and Towing

In the event the SFMTA deems it necessary to contract out for warranty repairs, the SFMTA shall notify the Contractor, and the Contractor shall approve the warranty repair before the SFMTA proceeds with contracting out the repair. The Contractor shall reimburse the SFMTA for the actual cost of the repair, including charges for any warrantable parts, consequential parts or damages, labor, and towing or transportation. The SFMTA may impose a handling charge of up to 15% of the total cost of the warranty parts not to exceed $250 per claim plus applicable taxes.

The Contractor will be responsible for the cost of towing for two years or 100,000 miles if such action was necessary and if the Coach was operating in regular revenue service.

The Contractor shall reimburse the SFMTA for approved warranty claims within 60 Days after each warranty claim has been submitted by the SFMTA. If the SFMTA does not receive payment within 60 Days, the SFMTA may deduct the amount of the approved claim from the progress payments due to Contractor.

10.2.2.6 Major Component Repairs

To the extent that suppliers of Major Components require that warranty repairs be performed by an authorized dealer for those components, the SFMTA acknowledges that if it elects to repair these components without written permission from the original equipment manufacturer, the remaining warranty may be voided.

10.2.3 Warranty after Replacement or Repairs

The warranty on parts, components, or subsystems replaced as part of a standard warranty repair shall have the unexpired warranty period of the original subsystem, effective the

replacement date. Extended warranties shall begin on the date of the repair or replacement of the parts, components, or subsystems.

10.2.4 Failure Analysis

At the SFMTA's request, the Contractor, at its cost, shall conduct a failure analysis of a failed part involved in a Fleet Defect or that is safety-related or a Major Component that could affect fleet operation that has been removed from Coaches under the terms of the warranty. The analysis shall be documented and compiled into a report. The failure analysis reports shall be delivered to the SFMTA Project Manager within 60 Days of the receipt of failed parts.

10.3 DATA PROCESSING

10.3.1 Warranty and Computer Program

The SFMTA's preference is to use the latest SFMTA in-house warranty module for all tracking and submission of Warranty repairs and/or claims. All systems modifications, parts retrofits, and factory recalls must be documented for integration into warranty software.

If an alternative Warranty technology is proposed, it shall be made available to the appropriate SFMTA staff without any restrictions.

10.3.2 Warranty Data

The warranty data shall be provided in Microsoft Excel format with the following data elements for the Contractor's warranty and manufacturer warranties on all individual components and part(s). The SFMTA will provide Vendor IDs to be used for this data. At the start of the project, the Contractor shall provide a complete list of all manufacturers and/or vendors that the Contractor will use in building the Coaches. The SFMTA will provide Vendor IDs for use for the following warranty data.

10.3.2.1 Main Header Information

The main header shall include the name of the recipient of the Warranty, Vendor ID, contacts who are contracted to perform the warranty work, and a vendor contract number if there is one.

10.3.2.2 Details of the Warranty Conditions

A. If the warranty is a Coach Class warranty, give the term value, unit of measure and reimbursement type.
B. If the warranty is system-related, give the term value, unit of measure, reimbursement type, whether the condition is prorated, and whether the warranty term value flows down to underlying attached components of the system.
C. If the warranty is a component-type of warranty, give the term value, unit of measure, reimbursement type, whether the condition is prorated, and whether the warranty term value flows down to underlying attached components.

D. If the warranty condition is an item warranty from Contractor or a subcontractor that manufactures parts for the Contractor, then please provide the following information: Main header information as described above, manufacturer part number, part description, term value, unit of measure, term type, reimbursement type, and whether the condition is prorated.
E. Data and data processing procedures must be approved by the SFMTA to ensure compliance with these specifications and compatibility with the SFMTA's data processing methods.

10.3.3 Database Information

The Contractor shall supply data on the fleet to the SFMTA in an electronic format to facilitate its loading into the SFMTA in house inventory software system. This section provides layouts and data requirements for the required data elements. The Contractor may supply this information in its choice of:

- Microsoft Excel
- Microsoft Access
- Oracle tables

The SFMTA has no preference among the above, but all provided database files must be in the same format. Files will be provided via email, file-sharing websites, or electronic data storage media using the Contractor's choice of format from the above options.

10.3.3.1 Coach Master File

The Contractor shall provide a record for each Coach at the time of delivery. The Contractor shall provide a sample of the Coach master file structure for the SFMTA to review and approve.

This record shall be intended for import into the SFMTA's own database system, shall have no access restrictions, and shall not be indexed. The Contractor may supply a single file, which contains records for multiple Coaches.

At a minimum, the following Coach components shall be serialized and included in the record for the Coach:

Engine	Alternator
Exhaust after-treatment device	Steering gear box
Differential	Brake booster
Traction Motor	HVAC
Traction Generator	Front axle
Energy Storage System (ESS)	Rear axle
ECU (Electronic Control Unit or similar)	Electronic Cooling Package (ECP)
Propulsion Control System (PCS)	Hydraulic pump

Destination sign(s)	Wheelchair ramp
Air compressor	
Any auxiliary modules such as a radio or GPS system, which is installed by the vendor	

Serialized tire "brands" table records will also be provided but will be provided in a separate file. The locations for tires on each Coach are as follows:

- Left front
- Right front
- Inner left center (as applicable)
- Outer left center (as applicable)
- Inner right center (as applicable)
- Outer right center (as applicable)
- Inner left rear
- Outer left rear
- Inner right rear
- Outer right rear

10.3.3.2 Illustrated Parts Catalog Master File

The Contractor shall provide the Illustrated Parts Manual via an approved electronic file format that the SFMTA can import into parts inventory database. The Contractor shall provide a sample of the Parts Catalog Mater file structure for the SFMTA to review and approve.

10.3.3.3 Publications Software

The Contractor shall provide the following drawings via an approved electronic file format, including all required software and licenses.

- Maintenance Manuals
- Parts Manuals
- Training Manuals
- Wiring and Air Diagrams

The wiring diagrams and schematics shall be provided in CAD format such that the SFMTA can modify the drawings as needed. In lieu of providing the wiring diagrams and schematics in CAD format, the Contractor shall modify the wiring diagrams and schematics upon request by the SFMTA for the 12-year life of the Coach. The schematics shall be updated within 60 Days of the SFMTA’s request.

10.4 SPARE PARTS AND SPECIAL TOOLS

The Contractor shall furnish the spare parts and special tools per Article 4.4.1 and Article 4.4.2 of the Agreement. The parts and equipment shall be identical to and totally interchangeable with like items supplied with the Coaches. Delivery of these parts and equipment shall be completed prior to delivery of the first production Coach unless otherwise approved by the SFMTA.

Parts manuals shall be completed prior to the delivery of the first production Coach. Production of the remaining Coaches shall not commence until the SFMTA has reviewed and formally accepted the parts manuals.

The Contractor shall provide a parts cross reference table, identifying sub-suppliers and their part numbers for all parts that are not manufactured by the Contractor.

The Contractor shall update the parts books files with any changes made for the 12 years after the initial production of the SFMTA Coaches described in this request. Any urgent updates shall be handled on a case-by-case basis, at the SFMTA's discretion. The parts books shall have the following indexes sorted in the following order:

- By part manufacturer's description
- By Coach manufacturer's description
- By part manufacturer's part number
- By Coach manufacturer's part number

The Contractor shall provide consistent pricing for six-month intervals and shall provide a corrected price sheet every six months. The detail of the parts books shall be to the level of providing bolt size, lengths, and metal grades in addition to cross reference to the part manufacturer or component manufacturer's part number. In the event there are updates which affect the durability, reliability or safety of spare parts and components supplied as part of this contract, or if there is a running change made during production, the Contractor shall exchange on a one-for-one basis the originally purchased parts with the new superseded parts within 60 Days of their release.

10.4.1 Recommended Spare Parts from Build Sheet

The Contractor shall submit a recommended spare parts list for the SFMTA's use when planning and ordering spare parts and to support the SFMTA's initial start-up for revenue operation.

The quantities shall be based on the quantity of Coaches on order at the time the parts list is generated and shall be sufficient to cover the SFMTA's reasonable needs for five years.

Spare parts shall be interchangeable with their corresponding part. All spare parts shall be reconfigured to the latest revision during the warranty period. The recommended spare parts list shall take into consideration the potential for certain unused parts and assemblies to "age"

and otherwise experience degradation in performance or reliability when installed. All such parts and assemblies should be clearly marked with date of manufacture, ideal storage conditions information, and shelf-life date. This information tag should be clearly visible when the part, container, or assembly is stored.

10.4.1.1 Contractor's Recommendations/Prices

The Contractor's recommended spare parts list shall include the following:

I. Grouping by system, and special tool for stocking identification.
II. Generic name, trade name, description, rating, accuracy, Contractor's part number, original equipment manufacture's (OEM's) name, OEM's part number, drawing references, and correlation with the maintenance manuals.
III. Correlation for the recommended quantities with reliability requirements and lead time based on the following classifications:

- Consumable – Parts with an expected life of less than five years.
- Wear – Parts that may be expected to require regular replacement under normal maintenance schedules, such as mechanical parts subject to continuous operation.
- One Shot – Parts that normally require replacement after performing their function one time, such as fuses.
- Long Lead (three months or greater) – Parts that are not readily available from distributors or manufacturer, such as specially made.

IV. Exchange Assemblies – Assemblies that will be exchanges with failed units (or units that are not responding as specified) on the supplied equipment and that must be inventoried as complete assemblies.
V. A cross-reference and indexing system for replacement components common to more than one subsystem (whether Coach, test equipment, or special tool). Such components shall have only one-part number.
VI. Alternate sources of supply for all commercially available replacement parts.
VII. Current prices for all replacement parts.

10.4.2 Availability

The Contractor shall guarantee the availability of replacement parts for the Coaches for at least a 15-year period after the date of Acceptance of the last Coach. Spare parts shall be interchangeable with the original equipment and shall be manufactured in accordance with the Quality Assurance Provisions in these Technical Specifications. The Contractor shall guarantee availability of 14-Day delivery or less from receipt of normal purchase order. The Contractor shall not make exclusive agreements with sub-suppliers that would preclude the SFMTA from purchasing components directly from sub-suppliers. The Contractor shall be able to expedite delivery (e.g., overnight delivery) of emergency shipments for 85% of the Coach parts.

Spare parts must be available to repair all electronic assemblies and subassemblies. Special provisions shall be made to supply those components that are not readily available on the commercial market (custom parts, for example). Any custom-made transformers, inductors, programmable components, or other devices containing proprietary firmware, shall be made available to the SFMTA as spare parts. When the original manufacturer is no longer able to supply the spare IC's, the associated proprietary firmware, design specifications, and other relevant detail must be provided to the SFMTA at that time.

11 RELIABILITY, MAINTAINABILITY, AND SAFETY

The Contractor shall establish and maintain an efficient reliability program to maintain the Mean Distances Between Failures (MDBF) as specified in Section 11.2 (VEHICLE RELIABILITY REQUIREMENTS). The Contractor's reliability engineering tasks shall focus on the prevention, detection, and correction of reliability design deficiencies, weak parts, and overall work quality defects. Reliability engineering shall be an integral part of the Coach design process, including design changes. The reliability program shall monitor and control sub-suppliers' design and manufacture of parts to ensure compliance with the Reliability requirements and the Contract terms.

11.1 SERVICE LIFE

The Coach, including all subsystems, shall be designed to operate in transit service for at least 12 years or 500,000 miles. It shall be capable of operating at least 40,000 miles per year, up to and including its 12th year. Components and structural members shall be designed to withstand the loads and motor torque reactions expected in revenue service on any route in San Francisco.

11.2 VEHICLE RELIABILITY REQUIREMENTS

The Coaches shall be designed to meet the service goal for a Mean Distance Between Failures (MDBF) of 12,000 miles. The Contractor shall demonstrate compliance with these reliability requirements on all Coaches during their first year or first 40,000 miles in revenue service.

11.3 FAILURES

Failure definitions are for the purpose of reliability demonstration testing, specification compliance and warranty administration.

Classification of failures are described below:

- Bad Order: A failure that does not require removal of the Coach from service during its assignments but does degrade Coach operation. The failure shall be reported by operating personnel.
- Physical Safety: A failure that could lead directly to passenger, operator, or maintainer injury.

11.3.1 Accountable Failures

Failures that are determined by the Failure Review Board (reference Section 11.4) to have been caused by a design flaw or Defect in the Coach subsystems or components shall be tallied against the applicable warranty and Fleet Defect provisions of this Contract. Failures that are tallied for calculating the achieved reliability are those that meet the following criteria:

A. They are detected on the equipment during any period the test is in process and test time is being accumulated and recorded - all safety-critical failures are accountable.
B. They are verified by subsequent re-testing or investigation.
C. They are independent (primary) failures.

In addition, an item failure will be accountable and included in the MDBF calculations when one or more of the following conditions exists:

- Inability of the equipment to attain or sustain minimum specified output requirements.
- Item failure symptoms that are detected during operation and recur in subsequent re-testing, but diagnosis and determination of the basic cause cannot be accomplished.
- Multiple independent (primary) item failures detected on the equipment during measurement test time (these will be individually accountable).

11.3.2 Non-Accountable Failures

Item failures will be excluded from the MDBF computations when one of the following conditions exists:

- The item failure cannot be duplicated during subsequent re-test, and the cause cannot be determined by investigation and analysis. The SFMTA will judge the adequacy of the Contractor's analysis for this determination.
- The item failure is a dependent (secondary) failure resulting from an independent (primary) failure.
- The item failure is caused by mishandling, abuse, improper storage, or accidental damage.
- The item failure is the direct result of improper test procedure or improper test equipment.
- The failure is a recurrence of an earlier failure thought to have been corrected by adjustment or repair and occurs within 20 test hours of the original failure.
- The item failure occurred in a unit that had been subjected to verified operational or environmental stresses beyond design requirements.

11.4 FAILURE REVIEW BOARD

A Failure Review Board with members from the SFMTA and the Contractor may be convened to periodically review and determine the relevance of each failure and to recommend appropriate corrective action both for Coahces undergoing reliability demonstration testing and for those under warranty. The Failure Review Board shall be in effect during the complete warranty period of each Coach, and as necessary to resolve Fleet Defects.

11.5 MAINTAINABILITY

The Contractor shall establish and maintain an efficient maintainability program to support the maintainability requirements as specified in Section 11.5.4 (Maintenance and Inspection) of the Contract. Maintainability engineering shall be an integral part of the Coach design process,

including design changes. Methods shall be taken to assure the sub-suppliers' efforts are consistent with the overall system requirements.

All systems or components serviced as part of periodic maintenance or whose failure may cause a physical safety hazard or road call shall be readily accessible for service and inspection. To the extent practicable, removal or physical movement of components unrelated to the specific maintenance or repair tasks involved shall be unnecessary. Relative accessibility of components, measured in time required to gain access, shall be inversely proportional to frequency of maintenance and repair of the components. Accessibility to components needing frequent maintenance shall be considered during the design reviews. The body and structure of all Coaches shall be designed for ease of maintenance and repair. Ease of repair shall correspond to the vulnerability of the item to damage in service.

The Contractor shall provide all maintenance manuals to the SFMTA.

(Reference Section 9.2, Publications: MAINTENANCE MANUALS, ILLUSTRATED PARTS MANUALS, OPERATOR'S MANUALS, & VEHICLE RECORD BOOKS).

11.5.1 Special Tools and Diagnostics Equipment

Each Coach shall be designed for disassembly, re-assembly, servicing, and maintenance by use of tools and items, which are normally available as commercial standard items. Electronics assemblies and subassemblies shall also be maintainable using standard, commercially available test equipment and maintenance tools. The Contractor shall provide a list of all special tools and any special information that is needed to repair and reassemble electronic assemblies. All grease fittings shall be capable of being serviced from a pitted area. Jacks or dollies shall be specified to remove the energy storage system, traction motor, wheelchair ramp, and other large systems.

The following list of special tools and diagnostic equipment shall be available for purchase through the Contractor upon delivery of the first Coach. All tools and electronic test equipment described throughout this section must be of heavy-duty industrial grade quality approved by the SFMTA. Where software is provided to operate diagnostic equipment, a subscription for maintenance, support, and updates to that software should be included for the warranty period, including access to calibration codes.

11.5.1.1 Special Purpose Electrical and Electronic Diagnostic Tools

The Contractor shall provide pricing information for a complete set of industrial quality electrical and electronic system test equipment and diagnostic tools, to include digital multi-meters (Fluke 87E or approved equal), scope meters (Fluke 124 or approved equal), carbon pile testers, inductive pick-up ammeters, PLC logic analysis software and computer interface connectors, and other software.

The Contractor shall provide pricing information for a complete set of ESS maintenance, tune-up, and diagnostic tools, to include laptop computers, software, and connectors. Laptops are to be MIL-STD-810G compliant or equivalent, having the storage and performance capacity to effectively handle all the diagnostics utilized on the Coach, or approved equal having equivalent or superior durability, dependability, and ease of use. At a minimum they are to be equipped with 500 GB of SSD memory, 8 GB of RAM, one USB 2A port, and one serial (RS232) port or alternative port as required for interfacing with diagnostic tools.

11.5.1.2 Special Purpose Hybrid Drive System Tools

If applicable, the Contractor shall provide pricing information for a complete set of hybrid drive maintenance and diagnostic tools, to include electronic diagnostic data software, computer connectors, printers, and hand-held diagnostic data readers shall be used for reading trouble codes stored in ECM memory and for providing operating information about the hybrid drive system

11.5.1.3 Special Differential and Propeller System Tools

The Contractor shall provide pricing information for a complete set of OEM installation and removal tools needed to maintain the differential and propeller shaft systems and for a set of differential overhaul tools.

11.5.1.4 Tow Equipment

The Contractor shall provide pricing information for a set of specialized tow adapters, if required.

11.5.2 Electrical Maintainability

Electrical subsystems shall consist of replaceable units so that each major component, panel, or wiring harness is easily separable with standard hand tools or by means of connectors. Each unit, except the main body wiring harness, shall be removable and replaceable in less than 30 minutes by a mechanic.

11.5.3 Tire Replacements

A mechanic shall be able to raise the Coach and change any one tire in less than 30 minutes from the time the Coach is approached.

11.5.4 Maintenance and Inspection

Scheduled maintenance or inspection tasks as specified by the Contractor shall be within the prevailing industry practices and subject to the SFMTA approval.

Scheduled maintenance tasks shall be related and shall be grouped in maximum mileage intervals. Routine scheduled maintenance actions shall not be required at intervals of less than

1,500 miles. Higher levels scheduled maintenance tasks shall occur at even multiples of 6,000 miles. It shall be possible for a mechanic to accomplish the scheduled maintenance or inspection tasks as specified by the Contractor in a reasonable amount of time.

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.

The Contractor shall give prime consideration to the routine problems of maintaining the Coach. All coach components and systems, both mechanical and electrical, which will require periodic physical work or inspection processes, shall be installed so that a minimum amount of time is consumed in gaining access to the critical repair areas. Each Coach shall be designed such that it shall not be necessary to disassemble portions of the Coach structure and/or equipment such as seats and flooring under seats to gain access to these areas. Each coach 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 Coach 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.

11.5.5 Hazards

A Hazard is defined as any real or potential condition that can cause injury or death, or damage to or loss of equipment or property.

11.5.5.1 System Safety Program Objectives

The Contractor shall have the responsibility of developing a system safety program that shall as a minimum have as its objective minimizing Hazards. The system safety program shall also be consistent with FTA guidelines, which certify the Vehicle Acceptable for revenue service and maintenance. System safety engineer/personnel shall be identified and shall be involved throughout the entire program. System safety engineer/personnel shall be responsible for problem identification, resolution reporting and submitting design changes affecting safety to the SFMTA Project Manager / Representative for approval.

11.5.5.2 System Safety Criteria

Criteria for system design and subsequent operation procedures shall assure that system safety objectives for Coaches are implemented throughout design development, testing, delivery, operations, and maintenance. Safety of passengers, mechanics and operator shall be taken into full consideration.

Potential or actual Hazards that have been identified through analysis shall be limited in accordance with the following order of precedence:

- Design for minimum Hazard
- Use of safety devices
- Use of warning devices
- Use of special procedures.

11.5.5.3 System Safety Data

The Contractor shall provide appropriate system safety information and procedures for inclusion in training instructions, lesson plans and other publications.

12 QUALITY ASSURANCE

12.1 CONTRACTOR IN-PLANT QUALITY ASSURANCE REQUIREMENTS

12.1.1 Quality Assurance Organization

The Contractor shall establish and maintain an effective in-plant quality assurance (QA) organization. It shall be a specifically defined organization directly responsible to the Contractor's top management.

12.1.1.1 Control

The QA organization shall exercise quality control over all phases of production from initiation of design through manufacture to preparation for delivery. The organization shall also control the quality of supplied articles.

12.1.1.2 Authority and Responsibility

The QA 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 Coaches. These responsibilities include assuring that all components meet the engineering requirements for reliability, safety, and maintainability. The SFMTA or its representatives shall be allowed to participate in all Contractor and/or subcontractor tests and inspections of all components of the equipment, at the Contractor’s and subcontractor’s plants, for the purpose of QA.

12.1.2 Quality Assurance Organization Functions

The functions of the QA organization shall include, but not be limited to, the following:

12.1.2.1 Work Instructions

The QA organization shall verify inspection operation instructions to ascertain that the manufactured product meets all prescribed requirements.

12.1.2.2 Records Maintenance

The QA 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 Inspector(s). Inspection and test records for this procurement shall be available for a minimum of two years after inspections and tests are completed.

12.1.2.3 Corrective Actions

The QA organization shall detect and promptly assure correction of any conditions that may result in the production of Defective Coaches. These conditions may occur in designs, purchases, manufacture, tests, or operations that culminate in Defective supplies, services, facilities, technical data, or standards. When repetitious rejections occur above 10%, the Contractor shall prepare a written report for the SFMTA detailing the problem(s) discovered during inspection and the efforts to be taken to remedy the problem(s). No further acceptance or production shall take place until the Contractor notifies the SFMTA in writing that the problems have been completely resolved.

12.1.3 Standards and Facilities

The following standards and facilities shall be basic in the QA process:

12.1.3.1 Configuration Control

The Contractor shall maintain drawings, assembly procedures, and other documentation that completely describe a qualified Coach that meets all the specification requirement options and special requirements of this procurement. The QA organization shall verify that each Coach is manufactured in accordance with these controlled drawings, procedures and documentation.

12.1.3.2 Measuring and Testing Facility

The Contractor shall provide and maintain the necessary gauges and other measuring and testing devices for use by the QA organization to verify that the Coaches 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.

12.1.3.3 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 accurate at formally established intervals and adjusted, replaced, or repaired as required to maintain quality.

12.1.3.4 Equipment Use by Resident Inspector(s)

The Contractor's gauges and other measuring and testing devices shall be made available for use by the Resident Inspector(s) to verify that the Coaches conform to all specification requirements. If requested, the Contractor's personnel shall be made available to operate the devices and to verify their condition and accuracy.

12.1.4 Control of Purchases

The Contractor shall maintain quality control of purchases.

12.1.4.1 Supplier Control

The Contractor shall require that each supplier maintain a quality control program for the services and supplies that it provides. The Contractor's QA organization shall inspect and test all 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.

12.1.4.2 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 the SFMTA Coaches.

12.1.5 Manufacturing Control

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.

12.1.5.1 Completed Items

A system for final inspection and test of completed Coaches and the spare parts package shall be provided by the QA organization. It shall measure the overall quality of each completed item.

12.1.5.2 Nonconforming Materials

The QA organization shall monitor the Contractor's system for controlling nonconforming materials. The system shall include procedures for identification, segregation, and disposition.

12.1.5.3 Statistical Techniques

Statistical analysis, tests, and other quality control procedures may be used when appropriate in the QA processes.

12.1.5.4 Inspection Status

A system shall be maintained by the QA organization for identifying the inspection status of components and completed SFMTA Coaches. Identification may include cards, tags, or other normal quality control devices. A “traveler” shall be attached to each Coach to track QA functions and defects as the work progresses through the shop. A copy of the report must be attached to each Coach upon coach delivery.

12.1.6 Inspection System

The QA organization shall establish, maintain, and periodically audit a fully documented inspection system. The system shall prescribe inspection and test of materials, work in progress, and completed articles. As a minimum, it shall include the following controls:

12.1.6.1 Inspection Stations

Inspection stations shall be at suitable 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.

Inspection stations shall permit inspectors to inspect or test characteristics before they are concealed by subsequent fabrication or assembly operations. These locations shall include but not be limited to underbody structure completion, body framing completion, body prior to paint preparation, traction motor installation completion, subsystem components, underbody dress-up and completion, Coach prior to final paint touch-up, Coach prior to road test, and Coach after final road test.

12.1.6.2 Inspection Personnel

Sufficient trained inspectors shall be employed to ensure that all materials, components, and assemblies are inspected for conformance with the Coach design and specifications.

12.1.6.3 Inspection Records

Acceptance, rework, or rejection records shall be attached to inspected articles. Articles that have been accepted after review by the Contractor and the City shall be identified. Articles that have been reworked to specified drawing configurations shall not require special identification. Articles rejected as unsuitable or as scrap shall be plainly marked and controlled to prevent installation on the Coach. Articles that become obsolete due to 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 Inspector(s) during assembly shall be entered by the inspection personnel on a record that accompanies the major component, subassembly, assembly, or Coach 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 SFMTA shall approve the modification, repair, or method of correction to the extent that the Contract specifications are affected. The inspection forms shall be posted at or

near the point of inspection for each coach and included in the Vehicle History Book when all discrepancies have been addressed.

An Inspection and Test Log (Log) shall be maintained by the Contractor during equipment assembly. The Log shall be submitted to the SFMTA for review before each Coach will be released for shipment to the delivery site. All Contractor and SFMTA in-process inspection sheets and test data records for that car shall be contained in this Log, which will be provided in the Vehicle History Book (see Section 12.2.3.3 – Vehicle History Book).

12.1.6.4 Quality Assurance Audits

The Contractor's QA organization shall establish and maintain a quality control audit program. The Contractor shall submit a Quality Assurance Plan for the SFMTA review and approval prior to the commencement of building the first Coach of this Contract.

Records of this program shall be subject to review by the SFMTA representatives during the manufacture of Coaches for this Contract.

12.1.6.5 First Article Inspection

The first article Coach shall undergo a detailed inspection by the SFMTA personnel or representatives. The purpose of this inspection will be to ensure that the Coach has been built to approved engineering standards and that all agreed-upon specifications have been incorporated. The configuration established at this inspection shall become a benchmark for all future production Coaches.

Dependent on circumstances, the first built Coach may have to participate in the Federal Bus Testing Program "Altoona Test" to qualify this procurement for federal funding. The Contractor shall inform the SFMTA of the status of the proposed Coach regarding the required testing prior to its manufacture.

The SFMTA may require this Coach be kept at the manufacturing plant to ensure its availability as a "template" in the event there is a question concerning the production Coaches conforming to this pattern.

Coach inspection snag list will be transmitted to the SFMTA and the assembly line for immediate production corrections, so as not to have repeated delivery of Coaches with repeat snags. Corrections shall be made at the manufacturing facility prior to delivery and contractor shall provide a corrective action report to the SFMTA explaining what was done to prevent these from occurring on later Coaches.

12.1.7 Resident Inspector

Resident Inspector(s) shall represent the SFMTA at the Contractor's plant. They shall monitor, in the Contractor's plant, the manufacture of transit Coaches built under the procurement. The

Resident Inspector(s) will be authorized to approve the pre-delivery Acceptance tests, and to release the Coaches for delivery. Upon request to the QA manager/supervisor, the Resident Inspector(s) shall have access to the Contractor's QA files related to this procurement. These files shall include drawings, material standards, parts lists, inspection processing and reports, and records of Defects.

No less than 30 Days prior to the beginning of Coach manufacture, the Resident Inspector(s) will meet with the Contractor's quality assurance manager/supervisor. They will review the inspection procedures and checklists. The Resident Inspector(s) may begin monitoring Coach construction activities two weeks prior to the start of the SFMTA Coach fabrication.

The Contractor shall provide office space for the Resident Inspector(s) in proximity to the final assembly area. This office shall be equipped with desks, chairs, file cabinets, internet access, and clothing lockers sufficient to accommodate the Resident Inspector staff, or otherwise be equivalent to offices utilized by the Contractor's staff.

The presence of the Resident Inspector(s) in the plant shall not relieve the Contractor of its responsibility to meet all the requirements of this procurement.

12.1.8 Compliance Demonstration

Upon written request of the SFMTA Project Manager or a Representative, the Contractor shall demonstrate compliance with any requirement in these Specifications. Requests shall normally be made such that the demonstration can be scheduled in advance of the delivery of the prototype and production Coaches. Other demonstrations may be requested after delivery should the SFMTA Project Manager or a Representative suspect that the prototype or production Coaches are not in conformance to these Specifications. The demonstrations shall consist of formal tests conducted on the prototype and/or representative production Coaches and witnessed by the SFMTA Project Manager or a Representative. In lieu of conducting tests of a destructive nature, the demonstration requirement may be satisfied by a comprehensive analysis of sufficient scope and quality to show specification compliance. The burden of demonstrating compliance rests on the Contractor but is subject to approval by the SFMTA Project Manager. The Contractor shall be responsible for associated costs to demonstrate compliance and any work required to correct any non-compliance conditions.

12.2 TEST REQUIREMENTS

12.2.1 General

This Section defines and establishes the requirements for comprehensive testing of the Coaches to be developed and managed by the Contractor. The SFMTA or its authorized representatives will have the option of overseeing all testing. The tests shall ensure proof-of-design and shall determine the compliance with the following requirements:

- Duty cycle and performance
- Dimensional requirements
- Accessibility (ADA) requirements
- Noise control (audible and electronic)
- Contract compliance
- Braking, Parking brake & Hill Holder
- Jerk rate
- Air compressor recovery rate

The tests shall also ensure that the production Coaches, including all components and subsystems, will function as required in the SFMTA environment. Modifications to the system programming, and specification of related subsystems (including rear axle ratio), shall be made as needed to best meet these requirements. Reliability shall be emphasized. Design qualification, production conformance, and acceptance testing on all Coach components and subsystems are required and subject to review and approval by the SFMTA.

Criteria for evaluating Coaches in the pre-delivery and post-delivery tests will be uniform.

12.2.1.1 Submittals

The following items shall be submitted for SFMTA approval:

- Test program
- Test procedures
- Test reports, training manuals, O&M manuals

12.2.1.2 Test Program

The test program shall include all tests required to verify compliance with these specifications. In general, all specified requirements shall be subject to verification by test. Tests, by definition, include visual observation, non-destructive examination, equipment operation under extreme environmental conditions, accelerated-life operation, normal performance, abnormal performance, observation of normal operation and maintenance, and results of induced failures/faults.

The Test Program shall identify all tests by reference to the appropriate specification section. The test program shall cover all the Contractor's and its sub-suppliers' tests and location of tests to be completed prior to Coach delivery and identify all testing to be conducted by the Contractor on the SFMTA property prior to Acceptance. The SFMTA requires the brake test program to be completed in the SFMTA San Francisco service area. As part of this Contract, for tests which the Contractor proposes will be performed outside of the SFMTA's San Francisco service area, the Contractor shall provide travel and expenses for two SFMTA representative witnesses.

Rates and duration shall be based on accepted FTA guidelines for the area being traveled to. The Contractor shall manage the testing and reporting process. The Test Program shall provide, for each major subsystem, a detailed explanation of how the requirements of this section will be met. Cases where the Contractor intends to meet the requirements of this section through some means other than testing shall be identified in the Test Program.

12.2.1.2.1 Test Facilities

The Contractor shall provide competent personnel in appropriate technical disciplines to ensure an uninterrupted test program. Where appropriate, tests shall be conducted under simulated operating conditions. Special tools, test equipment, instrumentation, data processing, and spare parts required during testing shall be furnished by the Contractor. Supplied equipment and parts shall be removed from the SFMTA's facilities at the conclusion of testing.

12.2.1.2.2 Test Procedures

The Contractor shall submit an overall test procedure for each design qualification and conformance tests and each acceptance test for approval 30 Days prior to the scheduled date of the test.

The Contractor shall provide all equipment and instrumentation required to conduct tests. Training to observe or participate in the test, if required of the SFMTA, shall be provided by the Contractor. The test procedures shall contain at least the following:

- Test objective
- Success/failure criteria and justification for criteria in quantitative terms
- Sequence of testing
- Equipment and instrumentation required
- Test setup, description, and diagrams
- Test methodology
- Data evaluation procedure
- Type of report or data to be submitted to the SFMTA.

With prior approval, the Contractor may submit proven existing procedures that differ from this format. At least 30 Days prior to each test, the Contractor shall notify the SFMTA Project Manager/Representative in writing of the date, time, and location the test will be performed.

The SFMTA or its authorized representative will have the right to witness all tests. The tests specified herein are specific tests requested by the SFMTA. The Contractor, with the SFMTA direction and approval, is required to develop a complete list of design and component qualification test and pre- and post-delivery tests. The Contractor and its subcontractors may perform additional testing, as they deem necessary.

12.2.1.2.3 Test Reports

Within 30 Days after successful completion of each test, a report shall be provided that summarizes results, analyses, and corrective actions.

Reports shall include photographs, charts, and additional data as necessary to support the test results. Reports must include a statement that certifies conformance to specified requirements. Should submitted data not be acceptable to the SFMTA, the Contractor shall complete the tests as specified with no increase in contract cost or extension of the delivery schedule.

The reports of each test shall be included in the appropriate Coach History Book.

12.2.1.2.4 Design and Component Qualification and Conformance Testing

The Contractor shall demonstrate that each component supplied meets the requirements of these specifications.

In cases where testing costs would be excessive, or where test results might be inconclusive, design integrity may be demonstrated through analyses. In cases where the component or subsystem in question is substantially similar in design and application to equipment previously used in transit service, the design may be qualified through submission of revenue service data.

In all other cases, the Contractor shall conduct a proof-of-design test that demonstrates that the requirements of these specifications are met. These tests need not be repeated if they are successfully completed and witnessed. If a test is failed, the Contractor shall make any necessary modifications to the equipment and rerun the test until it is successfully completed.

12.2.1.2.5 Design and Component Qualification through Analysis

If tests to demonstrate compliance with certain requirements are shown to be excessively expensive or potentially inconclusive, approval may be given to waive the requirements for certain design qualification and conformance tests. The process for qualification through analysis is as follows:

A. Submit a waiver request that details cost excessiveness, the specific design attributes that will be qualified in through design analysis
B. Submit design qualification analysis report with sufficient documentation (e.g., designs, calculations, and references to standards)
C. Obtain approval during the design review process.

12.2.1.2.6 Waiver for Proven Equipment

If the component or subsystem in question is substantially identical in design to equipment previously deployed in other transit applications, it may not be necessary to conduct design qualifications tests on that equipment. To obtain a waiver for proven equipment, the Contractor must submit:

A. A list of the quantities and locations of current equipment installations
B. A description of all relevant differences in the equipment and the equipment's application with respect to the requirements of these specifications and other installations
C. Results of any relevant design qualification tests that have previously been conducted on the equipment
D. Cost reduction analysis

Based on the data submitted, the SFMTA will determine whether to waive the requirements for design qualification testing. Specific requirements for each set of equipment shall be considered individually, and it will be possible for certain tests to be waived while others may still be required.

12.2.1.2.7 Design and Component Qualification Testing

These tests shall be run on production equipment that has passed production acceptance testing. These tests shall stress the equipment under environmental conditions at least as severe as those described in Section 1 (Overall Requirements). While stressed in this way, it shall be demonstrated that the equipment performs its intended functions without failure.

12.2.1.2.8 Subsystem Qualification Testing

Major subsystems shall be assembled separate from the Coach and shall be tested to verify compliance with these Specifications. Related subsystems may be integrated and tested

together to verify compliance of the individual subsystems and to verify the design of the interface between them.

The interfaces between equipment and between subsystems are viewed as crucial aspects of the system design. To verify these interfaces, it is preferred that subsystem tests be designed to include as many system interfaces as possible. Any equipment attributes that can be tested during subsystem testing need not be tested again at the component level.

12.2.1.3 Acceptance Testing

Fully documented Acceptance tests shall be performed on all assemblies and the completed Coach.

Acceptance test procedures shall be updated based on experience gained from previous qualification testing or Coach operation. Test procedures shall be expanded to focus on areas that prove to be, or have historically been, Defective, deficient, or unreliable.

Tests shall be conducted at the point of manufacture. The tests shall ensure that each unit is produced to at least the same quality level as the unit presented for the first article inspection.

12.2.2 Prototype Tests

The prototype test program shall consist of all tests outlined in Section 12.2.3 (Pre-Delivery Tests) through Section 12.2.4 (Post-Delivery Tests).

The prototypes will be Accepted by the SFMTA as production Coaches only if they are identical to the accepted production Coaches. The prototypes shall have adjustable mounts for the interior and exterior mirrors, fare boxes and other components as requested by the SFMTA to determine their optimum location for operators. The electric system and related subsystems shall be adjustable or modifiable to the extent that Coach reliability and performance can be optimized during testing while simulating in-service conditions. Final location of these components will be determined prior to assembly of production Coaches.

12.2.2.1 Prototype Pre-Delivery Tests

Factory tests shall include those tests specified in Section 12.2.3 (Pre-Delivery Tests). In addition, the prototypes shall be instrumented during road tests.

12.2.2.2 Prototype Post-Delivery Tests

Post-delivery tests shall include the following two phases. During Phase I, the prototype shall be instrumented to record time, speed, acceleration, distance, and brake pressure, and loaded with weights to simulate passenger load. While instrumented and loaded, the Coach shall be tested on the routes specified in Section 1.4 (Duty Cycle) to verify that the performance requirements

in these Specifications are being met. All records of test results shall be provided in an agreed-upon format.

In Phase II, the prototype shall be placed into simulated revenue service or actual revenue service on routes, determined by the SFMTA for up to 8,000 miles or 3 months. This purpose of this test is to determine any changes or adjustments needed to achieve optimum Coach performance, meet the desired MDBF, and determine the final configuration of the production Coaches, including the prototype Coach.

12.2.3 Pre-Delivery Tests

The Contractor shall conduct Acceptance tests at its plant on each Coach following: (a) completion of manufacture and (b) before delivery to the SFMTA. These pre-delivery tests shall include visual and measured inspections, as well as testing of the total Coach operation and water tightness. The tests shall be conducted and documented in accordance with written test procedures to ensure that the completed Coaches have attained the desired quality and have met the requirements of these Technical Specifications.

The pre-delivery tests shall be scheduled and conducted with sufficient notice so that they may be witnessed by the Resident Inspector(s), 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 Coach. The under-floor equipment shall be made available for inspection by the Resident Inspector(s), using a pit or Coach hoist provided by the Contractor. A hoist, scaffold, or elevated platform shall be provided by the Contractor to inspect the Coach roof easily and safely. Delivery of each Coach shall require written authorization of the Resident Inspector. Release of each Coach for delivery shall require written authorization of the Contractor. An executed copy of the authorizations shall accompany the delivery of each Coach. The SFMTA will not furnish an operator for these pre-delivery tests.

12.2.3.1 Visual and Measured Inspection

Visual and measured inspections shall be conducted with the Coach in a static condition. The purpose of the inspection is to verify overall dimensional and weight requirements, to verify that required components are included and are ready for operation, and to verify the function of components and subsystems that are designed to operate with the Coach in a static condition.

12.2.3.2 Water Tightness

Each Coach shall be tested as per Section 2.1.7 (Exclusion of Water).

12.2.3.3 Vehicle History Book

The Contractor shall produce a Vehicle History Book for each completed Coach. The Vehicle History Books shall be a specific record of production, testing, inspection, and relevant documentation for each individual Coach. The Vehicle History Book shall contain original

documents unless specified otherwise. All documents shall be marked with the Coach serial number, the production sequence number, or the SFMTA Coach number for the completed Coach.

The Contractor shall provide an electronic and a physical copy of the Vehicle History Book for each Coach. A draft Vehicle History Book will be submitted to the SFMTA for review and approval 60 Days before the first Coach is scheduled to ship.

At a minimum, each Vehicle History Book shall contain the following:

- Table of contents
- Production control cross-reference sheet, listing:
  - Coach serial number
  - Shop order/production sequence number
  - Final SFMTA Coach number
- Production schedule for each Coach showing start and end dates for each major stage of manufacturing
- List of all production drawings by number and revision status (release date, current revision, and outstanding engineering change requests at time of production)
- List of all parts by supplier and part number (bill of material)
- List of all serialized components
- Log of all non-conformances including status
- Component test certificates
- Test records:
  - Master test plan
  - Test procedures
    - Production tests
    - Acceptance tests
  - Record of measurements and results
- Critical dimensional inspection report
- Records of all required inspections
- Completed pre-shipment checklist
- Shipping approval form
- SFMTA Acceptance form
- Transfer of title of the Coach from the Contractor to the SFMTA (with original wet-ink signature of the Contractor's representative).

Each vehicle history book shall be presented to the SFMTA prior to the Coach being released from the Contractor’s facility.

12.2.4 Post-Delivery Tests

The SFMTA Project Manager/Representative may conduct post-delivery tests on each delivered Coach. The post-delivery tests will include visual inspection and Coach operation.

Coaches that fail to pass the post-delivery tests are subject to non-acceptance. The SFMTA Project Manager/Representative will record details of all Defects on the appropriate test forms and will notify the Contractor of non-acceptance. The Defects detected during these tests shall be repaired according to procedures.

12.2.4.1 Visual Inspection

The post-delivery visual inspection is equivalent to the inspection at the Contractor's plant and will be conducted with the Coach in a static condition. Any deficiencies, Defects or visible delivery damage will be identified and recorded during the visual inspection of each Coach.

12.2.4.2 Post-Delivery Acceptance Test

Prior to Acceptance, each Coach shall have a minimum of 500 driven miles. This mileage can be accumulated during the drive to the SFMTA's acceptance facility, if approved by the SFMTA in advance.

If a Coach is to be driven to the SFMTA's acceptance facility, the speed and operation en route shall be controlled to conform to the recommendations of the system suppliers and tire supplier to prevent damage to any part of the Coach. At the time of delivery, a written report shall be submitted to the SFMTA by the Contractor listing all incidents and unusual Coach performance as well as the quantity of oil, coolant and other fluids added to the Coach during the trip.

In the event the drive-away trip of any Coach is interrupted, for any reason, the Contractor shall include in the report a description of the nature of the service or repair, and the cause and restoration, if any, required to continue the trip. Failure to submit this written report will result in the SFMTA not accepting delivery of the Coach.

12.3 PROJECT PLANNING, SCHEDULING AND CONTROL

12.3.1 Introduction

This section specifies the requirements for project planning, scheduling, and progress reporting to be performed by the Contractor in conjunction with the Contract work. The Contractor shall employ Critical Path Method scheduling (CPM) for planning, scheduling, and reporting all work required by the Contract Documents.

12.3.2 Definitions and Clarifications

Baseline Schedule: The detailed CPM schedule, prepared by the Contractor, indicating the Contractor's plan for executing the Contract work. This schedule shall include the Contractor's logic network drawings, all scheduled network reports, and all scheduled resource reports. The Baseline Schedule shall conform to all requirements of the Contract Documents.

The Baseline Schedule shall be revised as necessary to incorporate approved Contract Modifications. The Contractor's performance or other avoidable delays shall not be considered justification for Baseline Schedule revision.

Current Schedule: The updated logic network and supporting reports indicating actual progress to date and forecasted logic and progress for the remaining work. The update will be, at a minimum, to the same level of detail as the Baseline Schedule. Monthly updates of the current schedule shall be a contract requirement. The City may withhold payment if this schedule update is delinquent.

Supplemental Schedule(s): Detailed schedules prepared by the Contractor, at the request of the SFMTA Project Manager / Representative, to substantiate proposed Contractor changes that may have a schedule impact.

Summary Level Bar Chart: A summary level bar chart schedule encompassing the entire Contract and indicating all Contract-required milestones or Contractor-identified milestone events.

Monthly Plan: A detailed plan of the work, in bar-chart format, to be accomplished in the coming weeks. Relationships between the Monthly Plan and Current Schedule activities shall be identified.

As-Built Schedule: The resulting schedule incorporating all actual activity durations, milestone completions, and Contract extensions as accomplished or incurred during the Contract duration. The Contractor shall submit this As-Built Schedule to the City at the completion of the Contract work.

Work Day: Any day except Saturdays, Sundays, and US legal holidays. If multiple shifts per day or extended hours (more than eight hours per shift) are scheduled, this is to be noted with the activities to which this applies.

Use of Float: Float identified in the baseline, or Current Schedule is jointly owned by the City and the Contractor. Its use must be approved in the scheduling update process.

12.3.3 Description of Submittals

A Baseline Schedule and Management Plan shall be submitted to the SFMTA for review and approval.

Reference Section 13.1 (Preferred Delivery Schedule).

12.3.3.1.1 Baseline Schedule

The Contractor shall submit a Baseline Schedule and shall include the following aspects:

- The program logic to be initially reviewed and approved by the SFMTA prior to initial design review.
- The costs and resources, as required, attributable to each activity of the accepted Baseline Schedule. Costs shall be allocated by bid item and shall match bid amounts.
- All activities related to major subsystems for the prototype and production Coaches.

The schedule documents, reports, lists, computer software with documentation and electronic files are required with each submittal. The Baseline Schedule shall be developed using Microsoft Project software or approved equal.

12.3.3.1.2 Management Work Plan

The Management Work Plan shall include protocols, procedures, and assignments of responsibility for key personnel and correspondence forms for all phases of the Contract and all project activities for the duration of the Contract. Once the Management Work Plan is approved, key personnel shall not be substituted without approval from the SFMTA. If the Contractor plans to substitute key personnel, a 30-Day advance notice and qualification of new personnel shall be required. At the request of the SFMTA, or when approved changes are made, the Contractors Management Work Plan shall be updated to include the latest revision to the project scope or other changes in project circumstances.

12.3.4 Early Completion Schedule

The Contractor may submit a schedule, which contains completion dates in advance of the dates specified in this Contract. The SFMTA may reject the schedule and require the Contractor to furnish a schedule indicating completion by the end of the originally scheduled Contract period. The SFMTA shall not be liable for damages, loss of profit, or any additional compensation as a result of such rejection.

12.3.5 Progress Review Meetings

On the date mutually agreed upon by the SFMTA and the Contractor, a meeting will be held to review the CPM schedule. The SFMTA, the Contractor, and, if necessary, the appropriate subcontractors shall attend the meeting.

During the meeting, the Contractor’s schedule submission will be discussed and revised by the Contractor as necessary. The SFMTA may require the Contractor to modify any portions of the schedule because of “behind schedule” activities. The marked-up schedule documents from this meeting will serve as the Current Schedule until the Contractor incorporates the change in the computer program and produces the updated Current Schedule. The SFMTA participation in the schedule review process shall not relieve the Contractor from the Contract required milestone completion dates of the Baseline Schedule in effect.

At monthly intervals, and at other times at the request of the SFMTA, the Contractor shall update the prior month’s Current Schedule indicating progress during the reporting period, the

latest schedule status, any approved Contract modifications, and any proposed logic changes. The schedule update shall be prepared concurrently with, and be an integral part of, progress evaluation and reporting.

12.3.6 Modifications to the Schedule

When requested by the SFMTA Project Manager/Representative, the Contractor shall submit a supplemental schedule to substantiate proposed Contract changes that may have an impact on the schedule within three working days to the SFMTA's Project Manager/Representative for review and approval; otherwise, any proposed Contract change will not be considered by the SFMTA.

Modifications: Upon approval of a Contract modification by the SFMTA, the approved change will be incorporated in the Baseline Schedule during the monthly update process.

12.3.7 Scheduling of Work

The program shall at minimum be divided into the following:

- Design Development Periods
- SFMTA Review Periods
- Prototype(s) Manufacturing and Testing
- Production Manufacturing and Testing for each Coach
- Warranty Program
- Contract Deliverables (training manuals, interactive training)

The work shall be scheduled to be completed within the Contract time allowances and to comply with requirements of the Contract Documents.

13 DELIVERY SCHEDULE

13.1 PREFERRED DELIVERY SCHEDULE

The SFMTA's preferred delivery schedule is indicated below. Completion of items as indicated below shall occur before the time periods listed have elapsed.

Item	Days after Notice-to-Proceed
1) Submittal of Baseline Schedule and Management Work Plan	--30--
2) Submittal of Coach drawings, control, Reliability Program Plan, and test plans	--60--
3) Submittal of training program (including lesson plans)	--90--
4) Delivery of prototype Coach[1]	--270--
5) Submittal of draft operations, maintenance, parts manuals, recommended spare parts	--300--
6) Approval of prototype Coach (estimated)	--330--

Item	Days after Approval of Prototype
7a) Production starts	--90--
7b) Beginning of Coach delivery[2]	--120--
8) Submittal of final operations, maintenance, and parts manual	--135--
9) Delivery of special tools	-- TBD--
10) Completion of Coach delivery[4]	--TBD--

[1] Approval to deliver prototype will not be granted until after receipt and approval of all Coach drawings, controls, and test plans.

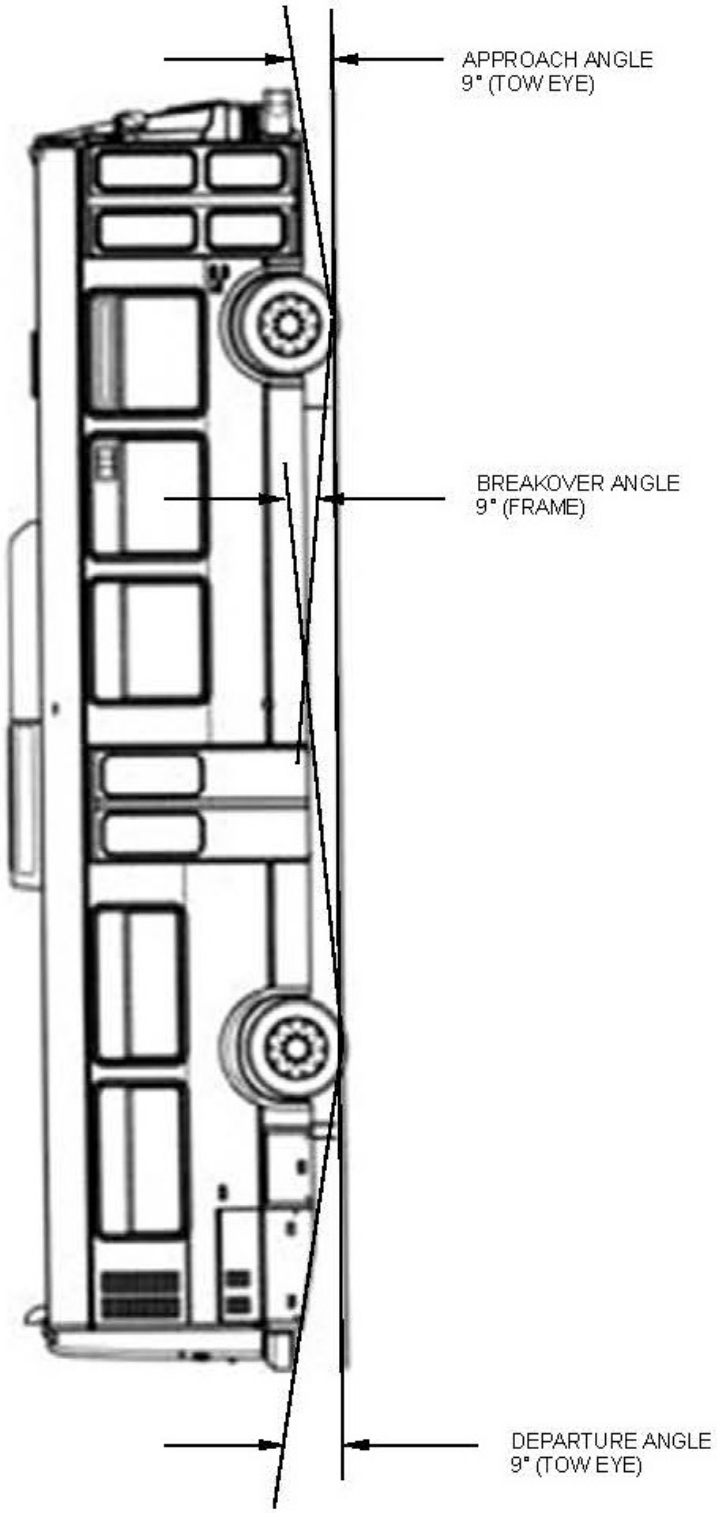
[2] Approval to deliver production Coaches will not be granted until after submittal of a satisfactory training plan; draft operations, maintenance, and parts manuals; all computer software, manuals, current FSRP's, document and demonstrate their operation and after successful completion of all appropriate tests as described in Section 12.2 (Test Requirements) of the Technical Specifications.

[3] The delivery of the special tools is dependent on the shipping lead times agreed upon with the suppliers. This is after the SFMTA selects the final tool list.

13.2 COACH DELIVERY

Coaches shall be delivered at a rate not to exceed three Coaches per week.

ATTACHMENT 1: CLEARANCE



ATTACHMENT 2: DECAL LISTING

A complete list of decals will be provided to the vendor at the pre-production meeting. The SFMTA will utilize its own paint scheme on the SFMTA's existing motor coach fleet.

ATTACHMENT 3: MATERIALS, COLORS AND FINISHES

NOTE: (1) All brand name callouts are understood to include the phrase, "or approved equal";
(2) Where stainless steel, aluminum, or fiberglass is called for, natural finish/color is acceptable.

BUMPERS	Romeo Rim High Energy Level Polymer (HELP)
Front and Rear Bumpers	
Color:	Black (colored throughout)
Reference:	Section 2.2.11 (Bumper System)

FINISH	Axalta Imron Elite, 2.7 VOC base coat/ clear cost system PPG Delta DBHS 2.7VOC or approved equal
Coach Exterior Primer	PPG Deltron, NCP 280, Hardener NCX 285, Primer
Coach Exterior Color	PPG Delfleet, FBCH 37464, New Flyer Silver ALT-1 Base
Coach Exterior Top Trim	PPG Delfleet, FBCH 942608, New Flyer Red
Coach Exterior Bottom Trim	PPG Delfleet, FBCH 942608, New Flyer Red
Coach Roof Fairing Color	PPG Delfleet, FBCH 37464, New Flyer Silver ALT-1 Base
Coach Clear Coating Reference:	PPG Delfleet, Clear F3921, Hardener F3210 Section 2.2.6 (Finish and Color)
Coach Interior Color Reference:	Black N3472 (with flattener) for Operator area in front of Standee Line Section 2.3.4 (Front End)

FLOOR COVERING	Altro Transflor
Aisle floor	Altro Transflor
Color:	TFFG2704F “Rocket”,
Reference:	Section 2.4.3 (Floor Covering)
Floor under seats	Altro Transflor
Color:	TFFG2704F “Rocket”,
Reference:	Section 2.4.3 (Floor Covering)
Operator’s Platform	Altro Transflor
Color:	TFFG2704F “Rocket”,
Reference:	Section 4.12 (OPERATOR’S PLATFORM)
Standee line	Altro Transflor Two inches wide
Color:	Yellow (colored throughout)
Reference:	Section 2.4.3 (Floor Covering)
Step Nosing	Altro Transflor Two inches wide
Color:	Yellow (colored throughout)
Reference:	Section 2.5 STEPS AND STEPWELLS
Step Tread	Altro Transflor
Color:	TFFG2704F “Rocket”,
Reference:	Section 2.5 STEPS AND STEPWELLS

Glazing	
Passenger Windows	No less than 50 percent luminous transmittance.
Reference:	Section 3.1.1.2 (Materials)
Operator’s Side –Window	76 percent luminous transmittance
Reference:	Section 4.4.2 (Side Window)
Door Glass	No less than 50 percent luminous transmittance
Reference:	Section 3.1.1.2 (Materials)
Windshield	Single-density tint
Reference:	Section 4.4.1 (Windshield)

INTERIOR TRIM	Textured stainless steel or anodized aluminum
Trim moldings	
Reference:	Section 2.3 (INTERIOR TRIM, PANELING AND ACCESS)

PANELING	Non-absorbing graffiti resistant material (final colors TBD with prototype)
Divider panels	1/4 inch thick
Color:	Grey
Reference:	Section 2.3.1 (Divider and Side Trim Panel)
Headlining	1/16 inch smooth and matte
Color:	Grey
Reference:	Section 2.3.3 (Headlining)
Operator barrier	1/10 inch thick
Color:	Grey
Reference:	Section 4.8 (OPERATOR BARRIER)
Rear Bulkhead	1/16 inch thick
Color:	Grey below the window / white above the window
Reference:	Section 2.3.2 (Rear Bulkhead)
Side Wall	1/10 inch thick
Color:	Grey
Reference:	Section 2.3.1 (Divider and Side Trim Panel)

Passenger Seats	Shell: Plastic / Insert: Plastic
Color:	Blue (Stencil on Priority and stroller parking seats)
Reference:	Section 3.7.4 (Construction and Materials)
Seat Shell Backs	Stainless Steel (Polished)
Reference:	Section 3.7.4 (Construction and Materials)
Seat Handhold	Plastic
Reference:	Section 3.7.2.1 (Transverse Seat)
Stanchions/Handholds	Stainless Steel / Stainless Steel with Yellow Powder Coating
Reference:	Section 3.9 (PASSENGER ASSISTS)

Steering Wheel	Vehicle Improvement – Part # BKBL1824D4V
Horn Button	Vehicle Improvement – Part # HB9T
Color:	Black
Reference:	Section 4.1.5 (Steering Wheel and Horn Button)
Wheel Housings	12-gauge or heavier stainless steel or equivalent fiberglass
Reference:	Section 2.6 (WHEEL HOUSING)
Wheels	Aluminum (Alcoa Dura-Brite)
Reference:	Section 5.8.1 (Wheels)

Window Sash	Aluminum
Reference:	Section 3.1.1.2 (Materials)

ATTACHMENT 4: AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENIST (ACGIH)

The ACGIH is an organization devoted to the administrative and technical aspects of occupational and environmental health. The guidelines and recommendations developed by the ACGIH are intended only for use in industrial hygiene by trained professionals. The threshold value limits (TVLs) for electric and magnetic fields present either time weighted average (TWAs) or ceiling values which most workers can be repeatedly exposed without adverse health effects.

The basis for the TVLs is specific to the field type and frequency range. No specific target organs have been identified for deleterious effects due to static magnetic fields. The ceiling value has been set a level below which no deleterious effects have been demonstrated in humans or animals. The whole body TWA has been set at the level used by Lawrence Livermore National Laboratory to limit the potential in the large aorta of an adult human to 1 mV. The ceiling for pacemaker wearers is based on the observation that the reed-relay switch in pacemaker can be closed by flux densities as low as 17,000 mG, placing the pacemaker in a synchronous pacing mode. Certain implanted medical devices such as aneurysm clips may experience significant magnetic forces and torques in strong flux densities if they contain ferromagnetic materials. No basis has been given for extremity limits.

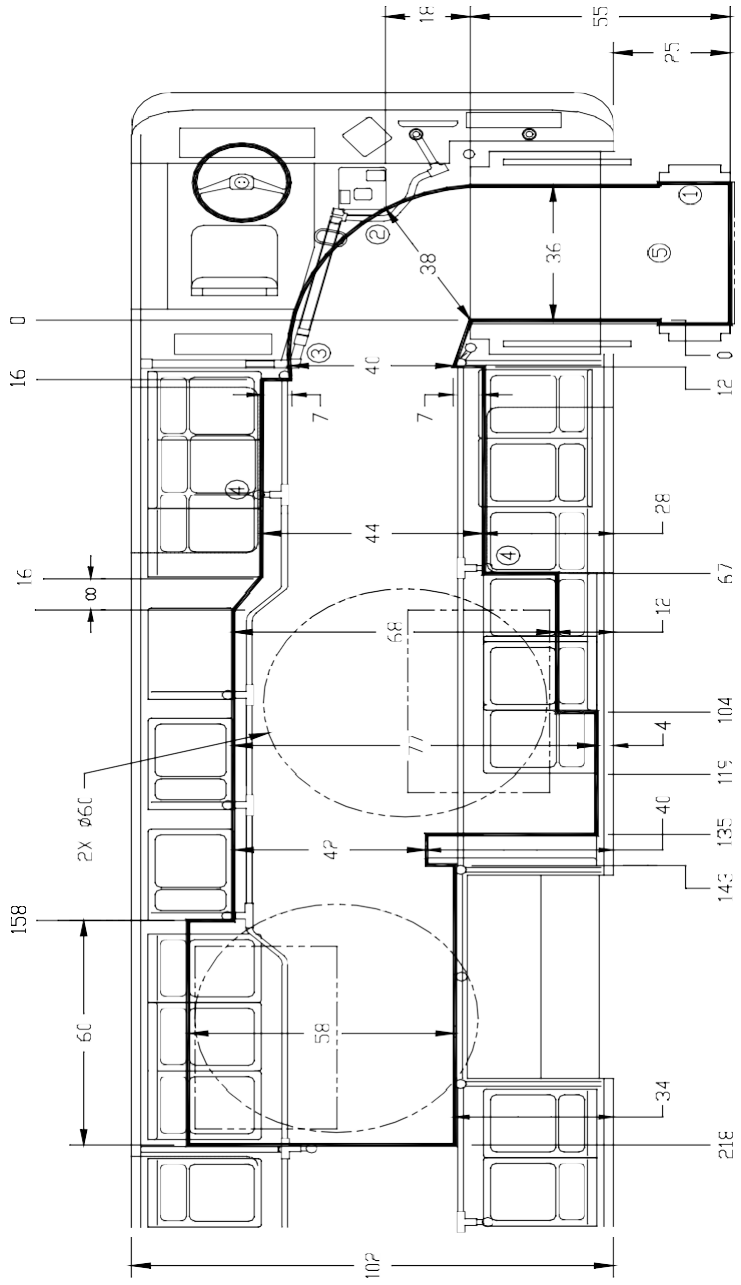
The limits for magnetic fields in the 1 Hz to 30 Hz (sub-RF) range have been set to limit the maximum induced current density within the human body to 10 mA/m^2 (rms). Other than the currently unresolved issue of risk of power frequency fields, there is no evidence of harmful effects from sub-RF magnetic fields that induce current densities in the body below 10 mA/m^2. The limits for pacemaker wearers are designed to avoid electromagnetic interference (EMI) that has been demonstrated to cause certain models to revert to an asynchronous mode or exhibit abnormal pacing characteristics at 60 Hz flux densities as low as 1,000 mG. At very low frequencies approaching DC there is concern that pacemaker reed switches may be closed by the field.

The basis for the electric field limits below 30 kHz is identical to the case of magnetic fields: maintaining induced current densities within the body below 10 mA/m^2. The limits for electromagnetic fields between 30 kHz and 3 MHz have been set to protect against shock and burn hazards. For the entire frequency range from 30 kHz to 300 GHz, the threshold limit values are intended to limit the average whole body specific absorption rate (SAR) to 0.4 W/kg. The primary concern is thermal damage.

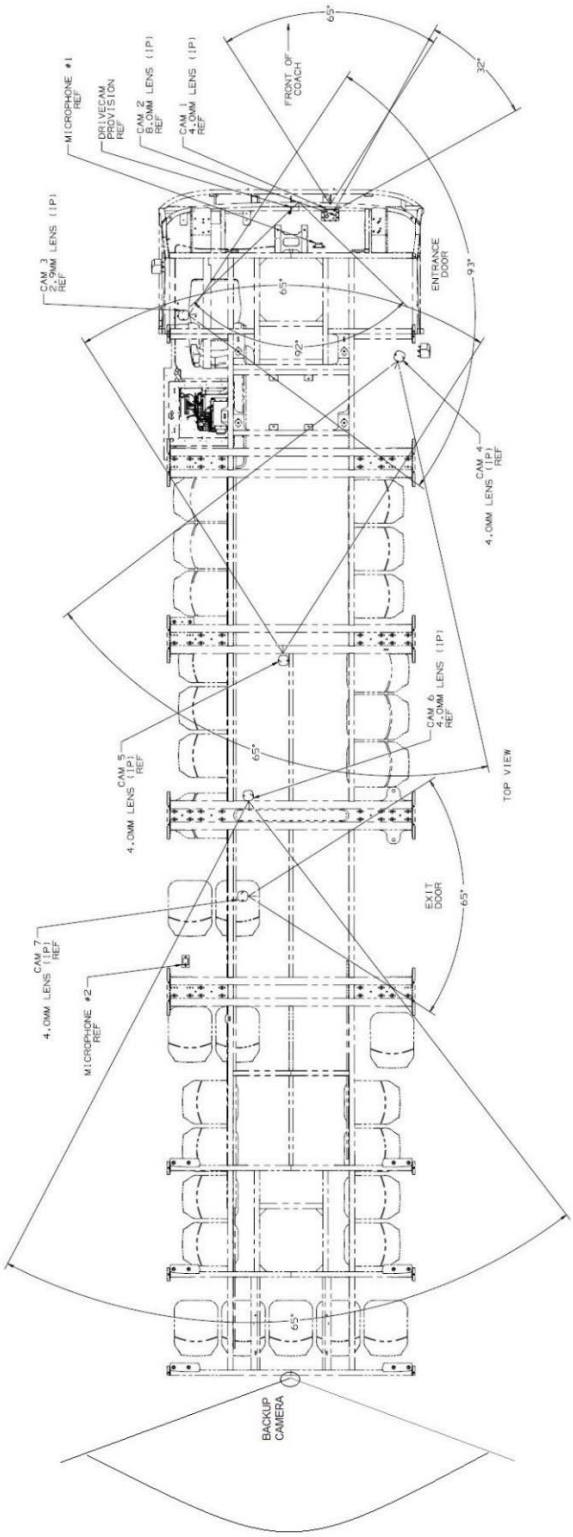
ATTACHMENT 5: WHEELCHAIR MANEUVERING ROOM

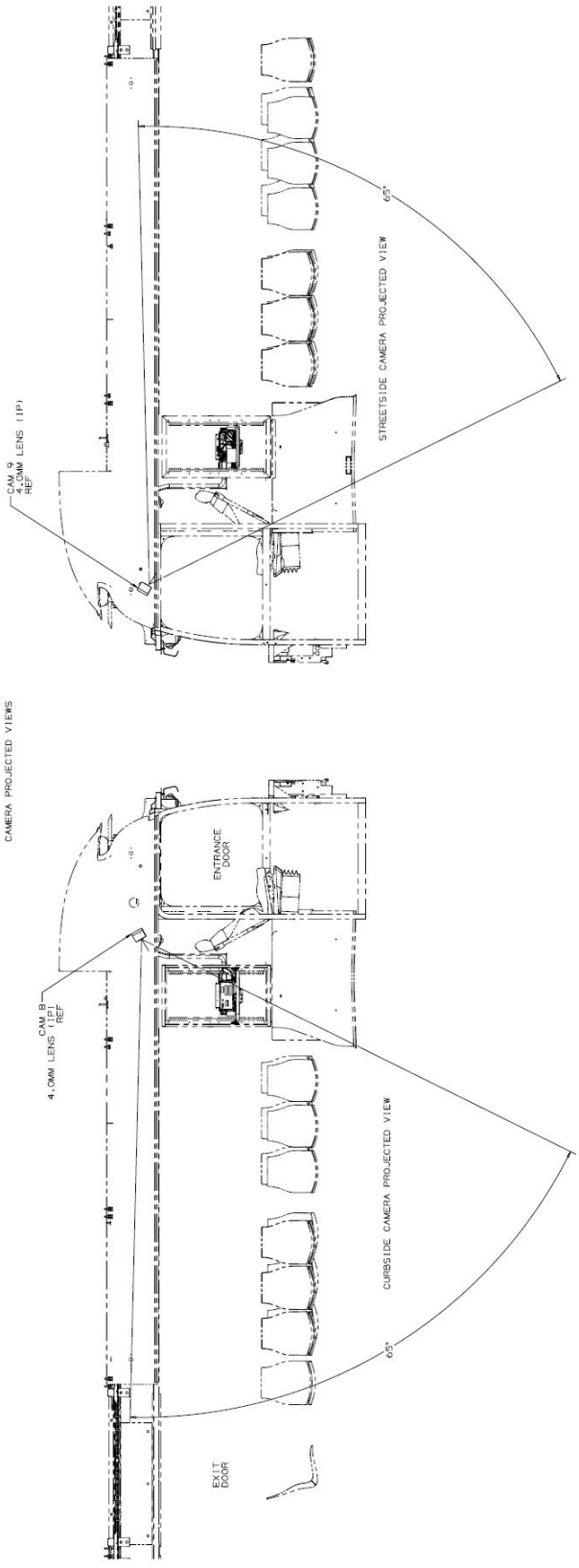
The following is a drawing of the required wheelchair maneuvering room at the entrance of the Bus and the wheelchair securement area.

For Reference Only



ATTACHMENT 6: CAMERA LAYOUT




CAMERA PROJECTED VIEWS
CAM 9
4.0MM LENS (IP)
REF
STREETSIDE CAMERA PROJECTED VIEW
65°
CAM 8
4.0MM LENS (IP)
REF
ENTRANCE DOOR
CURBSIDE CAMERA PROJECTED VIEW
65°
EXIT DOOR

ATTACHMENT 7: RESERVED

ATTACHMENT 8: SUGGESTED BILL OF MATERIALS

DIGITAL VIDEO RECORDING AND SURVEILLANCE CAMERA SYSTEM (3.15)

Vendor Part Number	Description	Qty
CBL-HAR-NFSFM-40ft	ASSY-CABLES,CAMERA SYSTEM	1
RCM-SVR300A	DVR-8TB	1
RCM-PoEPOW-1FT	CABLE, POE SW POWER, M12, 1FT	1
NSW0812	POE SWITCH Managed gigabit	1
RCM-6351092ND	HMI LCD Display-EVENT SWITCH	1
RCM-IP-SW1U	ETHERNET RELAY	1
RCM-DC-UPS	UPS MODULE	1
RCM-FB-PWR-CBL	FUSE BLOCK W/ PIGTAILS	1
RCM-CBL-NF-SF-DVR-PWR	CABLE-DVR PWR/IGN INTERFACE	1
RCM-CABLEDVR4B	CABLE-ETHERNET,CAT6E,18",BLUE	1
RCM-CABLEDVR4RG	CABLE-ETHERNET,CAT6E,18",90DEG,GREY	1
RCM-XNV6012-FF 2.4MM	CAMERA-IP,2.8MM (CAM #1), W/ AUDIO	1
RCM-XNV6012-TOLE 8.0MM	CAMERA-IP,8.0MM (CAM #2), W/ AUDIO	1
RCM-XNV6012-FD 2.4MM	CAMERA-IP,2.8MM (CAM #3), W/ AUDIO	1
RCM-XNV6012-Aisle 2.4MM	CAMERA-IP,2.8MM (CAM #4), W/ AUDIO	1
RCM-XNV6012-FS 2.4MM	CAMERA-IP,2.8MM (CAM #5), W/ AUDIO	1
RCM-XNV6012-RS 2.4MM	CAMERA-IP,2.8MM (CAM #6), W/ AUDIO	1
RCM-XNV6012-RD 2.4MM	CAMERA-IP,2.8MM (CAM #7), W/ AUDIO	1
RCM-XNV6013-CS 2.8MM	CAMERA-IP,2.8MM (CAM #8), W/ AUDIO	1
RCM-XNV6013-SS 2.8MM	CAMERA-IP,2.8MM (CAM #9), W/ AUDIO	1
RCM-ANRDCAM	CAMERA-ANALOG,REAR DOOR	1
RCM-CMB-SF-FF-3S	BRACKET-FORWARD FACING CAMERA	1
RCM-XNV6013-RV 2.8MM	CAMERA-IP,2.8MM (CAM #10), W/ AUDIO	1
IBR1900	Cradlepoint Router	1
LG-IN2445	5G ‘7-1’ antenna	1

DRIVECAM (3.16)

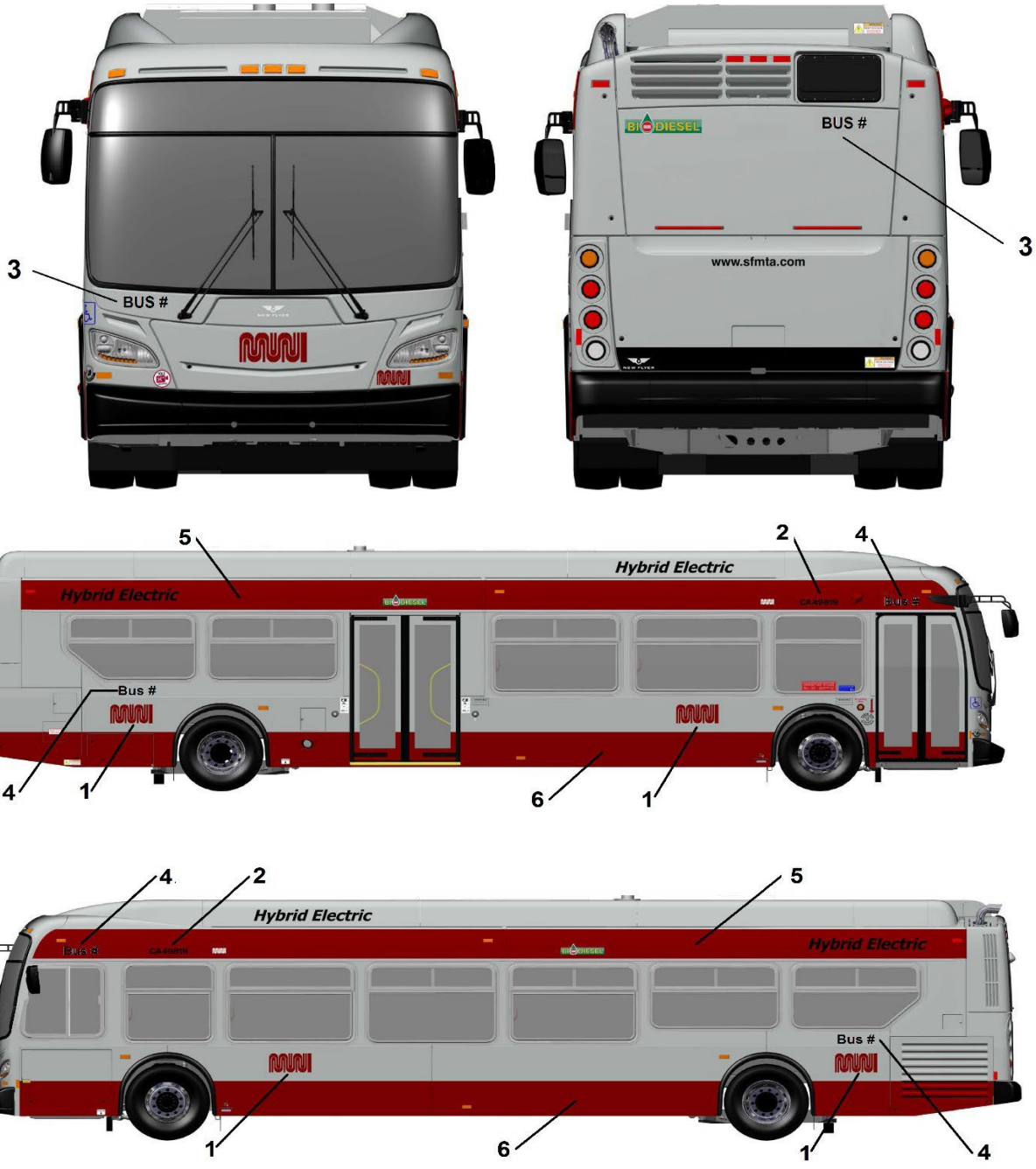
Vendor Part Number	**Description**	**Quantity**
ER-SF300-0027R	DriveCam SF300 Event Recorder, LTE, NA	1
PER-CAT-0020-NI	Cable – Extended Wiring Harness, 20-ft	1
PER-CAT-0500-NI	SF-Series – Device Power Cable	1
–/A	SF - ECM Vehicle Interface Kit	1
CBL-HD-S10-03P	RP1226 All-in-One (Data + Power) Cable 48”	1

MOBILE RADIO/AVL SYSTEM (3.17)

Vendor Part Number	Description	Qty
TMS-006298	Mounting Base with Ball Ram Vesa Base 3.625 sq.	1
TMS-006299	Mounting Base Square, 4.57 Sq.	1
TMS-006300	Socket Arm Assy, DBL Ball, RAM	1
120041-3	AGC Microphone, Internal	1
420000-24	AGC Microphone, External	1
131623-1	Gasket, External AGC Microphone	1
120004-5	Handset	1
130627-3	Bracket, Mount, Handset	1
110444-2	Sign, LED, Interior, 14 Characters, Amber, w/Conn	2
TBD	Switch, Ethernet, 16 Port	1
410006-1	TRAY-IVU-4000, EQUIPMENT w/TIB	1
410001-1	MDT-1000, Display	1
440080E-360	Cable Assy, MDT Display to IVU 4000	1
440057-12	Cable Assy, Vehicle Interface, CAN to IVU 4000	1
440100B-36	Cable Assy, IVU 4000 Ethernet to LNX 800 Switch	1
440071A-360	Cable Assy, Handset to IVU 4000 TIB	1
440068A-420	Cable Assy, IVU-4000 TIB to Farebox	1
440048A-264	Cable Assy, External AGC Pre-Amp to Audio Interface, IVU4000 TIB	1
440110A-120	Cable Assy, IVU to Harris M7300 Radio, Control and Serial	1
440093B-240	Cable Assy, AVA LED Sign to IVU4000 TIB, J1708_TR	1
440093B-390	Cable Assy, AVA LED Sign to IVU4000 TIB, J1708_TR	1
440055-420	Cable Assy, Internal AGC Microphone to IVU4000 TIB	1
141580A-12	Cable Assy, J1708 Splitter, TIB	2
440112B-24	Cable Assy, Discrete Alarm Connections, TIB to Bus	1
440086A-24	Cable Assy, Audio Interface, TIB to Bus	1
440099A-192	Cable Assy, Destination Sign, Luminator, MCU, w/Loom	1
141577-192	Cable Assy, Destination Sign,MCU to IVU 4000, Ethernet	1
141578A-36	Cable Assy, Power LNX 800 Switch	1
TMS-006134	ANTENNA, GPS	1
141352-180	CABLE ASSY, GPS ANTENNA, 15'	1
141593A-264	CABLE ASSY, 802.11P ANTENNA (TNC-RP female TO TNC Plug-90-RP)	1
AN-225001-004	ANTENNA-HARRIS RADIO (700/800 MHz, NMO)	1

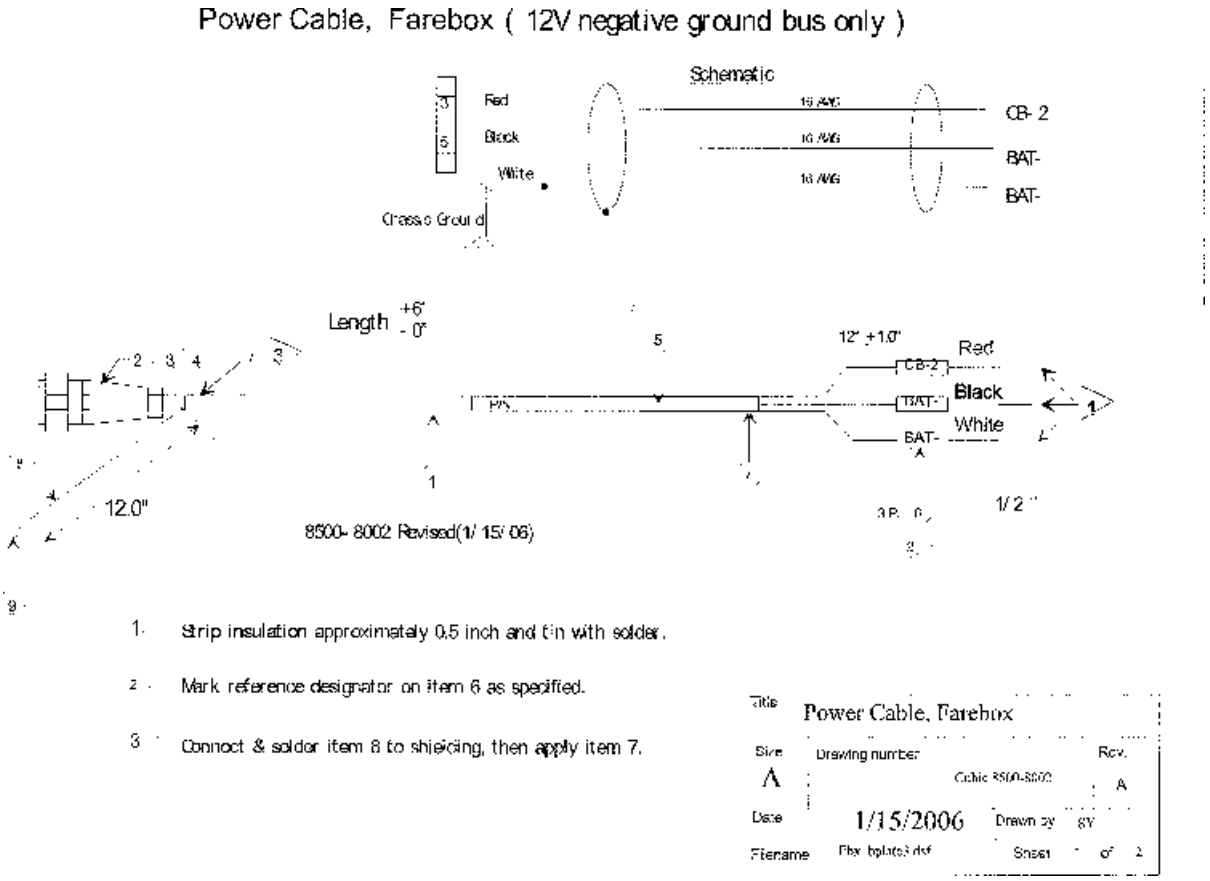
141335-180	CABLE ASSY, HARRIS RADIO ANTE'NA, 15' (NMO TO MALE TNC)	1
410000	IVU-4000	1
410004-1_REVD	TIB, IVU4000, w/ must work board	1
440148A-72	Cable Assy, Vehicle Power to IVU4000 TIB	1
440149A-72	Cable Assy, Vehicle Power to IVU4000	1
440073A-24	Cable, IVU to TIB, Generic I/O	1
440074A-24	Cable, IVU to TIB, Vehicle I/O	1
440075A-24	Cable, IVU to TIB, Radio I/O	1
440076A-24	Cable, IVU to TIB, Audio I/O	1
N/A	RADIO-HARRIS, M7300, COMPLIANT WITH SFMTA'S OPENSKY PROTOCOL	1
N/A	RADIO MOUNTING BRACKET KIT TRAY, SHORT, REMOVE MOUNT	1
N/A	SAMLEX MODULE-POWER FILTER	1
N/A	CABLE-DC POWER, M7300 RADIO,	1
N/A	CAN TERMINATOR, STRAIGHT, RADIO	2
N/A	SENSORS, APC, MATRIX, FRONT & REAR	2
N/A	CABLES, MATRIX SENSOR, ETHERNET, M12 CONN to IVU	2
N/A	CABLES, MATRIX SENSOR, PWR	2
N/A	CELL ROUTER, CRADLEPOINT, IBR1700	1
N/A	ANTENNA, CRADLEPOINT	1

ATTACHMENT 9: SFMTA EXTERIOR COLOR SCHEME



ATTACHMENT 10: POWER CABLE, FAREBOX

The following is a blueprint showing a schematic of the farebox power cable connections.

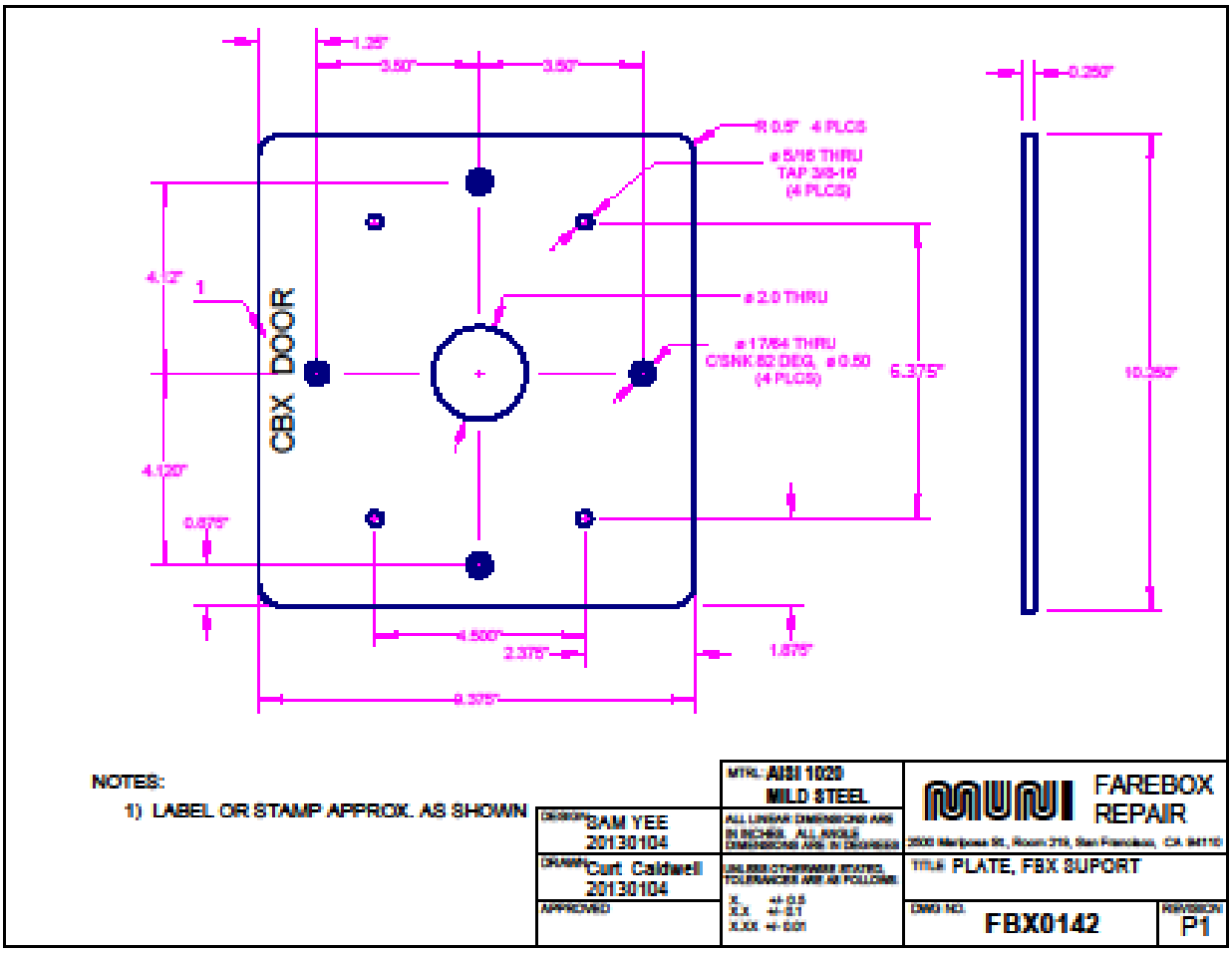


Item #	Part Number	Description	Vendor	Qty
1	8500-8033	Power Cable, Farebox	TBD	1
2	206708	Plug assembly	AMP	1
3	206966	Cable Clamp Kit	AMP	1
4	66360-3	Socket Contact	AMP	2
5	C2692	3cond 14 AWG, shielded	Carol	AR
6	FIT-221-1/2	Heat Shrink Tubing, Black	Alpha	AR
7	Sat-33-292	Marker, Cable	Brady	EA
8	C7514	Wire, 14 AWG, White	Alpha	in
9	327732	PIDG – Ring Tongue	Amp	1

ATTACHMENT 11: FAREBOX MOUNTING SUPPORT PLATE

The following is a drawing of the farebox mounting support plate indicating plate dimensions, hole locations and sizes.

Note: The orientation of farebox equipment shall be subject to SFMTA approval



Appendix H

New Flyer Proposal & Options Accepted by the SFMTA

Please see the attached New Flyer Proposal & Options Accepted by the SFMTA.

SFMTA-2024-03-FTA

Agreement

Appendix H

New Flyer Proposal & Options Accepted by the SFMTA

San Francisco Municipal Transportation Authority

Option Proposal for Ninety-Four (94) 40ft Xcelsior® Hybrid-Electric Buses

(BAE)

Option proposal from the State of Washington Department of Enterprise Services (Contract No. 06719-01)

Rev G

(Updated Deviations)

NEW FLYER OF AMERICA

Proposal Table of Contents

Tab 1, Letter of Transmittal

Solicitation Requirements:

N/A

New Flyer Response:

Please see attached our **Tab 1a, Letter of Transmittal** to SFMTA.

Please indicate your acceptance by providing a Purchase Order to New Flyer, attention:

Jeff Langelier, Business Segment Director – Metropolitan Fleets
204.471.3784
Jeff_Langelier@newflyer.com

August 8, 2024

Gary Change, P.E.
Sr. Program Manager
San Francisco Municipal Transportation Agency
700 Pennsylvania Ave
San Francisco. CA 94107

Subject: Quotation for Ninety-Four (94) Forty-foot Hybrid-Electric Buses (BAE) – Rev G

Dear Gary,

New Flyer is pleased to submit an option price quotation for the production of ninety-four (94) 40-foot Hybrid-Electric buses based on New Flyer's agreement with the State of Washington Department of Enterprise Services (Contract No. 06719-01).

The proposed buses will be technically configured as per SFMTA supplied Technical Specifications, Exhibit E, The Procurement of 40-foot Low Floor Hybrid Motor Coaches, Contract No. SFMTA-2023-XX, with a BAE hybrid propulsion system.

Note, that due to regulation changes coming into effect, SFMTA will have to apply for CARB exemption for non-compliance.

Contract Price:
The XDE40 (BAE) price per contract is **$1,188,844.66 / bus** which includes Warranty, Publications, Delivery, Payment Terms Discount, a flat $6,000,000 Performance Bond, a flat $3,000,000 2-year Warranty Bond, and 3 weeks of acceptance testing. This does not include Contract Spares, which were priced separately (see our Contract Spares proposal for more information).

Revision G updates: updated Deviations to match with proposal

Revision F updates: adjusted Publications deliverable to match with Contract Schedule.

Revision E updates: added testing per SFMTA requirements - including Noise, Duty Cycle, Gradeability, Acceleration, Jerk, Braking, Parking, Hill Hold, Water and Air Compressor Recovery.

We would like to highlight key elements of our proposal:

Warranty: New Flyer exceeds the industry standard warranties in many areas such as our 5 year / 300,000 miles axle warranty (standard warranty is 2 years) and our 3 years / 150,000 miles multiplex warranty (standard competitor warranty is 1 year / 50,000 miles). Please see our Warranty Proposal for more information. Please note that warranty is *included* in the bus price.

Training: New Flyer Training is an organization within the New Flyer Customer Services group, a division of New Flyer Industries. As a part of the leading manufacturer of heavy-duty transit buses in the United States and Canada, we have access to top design, engineering, propulsion technology, and electrical systems professionals. This allows us to offer the service and expertise to maximize the lifetime value of your fleet. Please see our Training Proposal for more information. Please note that optional training is *not included* in the bus price.

Publications: The New Flyer Publications team combines extensive, hands-on technical experience with exceptional writing, illustrating, and publishing skills to create the industry's benchmark in maintenance manuals. They supply accurate information in a timely manner, assisting the customer in the performance of proper bus maintenance, which adds to the overall reliability and lifetime value of each New Flyer bus on the road. Please see our Publications Proposal for more information. Please note that publications are *included* in the bus price.

Tooling and Diagnostics: Please see our Tools and Diagnostics Proposal for more information. Please note that tooling and diagnostics are ***not included*** in the bus price.

Delivery Proposal: New Flyer is proposing a complete delivery by the end of Q3 of 2026 based on a receipt of a Notice to Proceed within 90 days of this submission, to secure the production line entry dates to meet the proposed delivery schedule. Please note that delivery is ***included*** in the bus price. This build is currently slotted to be built in New Flyer's St Cloud plant.

Payment Terms: Following the terms and conditions of New Flyer's contract payment terms:

- Payment terms are Net 30 days.
  - Engine Install 40%
  - Approval for Shipment from Facility 20%
  - Conditional Acceptance 23%
  - Full Acceptance 15%
  - Retainage – all contract deliverables received and accepted 2%
- Good faith effort to begin Acceptance process within 20 days after delivery of each bus.
- Note, a payment term discount has been applied to SFMTA's bus price

This project allows New Flyer the important opportunity to continue our strong relationship with San Francisco Municipal Transportation Authority. It also gives us the opportunity again to delivery some of the most advanced vehicles available in North America. We thank you for your continued interest in New Flyer products and look forward to working with you again in the near future.

This quote is open for acceptance for ninety (90) days. Please indicate your acceptance by providing a Purchase Order to New Flyer of America, attention Jeff Langelier, Business Segment Director – Metropolitan Transit Fleets at Jeff_Langelier@newflyer.com.

Sincerely,
NEW FLYER OF AMERICA INC

Nhi Le, P.Eng.
Technical Sales Manager
431.373.5698
Nhi_Le@newflyer.com

CC: Derek White – Regional Sales Manager
Jeff Langelier, Business Segment Director – Metropolitan Transit Fleets

Tab 2, Bus Price Summary

Solicitation Requirements:

N/A

New Flyer Response:

Please see attached New Flyer's **Tab 2a, Bus Price Summary** for ninety-four (94) – XDE40 buses for SFMTA.

NEW FLYER

Price Change Summary

Property:	SFMTA
Option Origin:	SOW 20-046 (2025)
Sales Release No.:	0
Quantity:	94
Type:	XDE40 (BAE)
Price Change No.:	1
Revision:	N
Date:	03-May-24

	Each	Total
Original Contract Price Base Coach	$ 822,282.75	$ 77,294,578.50
Base Bus Price Change Total	$ 366,561.91	$ 34,456,819.12
Contract Spares Base Bus Price Change Total	$ -	$ -
Revised Price Base Bus (including ADA & delivery)	$ 1,188,844.66	$ 111,751,397.62
Original Contract Price for Contract Spares (If priced separately)		$ -
Contract Spares Changes (Priced Separately) Total	$ -	$ 15,199.19
Revised Contract Spares Priced Separately		$ 15,199.19
Original Contract Price for Miscellaneous (If priced separately)		$ -
Miscellaneous Price Change Total	$ -	$ -
Revised Miscellaneous Priced Separately		$ -
Original Total Contract Price		$ 77,294,578.50
Total Contract Price Changes		$ 34,472,018.31
Revised Total Contract Price		**$ 111,766,596.81**

Authorized Signatures:

New Flyer Authorization:

Signature: _____

Title: _____

Date: _____

Property Authorization:

Signature: _____

Title: _____

Date: _____

7/20/2024

Tab 3, Bus Price Change Detail

Solicitation Requirements:

N/A

New Flyer Response:

Please see attached New Flyer's **Tab 3a, Bus Price Change Detail**.

This sheet includes all price changes that are required to go from the base bus to the proposed configuration, as requested.

NEW FLYER

Price Change Detail

Property: SFMTA
Option Origin: SOW 20-046 (2025)
Sales Release No.: 0
Quantity: 94
Bus Type: XDE40

Price per coach

Price Change Type	Reference No.	Option No.	Option Group	SRCR No.	Description	Total	
Base Bus Price Change	1				SOW Volume Discount	(3,000.00)	(282,000.00)
	2	Delivery	Deliverable		Delivery from Anniston to SFMTA (Delivery included in SOW)	0.00	-
	3	Bonding	Deliverable		Add $6M flat Performance Bond and $3M flat Warranty Bond, as per SFMTA	16,875.00	1,586,250.00
	5				Payment Terms Discount (40% engine install, 20% approval for shipment, 23% conditional, 15% acceptance, 2% retention)	(5,383.00)	(506,002.00)
	6	600	Customer Options		1, Add 300 or 400 series stainless-steel hardware to the interior and exterior hardware	537.04	50,481.76
	7	600	Customer Options		2, Delete tamperproof hardware within passenger compartment	0.00	-
	8	203	Suspension Front		3, Delete continuous wear sensors	(149.84)	(14,084.96)
	9	203	Suspension Front		4, Delete MGM E-stroke system	(2,827.51)	(265,786.37)
	10	203	Suspension Front		5, Add front stabilizer bar, SR Specific	1,423.28	133,788.47
	11	203	Suspension Front		6, Add two additional aprons aft of wheels	47.33	4,449.00
	12	204	Suspension Rear		7, Change rear axle gear oil from petroleum to synthetic	0.00	-
	13	204	Suspension Rear		8, Change rear axle and engine/transmission drain plugs to FEMCO (SOW Option)	114.79	10,790.26
	14	205	Tires		9, Change wheels to Alcoa 22.5" x 8.25" aluminum, polished Durabright finish (from white powdercoat) (SOW Option)	2,392.07	224,854.60
	15	284	Elect - Side/Console		15, Delete Fast Idle switch	(2.85)	(267.90)
	16	219	Engine		16, Remove transmission oil sampling, engine oil sampling	(119.67)	(11,248.62)
	17	420	Body A/P Before Paint		17, Add hybrid depot drive	427.54	40,189.16
	18	231	Cooling System		18, Change surge tank engine maintenance and derate sensor from Fozmula to Vertech	697.03	65,521.23
	19	231	Cooling System		19, Change coolant fluid/antifreeze to ES Compleat 50/50 premix distilled water & propylene glycol plus ocrrosion inhibitors	699.62	65,764.46
	20	241	Fuel System		20, Change diesel fuel tank from SST 16GA to cross-linked polyethlyene	(456.37)	(42,898.46)
	21	203	Suspension Front		24, Change suspension control to Barksdale mechanical leveling valves with parker kneeling block to allow font axle kneel or raise	(686.88)	(64,566.48)
	22	246	Air, Brake & Lev System		27, Change air dryer to Graham white QBA60NX5	1,411.27	132,659.65
	23	246	Air, Brake & Lev System		29, Change connectors to male 1/4" NPT with Series 10 coupler and 0.56" hex fitting (from Series 20/30 with tag)	(20.26)	(1,904.44)
	24	260	Battery Compartment		35, Change battery to two East Penn 8D absorbed glass matt (AGM) maintenance free batteries. 1450 CCA. Drop posts: 3/8" positive, 3/8" negative	390.30	36,687.98
	25	260	Battery Compartment		36, Change jump start to Anderson SB350 Red (from Grey)	751.98	70,686.00
	26				39, Add Bi-stable relays installed in fuse box	0.00	-
	27	269	PA System		40, Gooseneck microphone changes: Delete REI amp and change to footwswitch controlled (Clever Stealth mic priced in but gooseneck is in Technical Summary)	1,716.60	161,360.01
	28	269	PA System		42, Add additional Shekonic exterior speaker location above curbside exit door	28.07	2,638.95
	29	273	Exterior Lamp		44, Add one center stop deceleration light	65.04	6,113.49
	30	273	Exterior Lamp		45, Delete overhead ent and exit dialight white LED bulb	(385.66)	(36,252.25)
	31	273	Exterior Lamp		46, Add one curbside lamp located forward of rear axle	43.06	4,047.19
	32	277	Interior Lighting		48, Add Smartrend LED service lights	314.58	29,570.61
	33	280	Passenger Signal		49, Change lower deck vertical pullcords to 3 at specified locations	(111.38)	(10,469.49)
	34	280	Passenger Signal		50, Delete stop request sign	(125.79)	(11,824.17)
	35	280	Passenger Signal		52, Change passenger signal at exit from low profile recessed button to old LFR style square non-recessed button	(4.34)	(407.96)
	36	280	Passenger Signal		53, Add six push buttons to vertical and seat stanchions, old LFR style square non-recessed button	66.51	6,252.28
	37	280	Passenger Signal		54, Add old LFR style square non-recessed button to C/S and S/S stanchions aft of wheelhouse	22.32	2,098.35
	38	284	Elect - Side/Console		55, Change entrance door controller to extended with 5 position settings	23.81	2,238.51
	39	286	Elect - Instrument & Switch		56, Change instrument panel to LCD touch display screen	774.43	72,796.62
	40	286	Elect - Instrument & Switch		58, Add aux power plug 12VDC	7.20	676.46
	42	284	Elect - Side/Console		60, Add sweeper light switch	7.47	702.42
	43	600	Customer Options		63, Change water test to 20 min	431.76	40,585.17
	44	304	Paint & Decal		64, Change to SFMTA's Paint Scheme (including clearcoat) & Exterior Decals	7,630.03	717,222.82
	45	304	Paint & Decal		65, Delete safety yellow jack pads	(1.12)	(105.28)
	46	304	Paint & Decal		66, Change to SFMTA specific interior decals	181.72	17,081.59
	47	350	Drivers Control		67, Change to pedals adjustable fore/aft	1,092.20	102,667.00
	48	350	Drivers Control		69, Delete steering wheel NFIL logo	0.63	58.96
	49	420	Body A/P Before Paint		70, Change to SFMTA specific curbside propulsion compartment door with 1" additional clearance at bottom edge	(28.18)	(2,648.52)
	50	420	Body A/P Before Paint		73, Add S1 wheel guards	2,822.17	265,284.33
	51	422	Body A/P After Paint		76, Change HVAC return air grille door lock to 3 quad latch (add one latch)	6.64	624.53
	52	422	Body A/P After Paint		78, Change interior upper rear panel and bulkhead access panels to covered with charoal grey gloss melamine and add large central access door	220.15	20,694.18
	53	422	Body A/P After Paint		79, Change SDS enclosure door to include a paddle latch (CH751 key) in center	37.36	3,512.09
	54	422	Body A/P After Paint		80, Change front rollerblind size to 38" wide	(27.28)	(2,564.32)
	55	422	Body A/P After Paint		81, Change to side rollerblind to include a padded sunvisor	246.22	23,144.83
	56	422	Body A/P After Paint		84, Change rear PLC enclosure latch to tri-latch	9.56	898.69
	57	423	Advertising Frames		85, Change to one clear polycarbonate, 17" X 11" ad frame on the rear of the SDS enclosure and add one on the SDS door	(37.33)	(3,508.83)
	58	450	Flooring A/P		86, Change subfloor material of the lower deck to SpaceAge composite flooring and the upper deck to use fiberglass composite for step and floor to the rear wheelhouses and SpaceAge composite flooring to the rear	1,533.67	144,165.23
	59	450	Flooring A/P		87,Change to Altro, Rocket TFFG 2704 F floor covering & SFMA specific door nosings	1,379.61	129,683.04
	60	450	Flooring A/P		88, Add LED lamp Glare Shield to interior front wheelhouse	15.67	1,473.39
	61	470	Destination Signs		90, Change destination signs to SFMTA specified	8,273.89	777,745.35
	62	470	Destination Signs		91, Add Conduent AVA AVAL system, installed including antenna, cabling, ground paltes, and all required system components	39,581.10	3,720,623.77
	63	470	Destination Signs		92, Add Fleetwatch AVM with provisions for Viriciti Datahub	1,280.27	120,344.91
	64	470	Destination Signs		93, Add New Flyer Connect activation 12 years, diagnostic & monistoring with DMAS	1,083.63	101,861.01
	65	480	Mirrors		94, Change exterior and interior mirrors to Hadley SFMTA specific	649.69	61,070.65
	66	490	Door Entrance		95, Change entrance door to electric Vapor dual linear with solid state proximity switch	8,686.59	816,539.56
	67	491	Door Exit		96, Change to Vapor Wide Slide Glide exit door with CLASS, 1/2 top, no glass bottom with kickplate and 3M film on glass	9,612.96	903,618.12
	68	526	Seating & Stanchions		103, Change passenger seats to qty 32, USSC Gemini with docket 90, 2 Q'POD wheelchair restraint system, SFMTA specified layout. With passenger seat USB chargers	13,102.72	1,231,656.00
	69	526	Seating & Stanchions		105, Change driver's seat to 9100 ALX model, 2 point orange seat belt with air suspension and lumbar. With seat belt alarm and "fastened" configuration switch	1,967.10	184,907.48
	70	526	Seating & Stanchions		108, Add 24 grey PVC overhead grabrail straps, in yellow Bentech mounts	1,874.03	176,159.17
	71	526	Seating & Stanchions		112, Add upper panel aft of exit 0.5" clear polycarbonate, basic width	551.89	51,877.30
	72	526	Seating & Stanchions		113, Add double stanchion bar, barrier rear bench seats	456.49	42,910.19
	73	526	Seating & Stanchions		114, Add one piece driver's door, full height AG with extended sliding glass top, 5/16" AS2 tempered glass	7,031.39	660,950.47
	74	526	Seating & Stanchions		115, Change barrier fwd of exit - upper panel 0.5" clear polycarbonate, wide width, also lower melamine panel	639.26	60,090.60
	75	549	HVAC System		117, Change booster pump to Rotron	388.60	36,528.72
	76	549	HVAC System		118, Change defroster to SFMTA specific	151.11	14,204.53
	77	580	Wheelchair Lift		120, Change wheelchair ramp to Lift-U LU18-09 electric dual mode, 32" wide, 1:6 slope, with IP68-rated beeper, extra loud fasp beep. Short Lift-U ramp tool mounted inside equipment box	910.66	85,602.01
	78	600	Customer Options		122, Delete front tow receptacle	(30.70)	(2,885.68)
	79	600	Customer Options		123, Delete ground strap	(8.07)	(758.51)
	80	600	Customer Options		124, Add 4 SDS trays	1,063.30	99,950.15
	81	600	Customer Options		125, Change farebox pedestal to SFMTA spec	484.25	45,519.09
	82	600	Customer Options		127, Add Cubic farecard reader provisions (harnesses and mounting bracket) (note: no commissioning cost, see deviation)	1,151.26	108,218.33

Base Bus Price Change	84	600	Customer Options		129, Add curbside front equipment box	383.56	36,054.95
	85	600	Customer Options		130, Add driver's storage box with lift and turn compression latch	183.35	17,234.71
	86	600	Customer Options		131,Add three take one holder message boxes mounted on pier panels.	27.17	2,553.76
	87	600	Customer Options		132, Add ASI SST trash receptacle	586.70	55,149.73
	88	600	Customer Options		133, Add Harris radio comm system, installed by NFIL	14,132.04	1,328,411.31
	89	600	Customer Options		134, Add RCM video surveillance system with drivecam	42,459.83	3,991,223.58
	90	600	Customer Options		135, Add Sonalert turn annunciator system	127.19	11,955.49
	91	284	Elect - Side/Console		136, Add stand alone speedo module in SDS panel	258.93	24,339.42
	92	600	Customer Options		137, Add Amerex Safety Net fire suppression system	10,914.95	1,026,005.30
	93	600	Customer Options		138, Add Byk Rak, 3 position, front mounted with deploy indicator light, instructions in english/spanish (SOW Option)	2,146.95	201,813.66
	94	600	Customer Options		139, Change to 700W, 24VDC power inverter mounted inside SDS	746.31	70,152.87
	95	600	Customer Options		140, Add IRIS/IRMA Matrix Automatic passenger counter system	6,988.64	656,932.54
	96	600	Customer Options		142, Add antenna and antenna provisions	1,354.71	127,342.27
	97	460	Windows		144, Change to Ricon Windows	15,094.26	1,418,860.44
	98	491	Door Exit		145, Change to Plug Style Exit door	19,550.90	1,837,784.98
	99	Warranty	Deliverable		Change BAE Warranty to 5 years / 300,000 miles	23,625.00	2,220,750.00
	100	Warranty	Deliverable		Change TK A/C Warranty to 3 years / unlimited	2,330.10	219,029.40
	101	Warranty	Deliverable		Change to VMAC Air Compressor Warranty 3 years / unlimited	1,012.50	95,175.00
	102	600	Customer Options		Add 12 years NF Connect Subscription	14,944.50	1,404,783.00
	103	Warranty	Deliverable		Add Conduent Voice Annunication System Warranty	675.00	63,450.00
	104	Warranty	Deliverable		Change MAN Axle Warranty to account for 5.67 axle radio (to meet 23% grade)	6,778.35	637,164.90
	105	600	Customer Options		Mandatory Option for BAE Hybrid Purchases: EPA and Electric Accessories Change	71,944.10	6,762,745.36
	106	600	Customer Options		Add Noise Test and Duty Cycle Test (for Acceptance) as per SFMTA	319.15	30,000.00
Base Bus Price Change Total						366,561.91	34,456,819.12
Contract Spares Changes (Priced Separately)	4	Delivery	Deliverable		Add qty 30 Alcoa 22.5" x 8.25" aluminum, Polished Durabright finish wheels per section 5.8	15,199.19	1,428,723.95
Contract Spares Changes (Priced Separately) Total						15,199.19	1,428,723.95

Tab 4, Alternate Options

Solicitation Requirements:

N/A

New Flyer Response:

New Flyer is pleased to offer the following alternate optional items.

Alternate Option	Qty	Price Change	Unit
Warranty Liquidated damage terms of $250 per bus	1	$1,250	Per bus

Tab 5, Bus Warranty Proposal

Solicitation Requirements:

N/A

New Flyer Response:

Please see the attached New Flyer **Tab 5a, SFMTA Bus Warranty Proposal**. The Warranty Pricing is included as part of the Bus Price.

It is New Flyer's priority to ensure that all warranty-covered repairs are completed by the appropriate party in order for SFMTA to receive the highest quality, least expensive, and most efficient outcome possible.

With this goal in mind, New Flyer's proposal is based on the following Warranty Deviations.

- *Minor/Major Warranty: In the event of a warrantable failure, SFMTA and New Flyer will follow the current warranty process. SFMTA will notify New Flyer, and New Flyer Service will review the issue. If New Flyer lacks the resources to address the concern, then we will authorize SFMTA to conduct the warranty covered repairs. SFMTA will submit for warranty reimbursement.*
- *Major Component Warranty repairs should be carried out by the equipment suppliers (Engine, Transmission/Hybrid Drive, HVAC, destination sign, and battery suppliers) in order to adhere to their mandate that all warranty repairs be performed by an authorized dealer unless the SFMTA is an authorized warranty center. If the SFMTA elects to perform these repairs, without the written permission of the original equipment manufacturer, the warranty coverage will be voided.*
- *SFTMA will return all failed components, returned to the Contractor within 45 days from the date of failure. All parts need to be returned for evaluation so that reimbursement can take place. Please see the attached **5c, New Flyer Warranty Claim Policy**.*

New Flyer's proposal is based on a Contract without warranty liquidated damage terms. There is no cost impact if SFMTA accepts the following language:

- *In line with the current trolley contract SFMTA-CPT-32 CCO.No.12-1206 Section B4.05.09 Fleet Defects - New Flyer's proposal is that within fifteen (15) days of receipt of notification of a fleet defect unless the SFTMA grants an extension, the contractor shall provide the SFMTA with a corrective action plan, subject to review and approval by SFMTA. After a corrective action plan has been established and approved by SFMTA, the contractor will specify how and when all coaches with defects shall be corrected. After acceptance and approval of the final work plan and schedule, the contractor shall promptly undertake and complete the work program within the timeline established in the approved plan. The corrective work shall be reasonably designed to prevent the occurrence of the same defect on all other coaches and spare parts purchased under this contract. Any proposed changes to a fleet defect work plan or program must be submitted to SFMTA for its approval.*

If SFMTA rejects the above language, and include the following warranty liquidated damage terms of $250 per bus, it would be a $1,250 per bus adder:

- *If (a) Contractor does not provide a plan for correction within the time specified above (or as extended by the SFMTA); or (b) a specific declared fleet Defect is not fully corrected within the time specified in the plan; or (c) the remainder of the Coaches are not corrected in accordance with the Contractor's work program; the SFMTA may begin assessing liquidated damages in accordance with Section 19 of the Contract 15 days after providing written notice to Contractor up to a max of $1750 per bus per Fleet Defects Event. (Note: The $1750 cap could be claimed multiple times per bus if there are multiple fleet defects filed that warrant LD charges).*

CONTRACT DELIVERABLES LIST	Warranty
CUSTOMER NAME	San Francisco (MUNI)
BID NUMBER	2023-163
BUS MODEL	XDE40
QUANTITY	94

MAJOR COMPONENT DESCRIPTION	BASE AND EXTENDED WARRANTY			COMMENTS
	PROVIDER	YEARS	MILES	
Base Bus Warranty	New Flyer of America	2	100,000	Excluding scheduled maintenance items, acts of nature, or normal consumables
Basic Bus Structure	New Flyer of America	3	150,000	Body, and body structure shall consist of the components that are mechanically fastened or adhesively bonded or glued as part of the structure.
Chassis Structure (Integrity)	New Flyer of America	12	500,000	Consists of all components that are welded together to form the main frame (skeleton) and body construction. The structural integrity guarantee covers against a significant loss of structural integrity of the assembly or its functional performance due to non corrosion related failures.
Chassis Structure (Corrosion)	New Flyer of America	12	500,000	Consists of all components that are welded together to form the main frame (skeleton) and body construction, and are warranted against corrosion failure and/or fatigue failure sufficient to cause a Class 1 failure. The corrosion and structural integrity guarantee covers against a significant loss of structural integrity of the assembly or its functional performance, resulting from a pertinent loss of cross-section due to corrosion caused by normal environmental elements but excludes corrosion caused by aggressive road deicers such as Magnesium Chloride or equivalents, unless New Flyer approved preventative measures are taken. The warranty shall be void if the Agency fails to conduct corrosion inspections and scheduled preventive maintenance procedures as specified in the Contractor's maintenance manuals. The Agency shall maintain documentation, auditable by the Contractor, verifying service activities in conformance with the Contractor's maintenance manuals.
Engine	Cummins	2	Unlimited	All repairs/warranty claims need to be handled through the local authorized repair facility. When the 3 year extended warranty is purchased (5 years total) the following applies: Two Year Base (Full Coverage), years 3,4 & 5 covers components only as per manufacturer's warranty document.
Hybird Drive System	BAE	5	300,000	All repairs/warranty claims need to be handled through the local authorized repair facility. When the 3 year extended warranty is purchased (5 years total) the following applies: Two Year Base (Full Coverage), years 3,4 & 5 covers components only as per manufacturer's warranty document.
Axle (Front and Rear)	MAN	5	300,000	Excluding maintenance items & items that are not covered by the OEM's warranty. All friction materials are excluded from this limited warranty. Wear and third party items supplied with the axle (e.g. slack adjuster, seals and bearings, shocks, air bellows, radius rods, brake chambers) are not included in the 5 year warranty. Please see manufacturer's warranty document.
A/C	Thermo King	3	Unlimited	Some limitations and exclusions may apply - Please see manufacturer's warranty document. All repairs/warranty claims need to be handled through the local authorized repair facility.
Brake System	New Flyer of America	3	150,000	Friction Material Excluded

Destination Signs	Luminator	6	Unlimited	Some limitations and exclusions may apply - Please see manufacturer's warranty document. All repairs/warranty claims need to be handled through the local authorized repair facility.
Door Systems	Vapor	3	150,000	Some limitations and exclusions may apply - Please see manufacturer's warranty document.
Air Compressor	VMAC	3	Unlimited	
Wheelchair Ramp	New Flyer of America	3	150,000	
Electrical System	Parker	3	150,000	Some limitations and exclusions may apply - Please see manufacturer's warranty document.
LED Headlights	J.W.Speaker	6	Unlimited	Some limitations and exclusions may apply - Please see manufacturer's warranty document
Tires	New Flyer of America	2	24,000	New Flyer Industries Limited warrants the tires installed as original equipment on this vehicle only against defects in materials and workmanship which cause the vehicle to fail to comply with applicable U.S. and Canadian greenhouse gas emission limits (“Warrantable Emissions Failures”). This vehicle emissions limited express warranty relating to original equipment tires is valid for two (2) years or 24,000 miles whichever occurs first.
Emission Control System	Cummins	5	100,000	Some limitations and exclusions may apply - Please see manufacturer's warranty document. All repairs/warranty claims need to be handled through the local authorized repair facility for Cummins components. Warranty includes Particulate Filter, DEF Components and Aftertreatment devices which should be submitted direct to New Flyer.
Greenhouse Gas Emissions-Related Warranty (Idle Reduction Systems)	New Flyer of America	5	100,000	Aluminum Wheels, Emissions-related warranty on Neutral-Idle or Start/Stop idle reduction systems, as defined by the U.S. EPA (not including Allison Standard FuelSense 2.0, Restricted Neutral-at-Stop (NAS), and “Auto-Neutral” functions)
New Flyer Connect System	New Flyer of America	12	Unlimited	Warranty covers subscription and components.
Air Dryer	Graham White	3	150,000	Some limitations and exclusions may apply - Please see manufacturer's warranty document. Haldex to cover years 1 & 2. New Flyer to cover year 3. All warranty claims to be submitted to New Flyer.
Power Steering	New Flyer of America	3	150,000	
Towing	New Flyer of America	2	100,000	10.2.2.5 Reimbursement for Parts and Towing - The Contractor will be responsible for the cost of towing for two years or 100,000 miles if such action was necessary and if the Coach was operating in regular revenue service.
Handling Charge 15%	New Flyer of America	2	100,000	10.2.2.5 Reimbursement for Parts and Towing - The SFMTA may impose a handling charge of up to 15% of the total cost of the warranty parts not to exceed $250 per claim plus applicable taxes.
Suspension	New Flyer of America	2	100,000	Some limitations and exclusions may apply - Please see manufacturer's warranty document.
Cooling System including Electric Fans	EMP	3	150,000	
Flooring	Space Age	12	Unlimited	Some limitations and exclusions may apply - Please see manufacturer's warranty document.
Floor Covering	Altro	12	Unlimited	Some limitations and exclusions may apply - Please see manufacturer's warranty document.

Voice Annunciation System	Conduent	3	150,000	Some limitations and exclusions may apply - Please see manufacturer's warranty document.
Paint	Axalta	5	Unlimited	Some limitations and exclusions may apply - Please see manufacturer's warranty document.

WARRANTY CLAIM POLICY

WARRANTY CLAIM POLICY

1. The purpose of this instruction is to ensure that warranty claims are properly processed, recorded, and actioned in a timely manner through the online warranty system.

2. The Warranty Start Date is based on the acceptance date of each coach, unless otherwise specified by contract.

3. Claims are to be submitted within thirty (30) calendar days from the date of failure, unless otherwise specified by contract.

4. Claims submitted later than thirty (30) calendar days will not be accepted, acceptance of claims over (30) days will require further approval by your Regional Product Support Manager (RPSM) and/or the Warranty Manager.

5. All Claim types, (Standard, Warranty Coach down and Retrofit), will be submitted through the Customer Warranty Portal. For information on using the online warranty system, please email warranty@newflyer.com.

6. Your RPSM is responsible for reviewing and approving all claims. The combined NFI and MCI Warranty Department has the final claim approval authority.

7. All applicable supporting documentation must be included when submitting claims. This documentation may include invoices for service performed by a third party or invoices for parts purchased from a third party other than NFI Parts. Pictures or maintenance records may also be required upon request.

8. All claims submitted for MAN disc brake failures (example calipers) must include a completed copy of the “Inspection checklist for disc brakes” with the claim. This checklist can be found in the MAN Warranty Process document.

9. Claim submission to the NFI/MCI Warranty Department is the responsibility of the property.

10. All defective parts claimed under Warranty must be returned to NFI/MCI for warranty evaluation within forty-five (45) days from the date of failure. In certain circumstances the RPSM at their discretion and or in concurrence with the NFI/MCI Warranty Department, may determine to dispose of defective parts at the customers location, and this must be indicated on the Warranty Claim.

11. Returned defective parts must be identified with the Parts Return Tag (see page 3). All information must be completed, and the tag must be affixed to the defective part. Equivalent parts return tags will be accepted if all required information is provided.

    - Defective parts are to be shipped to NFI/MCI (see following pages for United States packing slip, Canadian packing slip and shipping instructions).

    - Please note, low voltage batteries and lavatory parts should not be returned.

12. Failure to return defective parts within the allotted timeline may result in rejection of a claim or a debit against your warranty account in the cases where replacement warranty parts were provided at no charge under a Warranty Coach Down claim.

13. Note that all major components are to be claimed directly through an authorized dealer, this includes Engine, Transmission, HVAC and Destination Signs. All Low Voltage Battery warranty claims should also be directed through a local dealer where available.

14. Claims will not be accepted for scheduled maintenance items, normal consumables, or items with progressive wear characteristics (bushings, friction surfaces). Nor shall it apply to items furnished by the Procuring Agency.

New Flyer/MCI Parts Return Tag

NEW FLYER

NEW FLYER INDUSTRIES

CUSTOMER NAME: _____

_____

_____

DATE: _____

PART # _____

DESCRIPTION: _____

_____

SR # _____ BUS # _____

VIN # _____

CUSTOMER REF. # _____

NF CLAIM # _____

_____

NOTES: _____

_____

_____

WARRANTY PARTS BEING RETURNED FOR CREDIT EVALUATION – NEW FLYER AND MCI

PACKING SLIP- USA

Date of Shipment:_____/_____/_____

Ship to:

Warranty Returns Dock #14
New Flyer Industries/MCI
7001 Universal Coach Drive
Louisville KY 40258
Attention: Warranty Department

From:

_____

_____

_____

_____

BOX QTY: _____

PART NUMBER	CLAIM NUMBER	PART DESCRIPTION	PART QTY	BUS NUMBER

*Email this packing slip to sheldon_chudyk@newflyer.com. Also place a copy in the shipment box / crate.

Please clearly mark **NF WARRANTY or MCI WARRANTY on the outside of the package**

WARRANTY PARTS BEING RETURNED FOR CREDIT EVALUATION – NEW FLYER AND MCI

PACKING SLIP- CDN

Date of Shipment:_____/_____/_____

Ship to:

NFI Parts
630 Kernaghan Ave
Winnipeg, Manitoba
Canada, R2C 5G1
Attention: Warranty Department

From:

_____
_____
_____
_____

BOX QTY: _____

PART NUMBER	CLAIM NUMBER	PART DESCRIPTION	PART QTY	BUS NUMBER

*Email this packing slip to sheldon_chudyk@newflyer.com. Also place a copy in the shipment box / crate.

Please clearly mark **NF WARRANTY or MCI WARRANTY on the outside of the package**

SHIPPING INSTRUCTIONS FOR US CUSTOMERS

The following carriers are to be used for pick-up of Warranty Parts being returned.

United States Customers – for New Flyer parts to be returned

Shipments 1-75 lbs. combined weight of the box(s) and not on a pallet	Shipments 76 – 9,999 lbs. pls place on a pallet
UPS Warranty account 5829VW FedEx Account 407816587 If you use UPS or FedEx, pls use the above account numbers to bill receiver (not collect) to: NFI Parts Warranty, 7001 Universal Coach Drive, Louisville, KY, 40258 If you don't ship with either, please email shipping address, contact name, phone number, shipping hours, number of packages, weights and dimensions to; nfipartsfreight@nfiparts.com and we will assist.	Please email shipping address, contact name, phone number, shipping hours, number of packages, weights, and dimensions to nfipartsfreight@nfiparts.com and we will assist.

United States Customers – for MCI parts to be returned

Shipments 1-75 lbs. combined weight of the box(s) and not on a pallet	Shipments 76 – 9,999 lbs. pls place on a pallet
UPS Warranty account # 8V5745 If you use UPS, please use the above account number to bill receiver (not collect) to: MCI Warranty, 7001 Universal Coach Drive, Louisville, KY, 40258 If you don't ship with either, please email shipping address, contact name, phone number, shipping hours, number of packages, weights and dimensions to; nfipartsfreight@nfiparts.com and we will assist.	Please email shipping address, contact name, phone number, shipping hours, number of packages, weights, and dimensions to nfipartsfreight@nfiparts.com and we will assist.

*** One of the above methods must be used for returns transportation, or you could be liable for shipping charges**.

SHIPPING INSTRUCTIONS FOR CANADIAN CUSTOMERS

The following carriers are to be used for pick-up of Warranty Parts being returned.

Canadian Customers – for New Flyer parts to be returned

Shipments 1-75 lbs. combined weight of the box(s) and not on a pallet	Shipments 76 – 9,999 lbs. pls place on a pallet
FedEx Account 326474207 UPS Account 02E469 If you use UPS or FedEx, pls use the above account numbers to bill receiver (not collect) to: NFI Parts Warranty, 630 Kernaghan, Door 10, Winnipeg, MB, R2C5G1 If you don't ship with either, pls email shipping address, contact name, phone number, shipping hours, number of packages, weights and dimensions to; nfipartsfreight@nfiparts.com and we will assist.	Please email shipping address, contact name, phone number, shipping hours, number of packages, weights, and dimensions to nfipartsfreight@nfiparts.com and we will assist.

Canadian Customers – for MCI parts to be returned

Shipments 1-75 lbs. combined weight of the box(s) and not on a pallet	Shipments 76 – 9,999 lbs. pls place on a pallet
Purolator account #7557315 NFI Parts/MCI Warranty, 630 Kernaghan, Door 10, Winnipeg, MB, R2C5G1 If you don't ship with Purolator, or have any issues, please email shipping address, contact name, phone number, shipping hours, number of packages, weights and dimensions to; nfipartsfreight@nfiparts.com and we will assist.	Please email shipping address, contact name, phone number, shipping hours, number of packages, weights, and dimensions to nfipartsfreight@nfiparts.com and we will assist.

*** One of the above methods must be used for returns transportation, or you could be liable for shipping charges.**

Tab 6, Bus Training Proposal

Solicitation Requirements:

N/A

New Flyer Response:

Please see the attached New Flyer **Tab 6a, SFMTA Bus Training Proposal**.

Please note that this proposal is for recommended training only. Training courses may be selected by SFMTA. New Flyer's training team is happy to advise on selecting the correct training for your needs.

Corresponding prices are not included in the Bus Price.

CONTRACT DELIVERABLES LIST	CUSTOMER TRAINING						
CUSTOMER NAME	San Francisco Muni						
BID/OPTION/SR NUMBER	2023-163						

Note: The training hours listed are per session, and Muni must select the quantity of each session. For the New Flyer supplied training, they can select a lump sum and use the hours at their discretion.

New Flyer Supplied Training

DESCRIPTION	QTY HRS.	CUSTOMER DELIVERY	SPECIFICATION	COMMENTS	SELLING PRICE (USD)	REQUIREMENT	BILLABLE: Y/N
Operator Orientation	4				$986.85	Recommended	Y
Maintenance Orientation	4				$986.85	Recommended	Y
Multiplex System	32				$7,894.80	Recommended	Y
Entrance & Exit Doors	8				$1,973.70	Recommended	Y
Wheelchair Ramp	4				$986.85	Recommended	Y
Brake Systems and Axles	16				$3,947.40	Recommended	Y
Front and Rear Suspension & Steering	8				$1,973.70	Recommended	Y
Air System and ABS	8				$1,973.70	Recommended	Y
Electric Fan Drive	4				$986.85	Recommended	Y
Coolant Loop Fill Procedure	4				$986.85	Recommended	Y
Sub Total - New Flyer Training					**$22,697.55**		Y

OEM Supplied Training

DESCRIPTION	QTY HRS.	CUSTOMER DELIVERY	SPECIFICATION	COMMENTS	SELLING PRICE		
HVAC Familiarization/Troubleshooting	8				$4,050.00	Recommended	Y
Vapor Electric Doors Troubleshooting	5				$3,712.50	Recommended	Y
MAN Differential Overhaul	24				$16,200.00	Recommended	Y
Fire Suppression	8	qty of 2 x 4-hr sessions per day			$3,240.00	Recommended	Y
Surveillance System Familiarization/Troubleshooting	16	qty of 2 x 8-hr sessions			$7,020.00	Recommended	Y
Engine Familiarization/Troubleshooting	24				$17,820.00	Recommended	Y
Hybrid Propulsion/ESS Familiarization	16				$12,420.00	Recommended	Y
Hybrid Propulsion/ESS Diagnostics & Troubleshooting	16				$12,420.00	Recommended	Y
Sub Total - OEM Training					**$76,882.50**		Y

Training Aids

DESCRIPTION	QTY	CUSTOMER DELIVERY	SPECIFICATION	COMMENTS	SELLING PRICE		
Camera System Test Kit	1				$35,932.56	Required	Y
Training Videos	15				$334,125.00	Required	Y

Training Charts	3				$4,050.00	Required	Y
Elearning Modules	8				$378,000.00	Required	Y
Sub Total - Training Aids					**$752,107.56**		Y
Training & Training Aids Total (priced separate from the bus price)					**$851,687.61**		Y

Tab 7, Bus Publications Proposal

Solicitation Requirements:

N/A

New Flyer Response:

New Flyer's proposal is based on keeping the revision timeframe consistent with previous builds. These publication deviations include:

1. *Bus Service manuals are maintained for a period of 6 years and Parts Manuals are maintained for a period of 12 years as in previous contracts. Bus manuals can be updated with either revised PDF files on USB or manual bulletins depending on the urgency of the issue. Manual Bulletins are delivered in PDF format via email.*
2. *New Flyer supplies updates to New Flyer published bus technical manuals only. This does not include OEM component supplier manuals. It is the responsibility of each OEM component supplier to maintain the content in their documents.*

Please see the attached New Flyer Publications Proposal:

- **Tab 7a, SFMTA Publications Proposal**

Please note that Publication Pricing is included in the Bus Price.

CONTRACT DELIVERABLES PROPOSAL	PUBLICATIONS rev c. July 31, 2024
PRIMARY CUSTOMER NAME	SFMTA - Muni
PUBLICATIONS CUSTOMER NAME	SFMTA - Muni
EIN#	
BID NUMBER	2023-163
SR #	
BUS MODEL	XDE40
QUANTITY	94

0 SFMTA - Muni

New Flyer Standard Bus Publications

This is for one XDE40 Option Build of approx. 94 Buses Only

DESCRIPTION	QTY	CUSTOMER DELIVERY	UPDATES (years)	COMMENTS
Draft Operator's Guide (8.5x11 3-hole)	1	With First Pilot Bus Delivery	N/A	
Draft Parts Manual	1	With First Pilot Bus Delivery	N/A	
Draft Parts Manual Listing (MS Excel File)	1	With First Pilot Bus Delivery	N/A	
Draft Service Manual	1	With First Pilot Bus Delivery	N/A	
Draft Bus System Drawings Manual (11x17 3-hole regular paper includes air, elect, hydraulic, cooling, PLC HVAC layouts and schematics)	1	With First Pilot Bus Delivery	N/A	
Draft TIV USB	1	With First Pilot Bus Delivery	N/A	
Emergency Responder Guide (8.5x11 3-hole laminated)	94	With First Pilot Bus Delivery	6	Emergency information to be onboard each bus.
Operator's Guide (8.5x11 3-hole)	40	With First Pilot Bus Delivery	6	
Parts Manual	10	90 Business Days After First Production Bus Delivery	12	
Parts Manual Listing (MS Excel File)	1	90 Business Days After First Production Bus Delivery	N/A	
Service Manual	10	90 Business Days After First Production Bus Delivery	6	
Vehicle System Drawings Manual (Incl. Elect, Air, Hyd, Cool, HVAC, PLC schems and layouts on 11x17 3-hole plastic paper)	10	90 Business Days After First Production Bus Delivery	6	
TIV USB	10	90 Business Days After First Production Bus Delivery	6	USB Includes all NF Manuals plus OEM manual below identified with "*"

OEM Supplier Publications

This is for one XDE40 Option Build of approx. 94 Buses Only

DESCRIPTION	QTY	CUSTOMER DELIVERY	UPDATES (years)	COMMENTS
Cummins B6.7 (CM2450) Engine OEM Vendor Manual Set (includes only the following)		With First Pilot Bus Delivery or Soon After Receiving From OEM Supplier		
Fault Code Troubleshooting Manual (Vol 1 - 6)	10	"	N/A	*
Service Manual (Vol 1 - 2)	10	"	N/A	*
Operation & Maintenance Manual	10	"	N/A	*
Owners Manual	10	"	N/A	*
Hybridrive OEM Manual Set (includes only the following)		With First Pilot Bus Delivery or Soon After Receiving From OEM Supplier		
BAE System Manual	10	"	N/A	*
Thermo King HVAC OEM Manual (includes only the following)		With First Pilot Bus Delivery or Soon After Receiving From OEM Supplier		
Unit Maintenance Manual	10	"	N/A	*
Intelligaire III Diagnostic Manual	10	"	N/A	*
Cooling System OEM Manual (includes only the following)		With First Pilot Bus Delivery or Soon After Receiving From OEM Supplier		
Modine Traction Motor and Inverter Cooling System Service Manual	10	"	N/A	*
Modine Roof Mounted Electronics Cooling Package	10	"	N/A	*
WABCO ABS System OEM Manual (includes only the following)		With First Pilot Bus Delivery or Soon After Receiving From OEM Supplier		
ABS Maintenance Manual	10	"	N/A	*
Destination Sign OEM Manual (includes only the following)		With First Pilot Bus Delivery or Soon After Receiving From OEM Supplier		
Operation & Maintenance Manual	10	"	N/A	*
Valeo Cabin Heater OEM Manual (includes only the following)		With First Pilot Bus Delivery or Soon After Receiving From OEM Supplier		
Thermo DC200 Workshop Manual	10	"	N/A	*
DTI Video Surveillance OEM Manual Set (includes only the following)		With First Pilot Bus Delivery or Soon After Receiving From OEM Supplier		
Kratos DVR System User Manual	10	"	N/A	*
APC System OEM Manual Set (includes only the following)		With First Pilot Bus Delivery or Soon After Receiving From OEM Supplier		
IRIS IRMA Matrix Operations and Maintenance Manual	10	"	N/A	*
LIFT-U WCR OEM Manual Set (includes only the following)		With First Pilot Bus Delivery or Soon After Receiving From OEM Supplier		
LU-18 WCR Service Manual	10	"	N/A	*
Amerex FSS OEM Manual Set (includes only the following)		With First Pilot Bus Delivery or Soon After Receiving From OEM Supplier		
System Operation and Maintenance Manual	10	"	N/A	*
SafetyNet Controller Operation and Maintenance Manual	10	"	N/A	*
Vansco Multiplexing System OEM Manual (includes only the following)		With First Pilot Bus Delivery or Soon After Receiving From OEM Supplier		
Hardware User Guides	10	"	N/A	*
Software User Guides	10	"	N/A	*

Tab 8, Bus Tools and Diagnostics Proposal

Solicitation Requirements:

N/A

New Flyer Response:

Please see the attached New Flyer **Tab 8a, SFMTA Bus Tools and Diagnostics Proposal**.

Please note that this proposal outlines New Flyer's recommended tools and diagnostics package required to maintain the Xcelsior® bus. The proposal acts as a shopping list for SFMTA to select the best tools and diagnostic equipment for your needs.

The corresponding prices are not included in the Bus Price.

CONTRACT DELIVERABLES LIST	DIAGNOSTICS & TOOLS
CUSTOMER NAME	San Francisco Muni
BID/OPTION/SR NUMBER	2023-163
BUS MODEL	XDE40
QUANTITY	94

NOTE: TOOL KITS MAY BE SUBJECT TO CHANGE

** All claims for concealed shortages must be reported within 20 days of shipment date. Shipping damages and / or loss must be noted on the delivering carrier waybill at the time of receipt of shipment. A copy of the carrier waybill and / or carrier inspection report must be submitted with your claim within 5 days of receipt of shipment to New Flyer Customer Service.

COMMENTS	DESCRIPTION	QUOTED PART #	BID QTY	EXTENDED SELLING PRICE	REQUIREMENT	BILLABLE: Y/N
Diagnostic Equipment						
for use with all diagnostic software	Panasonic FZ55 Toughbook Laptop	6502351	1	$3,408.33	Recommended	Y
Product Drivers - NEXIQ.com	Nexiq USB Link™ 3 - WIFI/Bluetooth Edition	6494933	1	$1,231.46	Recommended	Y
Requires annual renewal	Cummins Insite Lite (1-year subscription)	6339520	1	$1,582.52	Recommended	Y
Requires annual renewal	Cummins Insite Pro (1-year subscription)	6339521	1	$1,693.40	Recommended	Y
Requires annual renewal	Wabco ABS Software (1-year subscription)	6334596	1	$412.02	Recommended	Y
	Software - Wabco ABS 1-yr Renewal	6495817	1	$412.02	Recommended	Y
	BAE IDS Software	6494673	1	$5,886.00	Recommended	Y
https://www.kvaser.com/downloads/	KVASER Interface	6399629	1	$478.24	Recommended	Y
Software included in kit	Intelligaire III Diagnostic Software & Cables	6393934	1	$2,249.96	Recommended	Y
EMP : Drivers & Downloads (emp-corp.co	EMP Software	NPN	1	$0.00	Recommended	Y
https://luminator.zendesk.com/hc/en-us/re	Luminator MIE Software	NPN	1	$0.00	Recommended	Y
http://divapps.parker.com/divapps/iqan/Va	Vansco Software	NPN	1	$0.00	Recommended	Y
http://divapps.parker.com/divapps/iqan/Va	Vansco 1210 Chooser	NPN	1	$0.00	Recommended	Y
https://ph.parker.com/us/17616/en/gatewa	PVSG Software	NPN	1	$0.00	Recommended	Y
	Cable - PVSG Interface	6487019	1	$54.03	Recommended	Y
	Cable - Transtech VR Interface	6488984	1	$321.81	Recommended	Y
https://promo.parker.com/promotionsite/p	Smartrider Software	NPN	1	$0.00	Recommended	Y
	Vapor Class System Diagnostic Interface Kit	6358421	1	$89.22	Recommended	Y
kkobel@Wabtec.com	Vapor Class System Software	NPN	1	$0.00	Recommended	Y
agoetzelmann@Wabtec.com	Vapor VETC2 Software	NPN	1	$0.00	Recommended	Y
darryl_desjarlais@newflyer.com	Danfoss Software - Berendsen Pwr Strg	NPN	1	$0.00	Recommended	Y
	Cables Kit - Berendsen Pwr Strg	6490120	1	$351.66	Recommended	Y
Software included in kit	Amerex SafetyNet Software & Interface	6355551	1	$679.95	Recommended	Y
	Service Cable - IRMA APC Analyzer	479892	1	$41.20	Recommended	Y
	Ethernet Cable - IRMA APC	6465569	1	$123.90	Recommended	Y
	Kratos Camera System Special Tools & Viewing Station	RCM	1	$14,715.00	Recommended	Y
Total Diagnostic Equipment				**$33,730.74**	Recommended	Y
Special Tools & PPE						
	Kit - Lift Tow Universal	6396565	1	$286.79	Recommended	Y
	Kit - Lift Tow Receivers	6396567	1	$1,658.50	Recommended	Y
	Xcelsior Flat Tow adapter (2 pcs. Per set)	6395097	1	$3,164.91	Recommended	Y
	Assy - Frame Flat Towing	902990	1	$5,871.29	Recommended	Y
	Jacking Adapters	434434	1	$1,056.66	Recommended	Y
	Tool - Sway Bar Bushing Removal	566804	1	$426.18	Recommended	Y
	Repair Kit - Disc Brakes & Calipers	6408310	1	$4,100.41	Recommended	Y
	Torque Multiplier	6314711	1	$2,208.07	Recommended	Y
	Hub Repair Kit - MAN VOK-07 Frt Axle	6408311	1	$8,285.23	Recommended	Y
	Optional Hub Removal Hydraulic Tool Kit - MAN VOK-07	6458834	1	$5,306.00	Recommended	Y
	King Pin Press Kit - MAN VOK-07 Frt Axle	6494532	1	$17,222.53	Recommended	Y

CONTRACT DELIVERABLES LIST	DIAGNOSTICS & TOOLS
CUSTOMER NAME	San Francisco Muni
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QUANTITY	94

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COMMENTS	DESCRIPTION	QUOTED PART #	BID QTY	EXTENDED SELLING PRICE	REQUIREMENT	BILLABLE: Y/N
	Hub Repair Kit - MAN HY1350 RR Axle	6408306	1	$5,397.31	Recommended	Y
	ABS Sensor R&R Kit - MAN HY1350 RR Axle	6408307	1	$984.96	Recommended	Y
	Pinion Seal Repair Kit - MAN HY1350 RR Axle	6444302	1	$2,639.55	Recommended	Y
	Differential Repair Kit - MAN HY1350 RR Axle	6444303	1	$8,531.35	Recommended	Y
	Optional Tool Kit - MAN HY1350 RR Axle	6444304	1	$36,038.45	Recommended	Y
	Coolant System Pressure Tester	660817	1	$961.15	Recommended	Y
	Kit - Coolant Pressure Fill	6484741	1	$2,848.82	Recommended	Y
	Adj Tool - Strg Gear Box Press Relief	6465265	1	$309.02	Recommended	Y
	Depth Punch - Strg Gear Box Press Relief	6465266	1	$185.41	Recommended	Y
	Flow Meter Tester - Strg Gear Box	140809	1	$1,221.32	Recommended	Y
	Puller Tool - Pitman Arm	6394270	1	$449.62	Recommended	Y
	Alignment Tool - Flex Connector	6360381	1	$809.42	Recommended	Y
	Cummins B6.7 Service Tool Kit	6484144	1	$27,932.61	Recommended	Y
	BAE ISG Gap Measurement Tool	6469543	1	$1,324.35	Recommended	Y
	BAE Assy - Jig ACTM	6400475	1	$2,060.10	Recommended	Y
	BAE Lever - Anti Rotation	6400476	1	$1,030.05	Recommended	Y
	BAE Assy - Jig PSR	6400477	1	$1,140.41	Recommended	Y
	BAE Assy - Jig ISG	6400478	1	$3,678.75	Recommended	Y
	BAE Spanner - Socket Yoke	6400479	1	$1,545.08	Recommended	Y
	BAE Table - Lift Scissor OTC	6400481	1	$11,683.71	Recommended	Y
	BAE Blanket - Insulating	6400482	1	$2,221.97	Recommended	Y
	BAE Eyebolt - M12 x 1.75 x 24 30mm	6400486	1	$29.43	Recommended	Y
	BAE Eyebolt - M8 x 1.25 x 16 25mm	6400487	1	$17.66	Recommended	Y
	BAE Lifting Hook - ACTM	6410750	1	$88.29	Recommended	Y
	BAE Hardware - ACTM Lifting Hook	6410751	1	$1.47	Recommended	Y
	TK A/C Tool Kit - RLFE R407c	6459438	1	$24,497.61	Recommended	Y
	Amerex Discharge Hose Blowout Adapter	052132	1	$126.48	Recommended	Y
	Amerex Fire Alarm/Simulator Module	6484731	1	$365.23	Recommended	Y
HV Tools	Clamp Meter - 1000A Fluke 376	6487900	1	$923.08	Recommended	Y
HV Tools	Fluke 2 in 1 Multimeter - 1587FC	6400746	1	$1,644.99	Recommended	Y
HV Tools	Conductivity Meter	6489997	1	$555.50	Recommended	Y
HV Tools	modular test lead kit	6473267	1	$265.86	Recommended	Y
HV Tools	test probe flat blade	6473268	1	$39.26	Recommended	Y
HV Tools	test probe back probe	6473269	1	$39.78	Recommended	Y
HV Tools	Wiha Insulated Master Electrician's tool kit	6473445	1	$5,006.64	Recommended	Y
HV Tools	wiha 1/4 in ratchet set insulated SAE	6473447	1	$655.25	Recommended	Y
HV Tools	wiha 1/4 in ratchet set insulated Metric	6473448	1	$655.18	Recommended	Y
HV Tools	16 PC 3/8 drive socket set	6473449	1	$536.80	Recommended	Y
HV Tools	3/8 Extension set	6473450	1	$72.94	Recommended	Y

CONTRACT DELIVERABLES LIST	DIAGNOSTICS & TOOLS
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QUANTITY	94

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COMMENTS	DESCRIPTION	QUOTED PART #	BID QTY	EXTENDED SELLING PRICE	REQUIREMENT	BILLABLE: Y/N
HV Tools	3/8 Extension set	6473451	1	$101.75	Recommended	Y
HV Tools	wiha open end wrench insulated metric	6473452	1	$708.67	Recommended	Y
HV Tools	wiha open end wrench insulated sae	6473453	1	$880.55	Recommended	Y
HV Tools	Wiha insulated Serrated Tweezers Straight	6473454	1	$65.92	Recommended	Y
HV Tools	Wiha insulated Serrated Tweezers Angled	6473455	1	$91.83	Recommended	Y
HV Tools	Insulated Torque Wrench 1/4"	6473456	1	$906.00	Recommended	Y
HV Tools	Insulated Torque Wrench 3/8"	6472024	1	$978.02	Recommended	Y
HV Tools	Insulated Torque Wrench 1/2"	6473457	1	$1,038.26	Recommended	Y
HV Tools	torque screwdriver set	6473458	1	$525.03	Recommended	Y
HV Tools	insulated crimper 30 - 6 Awg 7"	6473459	1	$60.03	Recommended	Y
HV Tools	wire striper 6 - 3/8 overall 20 to 10	6473460	1	$54.15	Recommended	Y
HV Tools	insulated water pump pliers v-jaw	6473461	1	$100.28	Recommended	Y
HV Tools	insolated hex key set 10pc metric	6473462	1	$307.25	Recommended	Y
HV Tools	Long SAE Natural insulated hex key set 12 pc	6473463	1	$395.54	Recommended	Y
HV Tools	bit driver	6473464	1	$123.61	Recommended	Y
HV Tools	Stubby Bit Driver	6473465	1	$43.55	Recommended	Y
HV Tools	Wiha Insulated "bitFlip" Set	6472034	1	$76.52	Recommended	Y
HV Tools	Mini Screw Driver set	6473466	1	$130.61	Recommended	Y
PPE	ARC Flash Protection Clothing Kit - 2PC Small	6471958	1	$819.27	Recommended	Y
PPE	ARC Flash Protection Clothing Kit - 2PC Medium	6473412	1	$819.27	Recommended	Y
PPE	ARC Flash Protection Clothing Kit - 2PC Large	6473413	1	$819.27	Recommended	Y
PPE	ARC Flash Protection Clothing Kit - 2PC XL	6473414	1	$819.27	Recommended	Y
PPE	ARC Flash Protection Clothing Kit - 2PC 2XL	6471962	1	$915.69	Recommended	Y
PPE	ARC Flash Protection Clothing Kit - 2PC 3XL	6471963	1	$983.12	Recommended	Y
PPE	ARC Flash Protection Clothing Kit - 2PC 4XL	6471964	1	$1,065.04	Recommended	Y
PPE	ARC Flash Protection Clothing Kit - 2PC 5XL	6471965	1	$1,146.97	Recommended	Y
PPE	ARC Flash Protection Clothing Kit - 1PC Small	6471966	1	$651.16	Recommended	Y
PPE	ARC Flash Protection Clothing Kit - 1PC Medium	6473415	1	$651.16	Recommended	Y
PPE	ARC Flash Protection Clothing Kit - 1PC Large	6473416	1	$651.16	Recommended	Y
PPE	ARC Flash Protection Clothing Kit - 1PC XL	6473417	1	$651.16	Recommended	Y
PPE	ARC Flash Protection Clothing Kit - 1PC 2XL	6473418	1	$874.07	Recommended	Y
PPE	ARC Flash Protection Clothing Kit - 1PC 3XL	6471971	1	$874.07	Recommended	Y
PPE	ARC Flash Protection Clothing Kit - 1PC 4XL	6471972	1	$874.07	Recommended	Y
PPE	ARC Flash Protection Clothing Kit - 1PC 5XL	6471973	1	$874.07	Recommended	Y
PPE	Balaclava Head Cover one size fits all	6473440	1	$48.49	Recommended	Y
PPE	Hard Hat and Face Shield one size fits all	6368561	1	$381.25	Recommended	Y
PPE	Fall Safety Harness 425LBS	6473270	1	$257.12	Recommended	Y
PPE	Black electrical glove kit, Size 7	6471976	1	$148.99	Recommended	Y
PPE	Black electrical glove kit, Size 8	6473420	1	$148.99	Recommended	Y

CONTRACT DELIVERABLES LIST	DIAGNOSTICS & TOOLS
CUSTOMER NAME	San Francisco Muni
BID/OPTION/SR NUMBER	2023-163
BUS MODEL	XDE40
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COMMENTS	DESCRIPTION	QUOTED PART #	BID QTY	EXTENDED SELLING PRICE	REQUIREMENT	BILLABLE: Y/N
PPE	Black electrical glove kit, Size 8.5	6471978	1	$148.99	Recommended	Y
PPE	Black electrical glove kit, size 9	6471979	1	$148.99	Recommended	Y
PPE	Black electrical glove kit, Size 9.5	6473421	1	$148.99	Recommended	Y
PPE	Black electrical glove kit, size 10	6473422	1	$144.63	Recommended	Y
PPE	Black electrical glove kit, Size 10.5	6473423	1	$208.10	Recommended	Y
PPE	Black electrical glove kit, size 11	6473424	1	$151.86	Recommended	Y
PPE	Black electrical glove kit, size 12`	6473425	1	$144.63	Recommended	Y
PPE	HV Blanket 3' x 3'	6473431	1	$495.41	Recommended	Y
PPE	Blanket Clamp 9-1/2" L, 5" Opening	6473432	1	$35.02	Recommended	Y
PPE	Glove Dust 0.5oz	6473433	1	$90.86	Recommended	Y
PPE	Rescue Hook 6FT	6400745	1	$577.87	Recommended	Y
PPE	Defibrillator Adult	6473177	1	$2,901.96	Recommended	Y
PPE	Brady Personal Lockout Pouch Kit	6473441	1	$132.62	Recommended	Y
PPE	Steel Lock Hasp with Tab	6473442	1	$16.40	Recommended	Y
PPE	American lock A1106RED	6473443	1	$22.77	Recommended	Y
PPE	Lock Out Tag (pk of 25)	6473444	1	$29.47	Recommended	Y
PPE	Hv Warning sign	6473436	1	$19.26	Recommended	Y
PPE	Arc Flash Warning sign	6473437	1	$14.30	Recommended	Y
PPE	steering wheel covers	6473439	1	$72.28	Recommended	Y
PPE	Cart - Safety Barricade System (up to 75ft)	6491772	1	$1,711.68	Recommended	Y
Total Special Tools & PPE				**$226,378.73**	Recommended	Y
Total Diagnostic Equipment and Special Tools & PPE				**$260,109.47**		

Tab 9, Bus Contract Spares Proposal

Solicitation Requirements:

Section 5.8.1, The contractor shall provide 30 spare wheels upon delivery of coach.

New Flyer Response:

New Flyer is pleased to include the following Contract Spares as part of our option proposal, as per SFMTA's specifications.

Contract Spare	Qty	Extended Total Price
Alcoa wheels, 22.5" x 8.25" aluminum with polished Durabright finish	30	$15,199.19

Please note that Contract Spares are priced outside of the Bus Price.

Tab 10, Payment Terms

Solicitation Requirements:

N/A

New Flyer Response:

New Flyer's proposal is based on the following milestone payment terms:

Milestone, net 30 days	Percentage
Engine Install	40%
Approval for Shipment from Facility	20%
Conditional Acceptance	23%
Full Acceptance	15%
Retainage – all contract deliverables received and accepted*	2%

**Retention is based around the following deliverables being received and accepted: full acceptance of the last production bus, special tools related to propulsion, publications, and test reports. All deliverables will be completed during production run; therefore, acceptance of last production bus would govern when retention is released.*

Note, a payment terms discount has already been applied to SFMTA's bus price.

Tab 11, Bus Delivery Schedule

Solicitation Requirements:

N/A

New Flyer Response:

New Flyer is proposing delivery of one (1) Pilot bus by end of Q4-2025 followed by ninety-three (93) production buses from Q1 thru Q3 of 2026., based on receiving the NTP by October 31, 2024.

In order to maintain this delivery schedule as per SFMTA's desire, New Flyer has accounted for a pilot bus that will allow for 3 weeks of testing (including Noise and Duty Cycle), along with a configuration audit and any resulting engineering changes. However, the schedule does not allow for any in-service evaluation period. Should SFMTA require an in-service evaluation period, then the schedule would need to adjust accordingly which could cascade to further cost impacts should the line entry of buses cross calendar years from 2026 into 2027.

This build is currently slotted to be built in New Flyer's St Cloud plant.

Tab 12, Forms

Solicitation Requirements:

As per SFMTA supplied document.

New Flyer Response:

Please see the attached **Tab 12a, Forms**:

- Appendix D, Certification Regarding Debarment, suspension, and Other Responsibility Matters
- Appendix E, Certification Regarding Lobbying
- Appendix H, Buy America Requirements

Appendix D

To be completed by all Proposing Firms and All Proposed Subcontractors

Certification Regarding Debarment, Suspension, and Other Responsibility Matters

By signing and submitting its Proposal, the Proposer or proposed subcontractor certifies as follows:

(1) New Flyer of America Inc.
(Proposer or Proposed Subcontractor Business Name)

certifies to the best of its knowledge and belief that it and its principals:

a. Are not presently debarred, suspended, proposed for disbarment, declared ineligible, voluntarily excluded, or disqualified from contracting with any federal, state or local governmental department or agency;

b. Have not within a three-year period preceding the date of 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) or private agreement or transaction; violation of federal or state antitrust statues, including those proscribing price fixing between competitors, allocation of customers between competitors, and bid rigging; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, receiving stolen property, making false claims, or obstruction of justice; or commission of any other offense indicating a lack of business integrity or business honesty;

c. 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 (1)b of this certification; and

d. Have not within a three-year period preceding the date of this Proposal had one or more public contracts (federal, state, or local) terminated for cause or default.

(2) Where the firm executing this RFP Appendix D is unable to certify to any of the statements in this certification, such firm shall attach a detailed explanation of facts that prevent such certification.

(3) The certification in this clause is a material representation on fact relied upon by the San Francisco Municipal Transportation Agency. If it is later determined that the Proposer or proposed subcontractor knowingly rendered an erroneous certification, in addition to remedies available to the SFMTA, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment.

As the authorized certifying official, I certify that the above-specified certifications are true.

New Flyer of America Inc.	
Business Name	
Jennifer McNeill	Vice President Sales & Marketing
Authorized Representative Name (print)	Authorized Representative Title (print)
	11/07/24
Authorized Representative Signature	Date

Appendix E

To be completed by all Proposing Firms and All Proposed Subcontractors

Certification Regarding Lobbying

Certification for Contracts, Grants, Loans and Cooperative Agreements
(To be submitted with each bid or offer exceeding $100,000)

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person 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 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 instructions. https://www.gsa.gov/cdnstatic/SFLLL_1_2_P-V1.2.pdf?forceDownload=1

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients 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 section 1352, title 31, U.S. Code (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 or proposed subcontractor, New Flyer of America Inc. , certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Consultant or Contractor understands and agrees that the provisions of 31 U.S.C. § 3801, *et seq.,* apply to this certification and disclosure, if any.

New Flyer of America Inc.

Business Name

Jennifer McNeill

Authorized Representative Name (print)

Vice President Sales & Marketing

Authorized Representative Title (print)

Jennifer McNeill

Authorized Representative Signature

11/07/24

Date

Appendix H

BUY AMERICA REQUIREMENTS

If steel, iron, or manufactured products (as defined in 49 CFR Sections 661.3 and 661.5) are being procured, the appropriate certificate as set forth below shall be completed and submitted by each bidder or offeror in accordance with the requirement contained in 49 CFR Section 661.13(b). **Only complete and sign one of the following certificates.**

Buy America Certification
Procurement of steel, iron, or manufactured products

(applicable to procurements greater than $150,000)

Certificate of Compliance with Buy America Requirements

The bidder or offeror hereby certifies that it will meet the requirements of 49 U.S.C. 5323(j)(1) and the applicable regulations in 49 CFR Part 661.

Date 11/07/24

Signature Jennifer McNeill

Company New Flyer of America Inc.

Name Jennifer McNeill

Title Vice President Sales & Marketing

****

Certificate of Non-Compliance with Buy America Rolling Stock Requirements

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

Date _____

Signature _____

Company _____

Name _____

Title _____

2023-163 SFMTA Forms (re-signing)

Final Audit Report 2024-07-11

Created:	2024-07-10
By:	Nhi Le (nhi_le@newflyer.com)
Status:	Signed
Transaction ID:	CBJCHBCAABAAkwXr_mx8Bt79aRGDEHwreXhoLVgXZj51

"2023-163 SFMTA Forms (re-signing)" History

Document created by Nhi Le (nhi_le@newflyer.com)
2024-07-10 - 1:41:04 PM GMT

Document emailed to Jennifer McNeil! Uennifer_mcneill@newflyer.com) for signature
2024-07-10 - 1:41:08 PM GMT

Email viewed by Jennifer McNeil! Uennifer_mcneill@newflyer.com)
2024-07-11 - 3:04:03 PM GMT

Document e-signed by Jennifer McNeil! Uennifer_mcneill@newflyer.com)
Signature Date: 2024-07-11 - 3:05:57 PM GMT - Time Source: server

Agreement completed.
2024-07-11 - 3:05:57 PM GMT

Tab 13, Approved Equals

Solicitation Requirements:

N/A

New Flyer Response:

Please see the attached New Flyer **Tab 13a, Approved Equals** for the proposed bus.

Note, these Approved Equals were submitted as part of New Flyer's Option Proposal 2023-106 to SFMTA, which was off of the Commonwealth of Virginia State Contract.

The questions and responses are specific to SFMTA's technical specification, and so are still applicable to this Option Proposal.

AE #	Spec Section	Spec Section Title	Spec Language	AE	Attachment (Yes, No)	Customer Comments (Use dates)	New Flyer Comments (as applicable)	Status (Approved, Understood, Denied)
1	10.1.1	Warranty Requirements	Figure 10-1 Electric Bus Subsystem and Component Warranty	New Flyer requests clarification on engine and hybrid drive system warranties required. Supplier standard warranty on the engine and transmission is 2 years / Unlimited miles. A 3 year or 300,000 miles (whichever occurs first) extended warrant is available for purchase.	No	9/13/23: 2 year bumper to bumper No extended Warranty for the hybrid system and engine. However, reference the warranty table for other components that have pass thru terms more than 2 years. For allison, was the std term 5 yrs/100,000 miles. 10/2/2023: SFMTA does not want any extended warranty. Our warranty needs are 2yr bumper-to-bumper + subsupplier std terms. If any compenents have standard terms beyond 2 years/???miles, please passon to SFMTA. Allison eGen Flex, I believe this has a different warranty structure and please provide the most updated terms. 10/5/2023: Understood	9/20/23: Please provide clarification on the engine / hybrid system warranty requested. Is the requirement for the supplier standard warranty, or is the extended warranties required for these components. For Allison, the standard warranty term is 2 years / Unlimited miles. 10/5/23: Allison is offering SFMTA 5 years / 350,000 miles coverage on their eGen Flex 40 Max CERT system	Understood
2	10.1.4	Fleet Defects	A "Fleet Defect" is defined as the failure of identical subsystems or components on at least 20 percent, but not less than two, of Vehicles ordered by the SFMTA in any calendar year, where such failures occur prior to the expiration of the Fleet Defect warranty period applicable to the last such Vehicles accepted by the SFMTA. Where, in the SFMTA's opinion, such failure on multiple Vehicles creates a safety hazard or may result in damage to the Vehicle, such failure may, at the SFMTA's discretion, be considered a Fleet Defect, regardless of the proportion of such Defects identified. For the purposes of identifying and addressing Fleet Defects, identical items include Major Components and subsystems purchased by the Contractor as complete units and/or serviced as complete units, such as the power train. If it can be demonstrated to the SFMTA's satisfaction that only a component of a complete unit or subsystem needs to be changed or replaced to correct the problem, then changing or replacing such component in all Vehicles may be acceptable. If it can be demonstrated to the SFMTA's satisfaction that Defects can be isolated to a specific production batch, then changing or replacing components or subsystems of the specific production batch may be acceptable.	New Flyer clarifies that our is based on that a fleet defect is defined as cumulative failures of twenty-five (25) percent of the same components in the same or similar application in a minimum fleet size of twelve (12) or more buses where such items are covered by warranty. A fleet defect shall apply only to the base warranty period in sections entitled "10.1.1.1 Complete Coach". 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.	No	9/13/23: Since this is a bigger quantity purchase, the 20% seems to be a fair number. 10/2/2023, no additional questions or comments.	9/20/23: New Flyer clarifies that our proposal is based on that a fleet defect is defined as cumulative failures of twenty (20) percent of the same components in the same or similar application in a minimum fleet size of twelve (12) or more buses where such items are covered by warranty. A fleet defect shall apply only to the base warranty period in sections entitled "10.1.1.1 Complete Coach" 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.	Understood
3	10.1.4.3	Warranty after Replacement or Repair of Fleet Defects	The warranty on parts or components used to remedy Fleet Defects shall begin when the retrofit parts are installed and shall be extended for the time and/or miles remaining on the original Coach warranty or the part manufacturer's warranty, whichever is greater.	New Flyer clarifies that our proposal is based on the following revised language: The warranty on parts or components used to remedy Fleet Defects shall begin when the retrofit parts are installed and shall be extended for the time and/or miles remaining on the original Coach warranty or the part manufacturer's warranty, ~~whichever is greater~~ **whichever is first**.	No	9/13/23: Not restarting the warranty for new component, resuming remaining warranty term. It's fine.		Understood
4	10.1.4.5	Failure to Comply -- Corrective Action Plan	If (a) Contractor does not provide a plan for correction within the time specified above (or as extended by the SFMTA); or (b) a specific declared fleet Defect is not fully corrected within the time specified in the plan; or (c) the remainder of the Coaches are not corrected in accordance with the Contractor's work program; the SFMTA may begin assessing liquidated damages in accordance with Section 19 of the Contract 15 days after providing written notice to Contractor.	New Flyer clarifies that our proposal is based on removing this clause in its entirety. New Flyer will always do everything we can to provide a plan for correction within the time specified above (or as extended by the SFMTA); or fully correct the fleet defect within the time specified in the plan; or correct the remainder of the Coaches in accordance with the Contractor's work program. However, New Flyer will not pay Liquidated Damages, as they are onerous and burdensome on the Contractor and is not an industry standard.	No	9/13/23: as discussed in yesterady call, if SFMTA insisted, what other options are available? 10/2/23: will await for the price proposal.	9/20/23: We are following the same strategy as the electric option and will be available on the proposal.	Understood

AE #	Spec Section	Spec Section Title	Spec Language	AE	Attachment (Yes, No)	Customer Comments (Use dates)	New Flyer Comments (as applicable)	Status (Approved, Understood, Denied)
5	10.2	Repair Procedures	The Contractor shall be responsible for all warranty-covered repair work. The Contractor or its designated representative shall secure parts and perform all affected warranty repair work. At its discretion, the SFMTA may perform such work if it determines it needs to do so based on transit service or other requirements. The Contractor shall be responsible, and shall reimburse the SFMTA, for all costs for warranty work performed by SFMTA personnel or by any contractor(s) hired by the SFMTA to perform warranty work, as described in Section 10.2.2, Repairs by SFMTA.	New Flyer's priority to ensure that all warranty-covered repairs are completed by the appropriate party in order for SFMTA to receive the highest quality, least expensive and most efficient outcome possible. With this goal in mind, New Flyer clarifies that our proposal is based on providing the following solutions: 1. Minor/Major Warranty-covered repairs should be carried out by SFMTA and reimbursed by the Contractor through our online warranty system. Contractor is available to assist in completing these warranty-covered repairs when it is beyond SFMTA scope of expertise. 2. Major Component Warranty repairs should be carried out by the equipment suppliers (HVAC and destination sign suppliers) in order to adhere to their mandate that all warranty repairs be performed by an authorized dealer unless the SFMTA is an authorized warranty center. If the SFMTA elects to perform these repairs, without the written permission of the original equipment manufacturer, the warranty coverage will be voided.	No	9/13/23: Needs to discuss about condition #1. Does it mean all minor/major repairs are shifted to SFMTA by default? 10/2/23: will await for the price proposal.	9/20/23: This is the same as what was explained, discussed and understood on the Electric option.	Understood
6	10.2.1	Repairs by Contractor	The Contractor shall reimburse the SFMTA for all expenses incurred, including labor for driving Coaches, or towing charges for Coaches transported, between SFMTA's facilities and Contractor's service center or the facilities of its subcontractors or suppliers.	New Flyer clarifies that our proposal is based on the following revised language: The Contractor shall reimburse the SFMTA for all expenses incurred, including labor for driving Coaches, or towing charges for Coaches transported, between SFMTA's facilities and Contractor's service center or the facilities of its subcontractors or suppliers **for the warranty period as specified in section "10.1.1.1 Complete Coach".**	No	9/13/23: So towing only applies to the 2yr bumper-to-bumper only? If SFMTA decided to include extended warranty on Engine/hybrid systems, would towing be reimbursed after the 2 yrs? 10/2/23: will await for the price proposal.	9/20/23: This is the same as what was explained, discussed and understood on the Electric option.	Understood
7	10.2.2.1	Parts Used	The SFMTA shall use new parts, subcomponents, and subsystems that Contractor shall provide specifically for this repair. Contractor shall stock most required parts, including those of its sub-suppliers. All parts shall be stamped or permanently marked with the OEM part number, and serial number if applicable. Warranties on parts used shall begin once the Vehicle has been repaired. The OEM warranty will apply to the newly installed part with the manufacturer acknowledging the passed-through warranty.	New Flyer clarifies that our proposal is based on the following revised language: The SFMTA shall use new parts, **remanufactured,** subcomponents, and subsystems that Contractor shall provide specifically for this repair. Contractor shall stock most required parts, including those of its sub-suppliers. All parts shall be stamped or permanently marked with the OEM part number, and serial number if applicable. Warranties on parts used shall begin once the Vehicle has been repaired. ~~The OEM warranty will apply to the newly installed part with the manufacturer acknowledging the passed-through warranty.~~ **The unexpired warranty will apply to the installed part.**	No	9/13/23: Please define what components are under the remanufactured? I.e. alternator, caliper? I can understand for traction motor or ESS.	9/20/23: Withdrawn	Withdrawn
8	10.2.2.3	Defective Parts Return	The Contractor may request that Defective parts or components covered by warranty be returned to the manufacturing plant. The Contractor shall pay the total cost for this action. Materials will be returned in accordance with the Contractor's instructions.	New Flyer clarifies that our proposal is based on having SFTMA return all failed components, returned to the Contractor within 45 days from the date of failure. All parts need to be returned for evaluation so that reimbursement can take place.	No	9/13/23: Is NF asking to make sure parts will be received in 45 days? Or claims will be rejected? 10/2/23: will await for the price proposal.	9/20/23: This is the same as what was explained, discussed and understood on the Electric option.	Understood
9	10.2.2.4	Reimbursement for Labor	Contractor shall reimburse the SFMTA for approved warranty claims within 60 Days after each warranty claim has been submitted by the SFMTA. If the SFMTA does not receive payment within 60 Days, the SFMTA may deduct the amount of the approved claim from the progress payments due to Contractor.	New Flyer clarifies that our proposal is based on providing reimbursement for all valid warranty claims on labor and/or parts within sixty (60) days from the date that New Flyer has received the failed components.	No	9/13/23: Fine		Understood
10	10.2.2.5	Reimbursement for Parts and Towing	In the event the SFMTA deems it necessary to contract out for warranty repairs, the SFMTA shall notify Contractor, and the Contractor shall approve the warranty repair before the SFMTA proceeds with contracting out the repair. The Contractor shall reimburse the SFMTA for the actual cost of the repair, including charges for any warrantable parts, consequential parts or damages, labor, and towing or transportation. The SFMTA may impose a handling charge of up to 15% of the total cost of the warranty parts not to exceed $250 per claim plus applicable taxes.	New Flyer wants SFTMA to get the best value and service out of your buses. With this goal in mind, New Flyer clarifies that our proposal is based on reimbursing SFTMA for defective parts and for parts that must be replaced to correct the defect for the duration of the "Complete Coach" warranty period as specified in section "10.1.1.1 Complete Coach".	No	9/13/23: only parts but no other labor associated or towing fees? only reimburese during the 2yr bumper-to-bumper only? No 15% handling fees? 10/2/23: will await for the price proposal.	9/20/23: This is the same as what was explained, discussed and understood on the Electric option.	Understood
11	N/A	Acceptance Location	N/A	New Flyer requests clarification on where acceptance will take place? SFMTA has provided a location to accept on previous builds but from our understanding the location at Marin will not be available going forward.	No	10/6/23: in 2025, the Marin site will not be available and will be the Contractor's responsibility to provide the acceptance site. SFMTA prefers to use the "potential" Contractor's seatlite location. (MCI)		Understood
12	N/A	Technical Summary Comparison	N/A	In the comparison doc, there are a few lines where you asked, for example "460-0K can this window be an emergency exit window?" If our response is "yes" do you want us to make that change in the BOM? Or were you just asking for clarity?	No	10/2/23: If the options are available, please let us know the cost for getting the options. Please don't change the BOM yet, we would like to review the pricing and make the decision.	10/5/23: NF will review and price options separately if possible and applicable.	Understood

AE #	Spec Section	Spec Section Title	Spec Language	AE	Attachment (Yes, No)	Customer Comments (Use dates)	New Flyer Comments (as applicable)	Status (Approved, Understood, Denied)
13	N/A	AVM System		We are providing the Viriciti AVM system, which is typically only used on electric buses. On your previous hybrid, you had the Fleetwatch AVM system. Can you confirm that you would like Fleetwatch, and not Viriciti?	No	10/2/23: oSFMTA would like to keep Fleetwatch installed. SFMTA will also continue to use NF CONNECT, please **include the 12-year subscription fee in the pricing proposal**. Please also add ViriCiti provision to the vehicle built. We want to have the provision ready. 10/5/2023: Just to clarify, SFMTA only request Provision for the ViriCiti, we do not need the Module installed.	10/5/23: NF will provide Fleetwatch and 12 year subscription to NF Connect.	Understood

Tab 14, Deviations

Solicitation Requirements:

N/A

New Flyer Response:

Please see the attached **Tab 14a, Technical Deviations** for the proposed bus.

Please see our Warranty and Publications sections for deviations specific to those deliverables.

OPT 23-163 SFMTA Technical Deviations

Dev #	Page #	Section #	Section Title	Spec Language	Deviation
1	Overall Requirements, 8 Propulsion System, 4	1.1.3 6.4.1	Legal Requirements Emissions	D. The manufacturer shall verify that the Coach is certified by the California Air Resources Board (CARB) for meeting both exhaust emissions and engine durability requirements as specified for use in heavy-duty, urban transit coaches. If manufacturer intends to emissions certify through vehicle testing, a detailed testing strategy and design review shall be approved by the SFMTA prior to testing. The Coach shall meet or exceed all appropriate emission standards for use in transit service in the State of California, according to date of delivery, including any special circumstances requiring alternative regulatory compliance and/or testing The Contractor shall provide a CARB approved exhaust emission control system.	New Flyer's proposal is based on providing a 40' diesel electric hybrid bus which is provided with a Cummins B6.7, 280 horsepower diesel engine, compliant with the 2025 EPA emissions standards. Cummins will not be CARB-certifying the B6.7 engine, therefore the SFMTA will be required to request a Transit Bus Exemption from CARB. There are timing requirements and information available on CARB's website: https://ww2.arb.ca.gov/our-work/programs/innovative-clean-transit/omnibus-regulation-transit-exemption Please note that there is a requirement to file exemption requests by May 1.
2	Overall Requirements, 9	1.2	TABLE 1.2 – Bus Requirements	Overall height without roof-mounted HVAC system 125" max Overall height with roof-mounted HVAC system 140" max	New Flyer would like to clarify that on our diesel hybrid Xcelsior® buses, the hybrid rooftop components are the high spot on the bus, not the roof mounted HVAC system and the max height is 130" for BAE and Allison hybrid configurations. Please refer to the following bookmarks for additional information: **- 1.2a, BAE Exterior Layout 938981** **- 1.2b, Allison Exterior Layout 353674**
3	Overall Requirements, 9	1.2	TABLE 1.2 – Bus Requirements	Overall passenger capacity 65 min	New Flyer's proposal is based on providing a total capacity of 63 passenger based on the proposed seat layout which is the same as provided on SR2117. Please refer to the following bookmarks for additional information: **- 1.2c, SR2117 LD 718313** **- 1.2d, SR2117 UD 718315**
4	Overall Requirements, 20	1.17	FIRE SAFETY	An independently powered system of active thermal detection in the battery compartment that alerts the driver and/or personnel when the temperature is greater than 180°F shall be installed.	New Flyer's proposal is based on providing a hybrid system (either supplied by BAE or Allison) that does not include an independently powered system of active thermal detection in the battery compartment. This is not provided by the Hybrid OEMs and New Flyer does not provide 3rd party fire detection within the Hybrid ESS compartment.
5	Overall Requirements, 20	1.17	FIRE SAFETY	A warning notice will be provided within the battery compartment and on the outside of the Coach NOT to pour water on the battery equipment in case of fire. Appropriate instructions will be posted.	New Flyer's proposal is based on NOT providing this type of warning notice. We fear that this type of instruction could be misinterpreted and result in a complete bus loss during a thermal event. New Flyer recommends pouring large volumes of water on the batteries during a thermal event to help limit the damage to batteries and the bus.
6	Overall Requirements, 20	1.17	FIRE SAFETY	A fire suppression system shall be provided inside the house battery box and traction motor compartment to reduce the risk of the fire from spreading to other parts of the Coach... Fire detection systems shall be provided for the house battery compartment, all ESS modules, traction motor compartment, and for all other power conversion hardware and electronics on the vehicle.	New Flyer's proposal is based on providing a fire detection (and suppression) system within the house battery and propulsion compartments (as provided on your previous hybrid SR2117), but not in the ESS modules or in the traction motor comparment.
7	Body, 3 Body,7	2.1.7 2.2.10.4	Exclusion of Water Electronic Equipment Compartment	Any equipment compartment located inside the Coach shall be sealed to prevent water entry. The electronic equipment enclosure shall be lockable, waterproof, and dustproof.	New Flyer's proposal is based on providing our standard SDS **(the same as SR-2450)** enclosure which, when the door is secured, protects the equipment from dust and water splashes. However, it is not sealed to prevent water entry.
8	Body,7	2.2.10.2	Rear Equipment Compartment	The SFMTA prefers that an access door be installed which allows easy maintenance access to engine exhaust after-treatment devices. The access door should be designed to minimize labor time related to periodic servicing of the after-treatment device.	New Flyer would like to clarify that the current diesel hybrid configuration with the ISB engine has the after treatment system combined as one unit with the muffler. This combined unit is easily accessed through the left side upper corner pillar door. Please refer to the following bookmarks for additional information: **- 2.2.10.2a, SR-2734 Exterior-Muffler and Tailpipe**
9	Furnishings, 2 Operator's Area, 12	3.1.1.4 4.5.1	Emergency Exits Mirrors - Exterior	The operator's window and all passenger side windows shall open outward to provide an emergency exit except for the two rear most windows and the destination sign windows on each side of the Coach. Both mirrors shall be mounted on swivel arms with their lower edges no less than 80 inches above the street surface.	New Flyer's proposal is based on providing an operator's window which is non-egress. We are unable to provide an egress operator's window with the high mount mirror specified in section 4.5.1. The window contacts the mirror when it is opened and prevents it from being used for egress. Please refer to the following bookmarks for additional information: **- 3.1.1.4a, Egress Driver's Window with High Mount Mirror #1** **- 3.1.1.4b, Egress Driver's Window with High Mount Mirror #2**

OPT 23-163 SFMTA Technical Deviations

Dev #	Page #	Section #	Section Title	Spec Language	Deviation
10	Furnishings, 3	3.2.2	Doors - Dimensions	Door openings shall be no less than 84.5 inches high	New Flyer's proposal is based on providing the following door opening heights: Entrance door: 77.4" Exit door: 77.3" These heights are inherent to the design of the Xcelsior® bus and are the same as provided on your current Xcelsior® buses.
~~11~~	~~Furnishings, 3~~	~~3.2.2~~	~~Doors - Dimensions~~	~~The rear door shall have a free clear opening of 44 inches wide for the entire vertical height. The rear door clear opening width may be reduced to 41 inches wide in the areas of the passenger assists and the passenger head and foot areas if these projections do not present hazards.~~	~~New Flyer's proposal is based on providing the Vapor Wide Slide Glide exit door which has a clear opening width of 40.7".~~ ~~This is the same as provided on your SR2117 Xcelsior® buses.~~ **NF withdraws this deviation**
12	Furnishings, 4	3.2.6	Actuators	Both door panels shall be operated by a single actuator for each door opening to guarantee synchronization of panels during opening and closing cycles.	New Flyer would like to clarify that the specified Vapor Dual Linear entrance door has two actuactors (as the name implies). Vapor uses an electronic door controller to guarantee the synchronization of the panels.
13	Furnishings, 32	3.22	NUMBERING AND SIGNING	The Contractor shall provide the Coach number on a 48 inch high decal on the roof of the Coach.	New Flyer's proposal is based on providing coach number decals on the roof of the bus which measure 14" in height. This is the same as provided on your SR2117 Xcelsior® buses. Please refer to the following bookmarks for additional information: **- 3.22a, Roof Fleet Number Decal 721623** **- 3.22b, Roof Decals per Paint Layout 719829**
14	Operator's Area, 8	4.1.5	Steering Wheel and Horn Button	The steering column shall be capable of a minimum six inch horizontal adjustment and a three-inch vertical adjustment from the operator seat.	New Flyer's proposal is based on providing the Douglas Autotech steering column which has a telescopic range of 1.88 in. On the New Flyer buses the wheel cannot be positioned in a pure horizontal position, but rather has nearby steps at 2 degrees tilted away from the driver and 5 degrees tilted towards the driver. - At the -2-degree tilt, the minimum low-end adjustment is 32.0 in., measured from the top of the steering wheel rim in the horizontal position to the cab floor at the heel point. - At the 5-degree tilt, the minimum low-end adjustment is 30.8 in., measured from the top of the steering wheel rim in the horizontal position to the cab floor at the heel point. This is the same as provided on your current Xcelsior® buses. Please refer to the following bookmarks for additional information: **- 4.1.5a, TS 32 2 4 LA steering adjustment -1.5 degrees**
15	Operator's Area, 8	4.1.5	Steering Wheel and Horn Button	The steering wheel shall be Vehicle Improvement Products BKBL1824D4V, or approved equal and the horn assembly shall be a Vehicle Improvement Products HB9T, or approved equal.	New Flyer's proposal is based on providing a Vehicle Improvement Products steering wheel part number BKBL1824D4SS and horn assembly part number HB10BL. These are the same as provided on your previous Xcelsior® buses. Please refer to the following bookmarks for additional information: **- 4.1.5b, Steering Wheel 064449** **- 4.1.5c, Steering Wheel Horn Button 557082**
16	Operator's Area, 9	4.1.9	Turn Signal	Turn signal controls shall be foot-controlled, waterproof, heavy-duty momentary contact switches, floor-mounted on a platform inclined at an angle between 35 and 45 degrees in a manner that precludes confusion between the left turn, right turn, and high-beam switches.	New Flyer's proposal is based on providing turn signal control switches which are water resistant not waterproof. This is the same as proivded on your current Xcelsior® buses.
17	Operator's Area, 12	4.5.1	Mirrors - Exterior	Both mirrors shall be mounted on swivel arms with their lower edges no less than 80 inches above the street surface.	New Flyer's proposal is based on providing the same exterior mirror configuration as provided on SR2450. The lower edges measure the following distances from the street surface: Streetside: 73.83" Curbside: 79.58" Please refer to the following bookmarks for additional information: **- 4.5.1a, SS Exterior High Mount Mirror 604058** **- 4.5.1b, CS Exterior Mirror 869848**

OPT 23-163 SFMTA Technical Deviations

Dev #	Page #	Section #	Section Title	Spec Language	Deviation
18	Operator's Area, 14	4.11	STORAGE LOCKER	The locker shall be at least four cubic feet.	New Flyer's proposal is based on providing an equipment box mounted on the front curbside luggage rack that is 3.64 cubic feet in size. This is the same box as provided on your SR2117 & SR2450 Xcelsior® buses. Please refer to the following bookmarks for additional information: **- 4.11a, Curbside Equipment Box 501275**
19	Chassis, 1	5.1.2	Axles	The front axle suspension system shall be independent type M.A.N., Rockwell, Meritor, ZF, or approved equal	New Flyer's proposal is based on providing a MAN front axle which has a rigid, non-independent suspension. Our axles are inherent to the design of the Xcelsior® bus.
20	Chassis, 1	5.1.3	Wheel Bearings	The non-drive axle bearings shall be grease unitized bearings by Fuchs, or approved equal.	New Flyer's proposal is based on providing MAN front axle bearings that are manufactured by SKF. Fuchs is a grease manufacturer, however with unitized bearings, the grease does not have to be replaced.
21	Chassis, 7	5.5.1	Air Compressor	The air compressor shall have the capacity to charge the air system from 40 psi to the governor cutoff pressure in less than three minutes.	New Flyer's proposal is based on providing an electrically driven air compressor that charges the air system from 40 psi to the governor cutoff pressure in less than 4 mins. This is the standard for the Powerex direct coupled scroll air compressor to be provided.
22	Chassis, 8	5.5.2	Air Lines and Fittings	Nylon lines may be grouped and shall be continuously supported to prevent movement, flexing, tension strain, or vibration.	New Flyer's proposal is based on providing nylon air lines that comply with the requirement as stated in the APTA Bus Procurement Guidelines which is "Nylon lines may be grouped and shall be supported at 30 inch intervals or less." The use of the word "continuously" is not clearly defined and can have a wide range of technical interpretations.
23	Chassis, 8	5.5.2	Air Lines and Fittings	The line between the bulkhead and the air dryer shall be rigid copper. These lines shall have a minimum inside diameter of one (1) inch.	New Flyer's proposal is based on providing copper lines between the air dryer and the bulkhead which have an inside diameter of 0.75". This is our standard design and the same as provided on your current Xcelsior® buses.
24	Chassis, 11	5.8.1	Wheels	All wheels shall be machine finished and stamped with the following markings a) unique serial number, b) "Property of SFMTA" on a non-stressed area.	New Flyer's proposal is based on providing Alcoa Dura-Brite wheels which do not have the specified markings. Alcoa does not provide any additional markings aside from what is on their design drawings. They have however advised that they do allow customers to add markings as directed in their service manual. New Flyer is unable to provide these markings but they could be added by SFMTA upon receipt of the buses. Please refer to the following bookmarks for additional information: **- 5.8.1a, Alcoa wheel-service-manual-EN (page 14)**
25	Chassis, 12	5.9	FIRE DETECTION / SUPPRESSION	It must provide detection capability to all risk zones, including at all ESS battery storage areas, exhaust stack, and air conditioner area.	New Flyer's proposal is based on providing fire detection in the engine compartment, exhaust stack and LV battery compartments only and not does not include coverage of any roof mounted components including the ESS battery storage area or HVAC units.
26	Chassis, 12	5.9	FIRE DETECTION / SUPPRESSION	Two or more linear detection wires shall be installed in the Coach.	New Flyer's proposal is based on providing a single linear detection wire in the engine compartment which is sufficient to provide coverage for this area.
27	Chassis, 12	5.9	FIRE DETECTION / SUPPRESSION	The Contractor shall install a sensor with an audible alarm to detect approaching combustion temperatures in the catalytic convertor area.	New Flyer's proposal is based on providing a single spot sensor rated to 450F in the SCR/exhaust stack/catalytic convertor area, located in streetside rear upper corner pillar.
28	Chassis, 13	5.9	FIRE DETECTION / SUPPRESSION	If a fire is detected, the detection/suppression system shall automatically: Flood the propulsion system with sufficient dry chemical agent to extinguish the fire when either the Coach speed falls below 15 mph or after certain time delay, adjustable between zero and 15 seconds.	New Flyer would like to clarify that on a hybrid bus - the diesel engine, the hybrid drive unit and the hybrid ESS are all considered to form the "propulsion system". New Flyer's proposal is based on providing fire detection and suppression in the engine compartment only and not covering the hybrid drive unit area or the hybrid ESS compartment on the roof.
29	Propulsion System, 1 Propulsion System, 4	6.1 6.4.1	PROPULSION SYSTEM DESCRIPTION Emissions	At a minimum, APU shall comply with CCR, Title 13, section 1956.1 for both emissions and useful life requirements. The engine shall comply with 40 CFR section 86.094-25 (maintenance) and other applicable sections. The engine shall meet all requirements of the Technical Specifications. Complete Coach or systems certification documentation shall be provided to the SFMTA, based on the CCR, Title 13, section 1956.1.	New Flyer would like to advise that the two specifcations numbers referenced have been superseded as follows: CCR, Title 13, section 1956.8 is the current regulation for diesel emission compliance. 40 CFR section 86.004-25 is the current maintenance regulation for CARB (which Cummins complies with).

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30	Propulsion System, 2	6.2.2	Energy Storage and Controller	The energy storage system shall include a voltage equalization system designed to provide automatic real-time equalization of voltage between individual battery cells within each module. This equalization function shall be accomplished automatically and shall not require manual intervention by the Coach operator or maintenance personnel. Design and performance must be approved by the SFMTA. Energy storage shall be of a commercial design capable of operating in the San Francisco transit environment. Charging of the energy storage device shall be accomplished by on-board engine-generator, external charging stations and regenerative braking.	New Flyer's proposal includes the option for Allison Propulsion. New Flyer's proposal is based on providing the Allison eGen Flex Max system which does not provide the capability for external, shore power charging. ESS charging is automatically accomplished via on-board charging powered by the engine and regenerative braking.
31	Propulsion System, 2	6.2.3	Propulsion Controller	The hybrid system controller shall monitor system inputs and execute outputs as appropriate to control the operation of all hybrid devices. This controller may include or directly control power electronics necessary for operation of the engine, generator, traction motor, energy storage and other related hybrid devices. The controller shall be capable of storing multiple (minimum 3) configuration/calibration files in an effort to facilitate optimizing drive parameters to a variety of route profiles. The configuration default file shall be based upon operator route selection via destination sign code and further optimization “on the fly” by toggling between parameters in an effort to optimize via changing route duty cycle profiles.	New Flyer's proposal includes the option for Allison Propulsion. On behalf of Allison, New Flyer requests clarification to understand how this feature would work, to be addressed at PPM: - What are the inputs to the hybrid system to request a different calibration configuration file? - When during operation would a request to be made to automatically change the calibration configuration file? - What drive parameters need to be able to be changed?
32	Propulsion System, 2	6.2.3	Propulsion Controller	The controller shall be capable of storing multiple (minimum 3) configuration/calibration files in an effort to facilitate optimizing drive parameters to a variety of route profiles. The configuration default file shall be based upon operator route selection via destination sign code and further optimization “on the fly” by toggling between parameters in an effort to optimize via changing route duty cycle profiles.	New Flyer's proposal is based on providing the BAE Gen 3 Hybrid System. BAE has provided the following clarification for this requirement: The controller is capable of storing the installed configuration file. The parameters within this calibration file may be configured to meet the needs of the SFMTA through testing. Once the desired calibration parameters are arrived at, BAE Systems will make the calibration changes within the software package. If multiple configurations are desired for a single order, that can also be worked between BAE Systems and the SFMTA. The parameters within the calibration file are not configurable “on the fly”. They may be tweaked “on the fly” during testing using the BAE Systems diagnostic tool, but any changes would require a change in the calibration file and installation into the controller to become a permanent setting.
33	Propulsion System, 3	6.4	ENGINE	An engine oil pressure gauge and coolant temperature gauge shall be provided in the engine compartment for ease of maintenance.	New Flyer's proposal is based on providing a single electronic C-COM gauge with a backlit LCD display to display the engine oil pressure and coolant temperature. This electronic gauge can also display additional parameters such as transmission oil temperature, tachometer and 12V/24V battery voltage. This is our standard gauge used on the engine switch box and is the same as provided on your last hybrid SR2117.
34	Propulsion System, 7	6.4.8.2	Surge Tank	A spring-loaded, push-button type valve to safely release pressure or vacuum in the cooling system shall be provided.	New Flyer's proposal is based on providing a surge tank pressure relief valve which is a "LEV-R VENT" (lever type valve) which is built into surge tank cap.
35	Propulsion System, 7	6.4.8.2	Surge Tank	The sight glass, coolant fill location, and the valve shall be accessible and clearly visible from the exterior of the Coach through a separate access door without opening the main engine compartment door.	New Flyer's proposal is based on providing a coolant fill system which is through the coolant recovery tank located in the rear engine compartment, accessible through the rear engine door. The surge tank sight glass and pressure relief valve are still visible via the surge tank access door on the rear streetside of the bus.
36	Propulsion System, 7	6.4.8.4	Cooling System and Charge Air Hoses	Oetiker clamps, Breeze, or approved equal	New Flyer's proposal is based on providing Ideal SmartSeal and WaveSeal stainless steel constant torque clamps. These are New Flyer's standard for constant torque clamps and are the same as provided on previous Xcelsior® builds. Please refer to the following bookmarks for additional information: **- 6.4.8.4a, SIB-231-005-X-Coolant System-NFA.**
37	Propulsion System, 9	6.6	ENERGY STORAGE SYSTEM (ESS)	The battery cells within the ESS shall be packaged into modules and mounted into enclosures which allows for ease of servicing. These enclosures shall be designed to minimize shock hazard to maintenance personnel and to prevent any leaked substance from escaping.	New Flyer's proposal is based on providing the BAE Systems Gen 3 Hybrid system. BAE Systems cannot guarantee zero leakage because the ESS is not hermetically sealed. The design of the ESS enclosure follows industry standards and guidelines including, but not limited to, UNECE R100, ISO16750, SAE J2929, SAE J1766, SAE J1797, and SAE J2464.

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38	Electrical, 1	7.1	POWER REQUIREMENT	~~which allows for ease of servicing. These enclosures shall be designed to minimize shock~~ **Correction on a copy/paste error:** **An isolated and dedicated control circuit and line feed circuit with a continuous load rating of at least 150% of the engine and propulsion system control system current demand shall be provided.**	New Flyer would like to clarify that we provide: - 12VDC/24VDC power from the low-voltage batteries - 24VDC power from the Hybrid System Please note these circuits are isolated from each other. The line feed control for the low-voltage batteries is the main power disconnect switch and the HVIL switch is for the 600V hybrid system.
39	Electrical, 4	7.8	JUNCTION BOXES	hazard to maintenance personnel and to prevent any leaked substance from escaping. **Correction on a copy/paste error** **A rear start and run control box shall be mounted in an accessible location in the engine compartment. The run control box shall contain:** **1) a starter pushbutton,** **2) engine oil pressure gauge,** **3) traction motor oil temperature gauge,** **4) traction generator oil temperature gauge** **5) coolant temp gauge,** **6) sealed, coach data port connector,** **7) ignition switch (front/rear/disable options).** **The control box shall be stainless steel and waterproof. The rear control box and its location shall be submitted to the SFMTA for approval at the design review.**	New Flyer's proposal is based on providing a "rear start and run control box" with the following features: - a rotary switch to select "FRONT", "OFF", or "REAR" start. It also includes a momentary turn switch to start the bus from the rear. We do not provide a pushbutton starter. **(note, NF's new switchbox design is different than what was supplied for SR-2117. It incorporates a keypad which replaces multiple switches and the start pushbutton, and engine run switch with a rotary switch. See attached CCB)** - We provide one (1) electronic gauge that show engine oil pressure, oil temperature, and coolant temperature (as opposed to separate gauges). - The control box is also made out of aluminum (not stainless steel).
40	Electrical, 6	7.10.1	Battery Tray	A polarized lug mating with Anderson power products #632062 or approved equal and manual release #919 shall be provided inside the battery compartment and adjacent to, but no further outboard than, the batteries. The plug shall be wired with 3/0 cable.	New Flyer's proposal is based on providing 2/0 cable for the jumpstart connector. Please note the Anderson Jumpstart Connector we provided needs a 2/0 sized cables (as opposed to 3/0 cable). This is the same was what was provided in previous builds for SFMTA.
41	Electrical, 7	7.11	LOW VOLTAGE MASTER BATTERY SWITCH	Using the master battery switch shall not damage any component of the electrical system.	New Flyer would like to clarify that using the master battery switch (after the bus has done an orderly shutdown) will not damage any component of the high voltage or low voltage electrical systems. However, please note that the master battery disconnect switch is meant for emergency and maintenance applications and should only be used in such instances.
42	Furnishings, 1	3.1.1.2	Passenger Windows - Materials	All passenger windows and door windows shall be no less than 50 percent luminous transmittance and shall have a solar heat gain coefficient of no greater than 40 percent; the Contractor shall submit the proposed luminous transmittances and solar heat gain coefficients of the passenger windows and door windows for the SFMTA's approval.	New Flyer's proposal includes the option for Ricon flush windows. Ricon has advised that their proposed tempererd glass meets the following specifications: 3/16" (5mm) thick 50% visual light transmittance 29% UV light transmittance 48% Total Solar Energy transmittance
43	Furnishings, 2	3.1.1.4	Passenger Windows - Materials	The upper window mounting hinge shall be stainless steel.	New Flyer's proposal includes the option for Ricon flush windows. Ricon has advised that their upper window hinge is made of aluminum.
44	Electrical, 3	7.7	WIRING AND TERMINALS	Wires shall be uniformly color-coded and tagged.	New Flyer's proposal is based on providing Vapor Entrance and Exit door system in which the wires are not color coded, however, each individual wire is identified at 2 inch intervals or less.
45	Body,7	2.2.11	Bumper System	Bumpers shall provide impact protection for the front and rear of the Bus up to 26 inches above the ground.	New Flyer's proposal is based on providing a front bumper height of 24 inches at the center line of the bus and a height at the outer edges of 27 inches from street level at ride height. The top center of the rear bumper measures 30.5" inches from the street level. The Xcelsior bumpers are designed to fit the esthetic look of the Xcelsior and have been impact tested in accordance with APTA Bus Procurement Guidelines. These are the same as provided on your current Xcelsior® buses.
46	Body, 9	2.3.1	Divider and Side Trim Panel	Sturdy divider panels constructed of durable, unpainted, corrosion-resistant material complementing the interior shall be provided as required at the rear of the entry stepwell and at the front and rear of the exit stepwell(s). Surfaces of the divider panels shall conform to Attachment 3: Materials, Colors and Finishes.	New Flyer's proposal is based on providing a barrier rear of the entry stepwell which is formed by the front curbside luggage rack with a matte black finish and not a separate modesty/divider panel. This is inherent to the design of the Xcelsior®.
47	Body, 10	2.3.6	Access Doors	Access doors shall be hinged with gas props or over center springs, where practical, to hold the doors out of the mechanic's way.	New Flyer's proposal is based on providing two interior access doors that do not meet this spec requirement. The rear bulkhead access panels are not hinged or held open with gas props or springs. They are retained with captive hardware. The front wheelchair mechanism access door is hinged but not held open with a gas prop or over center spring. This is the same as provided on your current Xcelsior® buses.
48	Body, 10	2.3.6	Access Doors	All door hinges shall be stainless steel piano-style type hinges or approved alternative	New Flyer's proposal is based on providing hinges which are predominantly fabricated from steel on the interior of the bus. This is the same as provided on your current Xcelsior® buses.

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49	Body, 11	2.4	Floor	All edges shall be sealed with an SFMTA-approved sealer.	New Flyer's proposal is based on not sealing the edges of the flooring as edge sealing is not required with the composite flooring specified in the last paragraph of this same section. **(note, this deviation is specific to the composite flooring, not the floor covering. The pieces of composite flooring are not edge sealed. But the Altro floor covering is welded at the seams)**
50	Furnishings, 0	3.1.1.2	Passenger Windows - Materials	All passenger windows and door windows 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. All passenger windows and door windows shall be no less than 50 percent luminous transmittance and shall have a solar heat gain coefficient of no greater than 40 percent;	New Flyer's proposal is based on providing passenger windows which have 5mm (3/16") tempered glazing and are grey with a 50% light transmittance, meeting the specification requirements. Please ntoe that your solar heat gain coefficient requirement is stated incorrectly as a coefficient value is a number less than 1.0. The proposed window glazing has a SHGC of 0.62 and a solar energy of 48% This is the same window glazing as provided on your current SR2450 battery electric buses.
51	Furnishings, 5	3.3	Lighting	Wherever possible, Contractor shall utilize LED lights from Truck Lite, Dialight, Hella, Luminator, Simcona, E-Corp, or an approved equal.	New Flyer's proposal is based on providing headlights provided by JW Speaker. Our headlights are inherent to the design of the Xcelsior® and the same as provided on your current Xcelsior® buses. Please refer to the following bookmarks for additional information: **- 3.3a, SIB-273-001 LED Headlights** **- 3.3b, Headlight Assy 621840**
52	Furnishings, 5	3.2	Lighting	Stop, turn, tail, and marker lights shall be flush mounted or low profile without guards.	New Flyer's proposal is based on providing side turn signal lights which are provide WITH guards. This is the same configuration as provided on all recent Xcelsior® buses.
53	Furnishings, 10	3.7.1	PASSENGER SEATS - Dimensions	Floor room, measured at the floor forward from a point vertically below the front of the seat surface, shall be no less than 14 inches.	New Flyer's proposal is based on providing foot room that measures down to 10" at the curbside seat location immediately aft of the exit door. This is due to the structure at this location and is the same as provided on your current Xcelsior® buses.
54	Furnishings, 12	3.7.5.1	Wheelchair Accommodation-Maneuvering room	No width dimensions shall be less than 34 inches; area requiring 90 degree turns of wheelchair shall have a clearance arc dimension of no less than 35 inches; and in the parking area, where 180-degree turns are expected, space shall be clear in a full 60-inch diameter circle. Wheelchair footrest clearance of 12 inches above the floor surface shall be provided on the outside turning radius.	New Flyer proposal's is based on the seat layout provided on SFMTA's most current SR2450 40' Xcelsior® battery electric buses which has a 59.4" diameter clear circle at the rear wheelchair position. Please refer to the following booksmarks for additional information: **- 3.7.5.1a, SR2450 LD 865674, page 2**
55	Furnishings, 14	3.9.1	Doorways	A full-size vertical assist that is functionally continuous with the overhead assist shall be provided on the aisle side of the modesty panels at the entrance and exit areas.	New Flyer's proposal is based on providing a barrier rear of the entry stepwell which is formed by the front curbside luggage rack and not a separate modesty panel. Vertical and horizontal stanchions are mounted on the top of the luggage rack with the vertical stanchions being functionally continuous with the overhead assist. For additional information please refer to bookmark **3.9.1a Front CS Luggage Rack Stanchions 866390**.
56	Operator's Area, 12	4.4.2	Side Window	The operator's side-window shall consist of ¼ in. nominal thickness laminated safety glass conforming to the requirements of ANSI Z26.1-1996 Test Grouping AS-2 and the recommended practices defined in SAE J673.	New Flyer's proposal is based on providing an operator's side window with 1/4" tempered glazing. This is the same as provide on your SR2450 battery electric buses.
57	Chassis, 1	5.1.1	SUSPENSION AND AXLES - General Requirement	The Coach should be equipped with an anti-sway bar or other equipment approved by the SFMTA to limit Bus sway.	New Flyer's proposal is based on providing a stabilizer bar on the front axle only. This is the same as provided on your SR2117 hybrid buses.
58	Chassis, 5	5.3.4	Rotors	Wheel bearing seals shall run on replaceable wear surfaces.	New Flyer would like to clarify that for all axles we use unitized wheel bearings. The seals are self-contained with replaceable wear surfaces. The wheel bearings are lubed-for-life with grease. This is the same as provided on your current Xcelsior® buses and inherent to the design of the MAN axle.
59	Chassis, 7	5.5	AIR SYSTEM	Provision shall be made to apply shop air to the Coach Air systems through Amflo CP2 female charging ports or approved equal. ¼" Amflo CP2 or approved equal plugs shall be conveniently located in the motor compartment and behind the front bumper.	New Flyer's proposal is based on providing a 1/4" male Amflo CP1 fitting for both front and rear air charge and tow connectors. Note that we cannot provide a female fitting on the front tow fitting. These are the same as provided on all your previous Xcelsior® buses. For additional information please refer to the following bookmarks: **- 5.5a, Air Fittings 145951**

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60	Chassis, 10	5.6.1 5.7	Hydraulic Lines FLUID LINES	Flexible hydraulic lines shall be Aeroquip, Balflex rubber or approved equal. Equator 1 (EQ1), Equator 2 (EQ2), 2807 PTFE and GH100 shall be used to accommodate the different ratings as required. High-pressure hydraulic lines shall be Aeroquip, or approved equal.	New Flyer's proposal is based on providing Gates hoses for all hydraulic system hoses except the -20 hoses which will remain the Aeroquip FC355-20 hose. Gates hoses have improved durability and a more stable source of supply and are our new standard for hydraulic hoses. For additional information please refer to the following bookmarks: **- 5.6.1 & 5.7a, CCB-002833-Gates Hoses**
61	Body, 3	2.2.10.3	Low Voltage Battery Compartment	The inside surface of the battery compartment's access door shall be **electrically insulated.**	New Flyer's proposal is based on providing a rubber pad mounted on the inside of the battery access door as its electrical insulator. The pad creates an electrically resistant barrier between the batteries and the access door, which, prevent the battery terminals from shorting on the door if the door is damaged in an accident or if a battery comes loose. This is the same as what was provided in previous builds for SFMTA.
62	Furnishings, 4	3.2.7	Emergency Door Operation	When any of the door emergency unlocking devices are actuated, the door interlock system shall inhibit propulsion, and the service brakes shall be applied to stop movement **regardless of the position of the override switch described in Section 4.1.4.3 (Interlock Override Switch).**	New Flyer's proposal is based on activating the brake interlocks when the door emergency unlocking device is actuated regardless of speed. Our interpretation of FMVSS 217 (49CFR § 571.217) is that there can be only a maximum of two motions required to open an emergency exit. For most bus rear door systems, this means: (1) operating the emergency release mechanism (lever, cord, dump valve, etc.), and (2) pushing the doors open. Without an immediate brake application when the emergency mechanism is activated, it would be possible for a person or persons to force or be forced off of a moving bus. This is the same as what was provided in previous builds for SFMTA.
63	Furnishings, 6	3.3.3	Service Area Lighting	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.	New Flyer's proposal is based on providing a maintained switch that is connected to the PLC system. This allows the power to service lights to stay on as long as needed without having to reactivate the switch when the 30-minute timer is reached. Please note that in a case where maintenance staff fails to turn off the switch after repairs are made, power will automatically shut off after 30 minutes (after the bus is turned off) to prevent damage. This is the same as what was provided in previous builds for SFMTA.
64	Operator's Area, 5	4.1.3	Indicators	**Whenever possible, sensors shall be of the closed-circuit type** so that failure of the circuit or sensor shall activate the malfunction indicator.	New Flyer requests approval to provide closed-circuit type sensors as much as possible except for the following: - Low coolant sensor - Low power steering sensor - Front height sensor - Kneel sensor Please note these sensors also activate the malfunction indicator in an event of a failure in the circuit. This is the same as what was provided in previous builds for SFMTA.
65	Electrical, 1	7.1	POWER REQUIREMENT	The Contractor shall supply an additional **20% spare circuit breakers** for future equipment installations.	New Flyer's proposal is to provide the locations of the bus bars (where the spare circuit breakers will be mounted) as opposed to providing 20% circuit breakers in a specific location. Without the details of these "future installations", we wouldn't know what amperage of circuit breakers to supply. Please note that while we can provide spare circuit breakers, the quantity may have to be less than 20% because the SDS panel (located in the equipment box) has limited space for additional busbars. Further discussion is needed at the pre-production meeting to address this requirement.
66	Electrical, 1	7.2	CIRCUIT PROTECTION	Fuses shall be used **only where it can be demonstrated** that circuit breakers are not practicable, such as areas where the current exceeds 80 amps, and they shall be easily accessible for replacement.	New Flyer would like to clarify that we use high current fuses for circuits with current requirements of 80 amps or higher. These would be the main power distribution circuits that originate in the fuse box and distribute power throughout the coach. Fuses are used for these circuits to emphasize a severe problem in the circuit that requires immediate action and it cannot be delayed by simply resetting with a circuit breaker.

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67	Electrical, 3	7.7	WIRING AND TERMINALS	Wiring harnesses **shall not contain wires of different voltages** unless all wires within the harness are sized to carry the current and insulated for the highest voltage wire in the harness.	New Flyer's proposal is based on providing harnesses which are separated based on their functionality as opposed to their voltages. Each wire color provided will identify the voltage it carries such as red wire for 24V and blue wire for 12V. Doing this will eliminate the creation of unnecessary addition of harnesses that will stress the wire duct and possibly, affect the air flow. This is the same as what was provided in previous builds for SFMTA.
68	Electrical, 1	7.5	ELECTRICAL COMPONENTS	Unless otherwise approved by the SFMTA, all electric motors shall be heavy-duty brushless type, with a continuous duty rating of no fewer than 240,000 hours.	New Flyer's proposal is based on providing EMP radiators which have brushless fans that have been tested to 25,000 hours in maximum temperature environment without failure. The L10 life of EMP brushless fans is expected to be a minimum of 40,000 hours. Product life varies based upon working conditions. Please note that the APTA Bus Procurement Guidelines specify a rating of no fewer than 40,000 hrs (as was also specified in the SFMTA BEB Option). 240,000 hrs equates to over 27 years which far exceeds the lifespan of the bus.
69	Electrical, 3	7.7	WIRING AND TERMINALS	Where possible, all wiring harnesses over five feet long and containing at least five wires shall include 10% excess wires for spares that are the same size as the largest wire in the harness, excluding the battery cables.	New Flyer's proposal is based on providing EMP harnesses that do not include spare wires. Any harness that is more than 5 foot and can be replaced as an assembly.
70	Furnishings, 21 Operator's Area, 13	3.14 4.6	PUBLIC ADDRESS SYSTEM PUBLIC ADDRESS SYSTEM	A Stealth Mic hands-free digital microphone system, Digital Recorders Inc., REI, or approved equal shall be provided. The Contractor shall provide a Stealth Mic hands-free digital microphone system by Digital Recorders Inc. or approved equal for the public address system.	New Flyer's proposal is based on providing a gooseneck microphone with footswitch controls, inverted and clipped to the A-pillar. This is the only currently available option for a "hands free" microphone since Clever Devices has discontinued both their Stealth mic and their Speakeasy microphone system.
71	Furnishings, 29	3.19	CLIPPER®	The task of the final commissioning onsite at the SFMTA shall be included in the Contract price.	New Flyer's proposal does not include the cost of final commissioning onsite at the SFMTA by Cubic. They have advised that "Cubic does not quote the commissioning of these devices for new bus orders to the manufacturers, that particular scope is handled separately under the overall Clipper2 program contract covering the Bay Area region."
72	TABLE 1.3.1 – Performance Requirements	1.3.1	TABLE 1.3.1 - Performance Requirements	Speed on 0% Grade: 63 mph (max)	New Flyer's proposal has been revised to include the MAN rear axle with an ratio of 5.67:1 in order to meet the speed and acceleration on grade requirements of this specification. However, with the use of the 5.67 axle ratio, New Flyer requires that the top speed be limited to 60 mph.

ADDITIONAL INFORMATION CAN BE OBTAINED BY REFERENCING THREE DIMENSIONAL DESIGN DATA. CONTACT YOUR NFI GROUP INC. REPRESENTATIVE AS REQUIRED.

NOTE: FOR INSTALLATION DRAWINGS PLEASE REFER TO ATTACHED WIRE BOM SHEET FOR PARTS LISTING

PART N°
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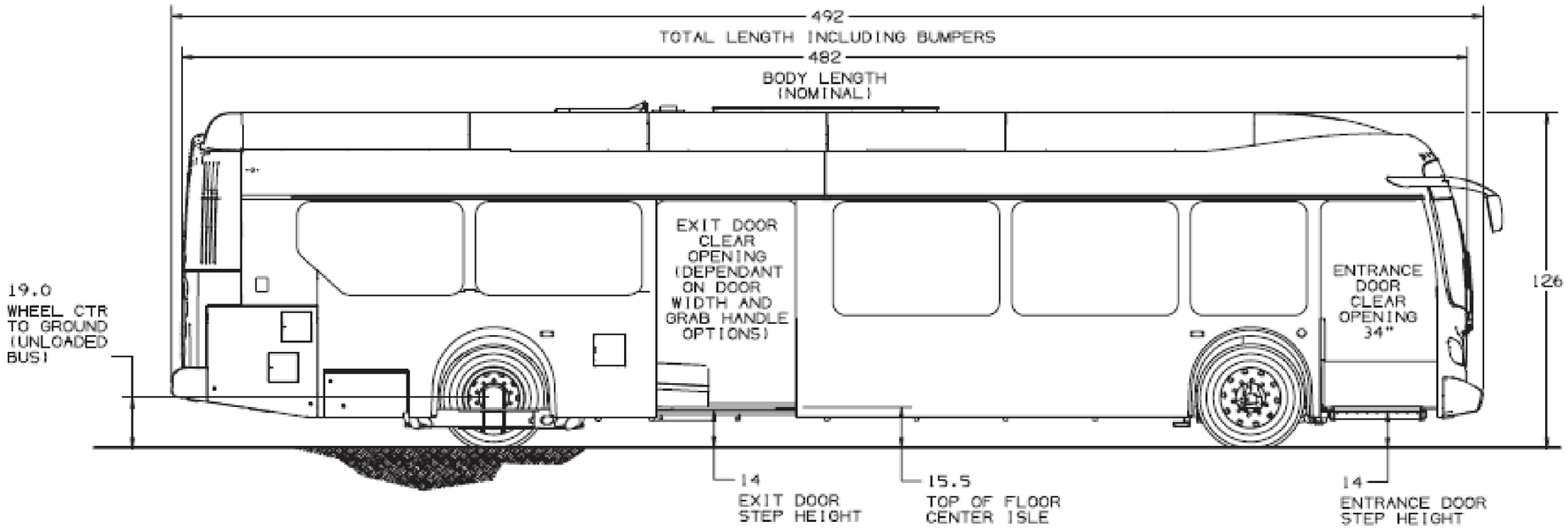

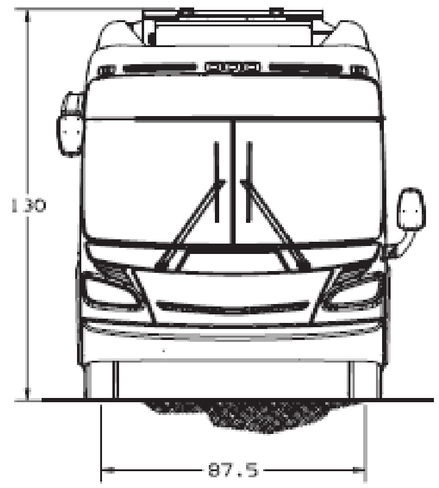

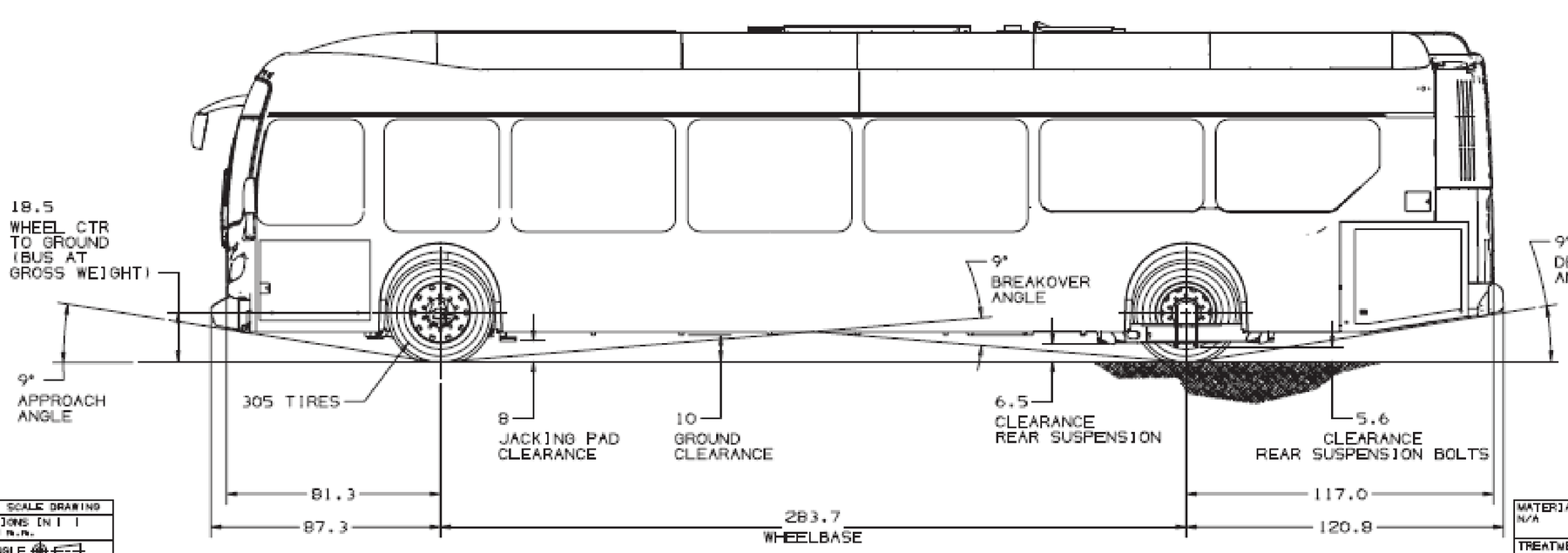

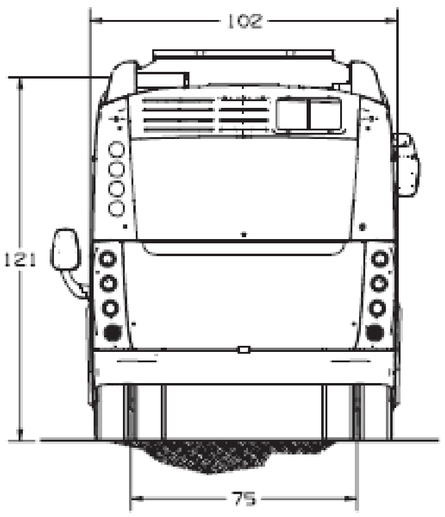

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MATERIAL N/A	TITLE: LAYOUT-XCELSIOR 40FT BAE HYBRID
TREATMENT NONE	UNSPEC'D TOL. DEC. .X ±.12 .XX ±.06 .XXX ±.03 MACH. SURF. ±.015 BEND RADII ±.03 ANGLE TOL. ±1°
WEIGHT N/A	NFI GROUP — PART N° 938981
SIMILAR TO 436633	SCALE NTS — D — SHEET 1 OF 1

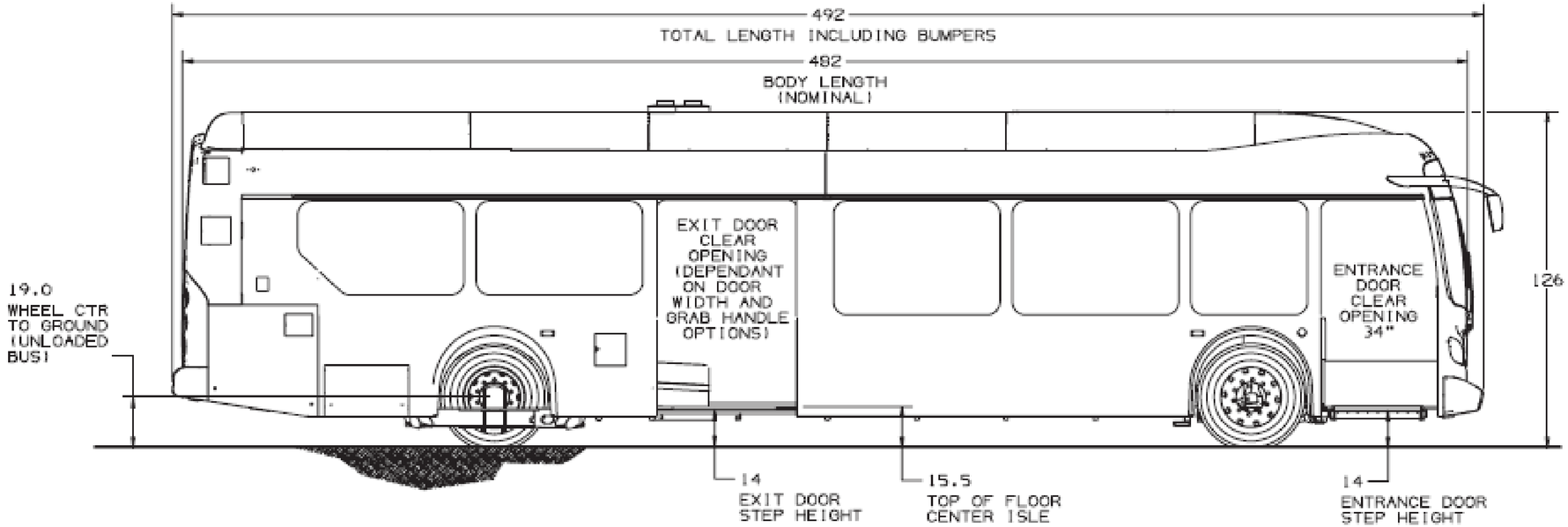
OVERALL DIMENSIONS

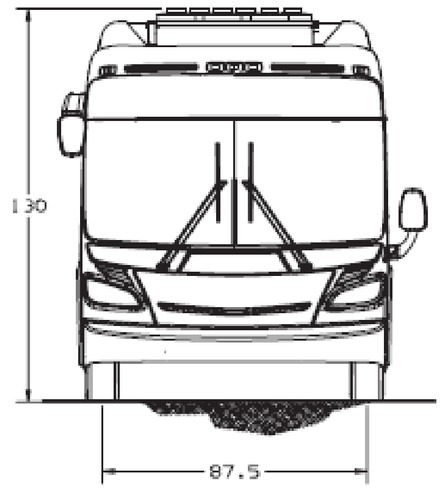
REPORT ALL ERRORS TO ENG. DEPT.

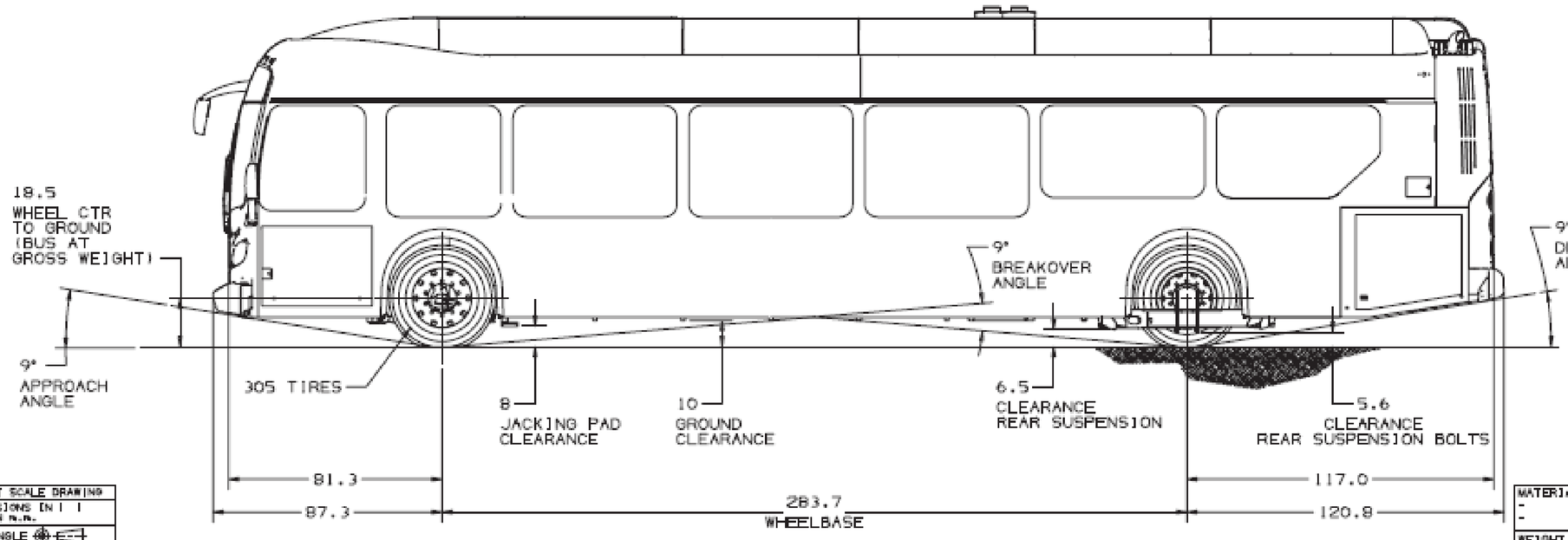
ADDITIONAL INFORMATION CAN BE OBTAINED BY REFERENCING THREE DIMENSIONAL DESIGN DATA. CONTACT YOUR NEW FLYER REPRESENTATIVE AS REQUIRED.

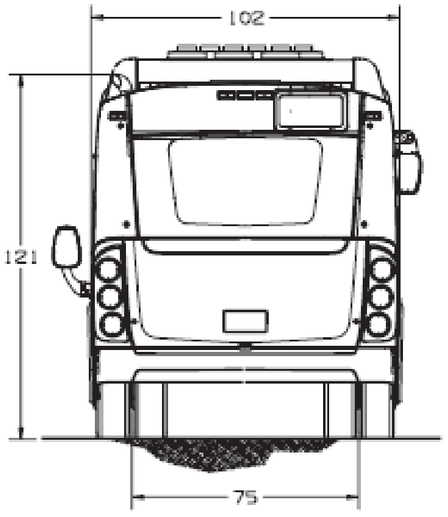
NOTE: FOR INSTALLATION DRAWINGS PLEASE REFER TO ATTACHED MRP BOM SHEET FOR PARTS LISTING

DRAWING Nº 353674









DO NOT SCALE DRAWING			
DIMENSIONS IN [ ] ARE IN m.m.			
THD ANGLE			
DRAWN BY			
DATE (DD-MMM-YY)	D	UPDATED LAYOUT VIEWS & UPDATED DIMENSIONS TO MATCH OTHER LAYOUT DRAWINGS	ECN-101392
27-FEB-18	REV	DESCRIPTION	ECO

MATERIAL - -	UNSPEC'D TOLS. .XX ±.03 .XXX ±.015 HOLE DIA. ±.03 BEND RADII ±.03 ANGLE TOL. ±1°
WEIGHT	
TREATMENT NONE	SIMILAR TO

TITLE
LAYOUT-XCELSIOR 40FT HYBRID

NEW FLYER

PART Nº 353674

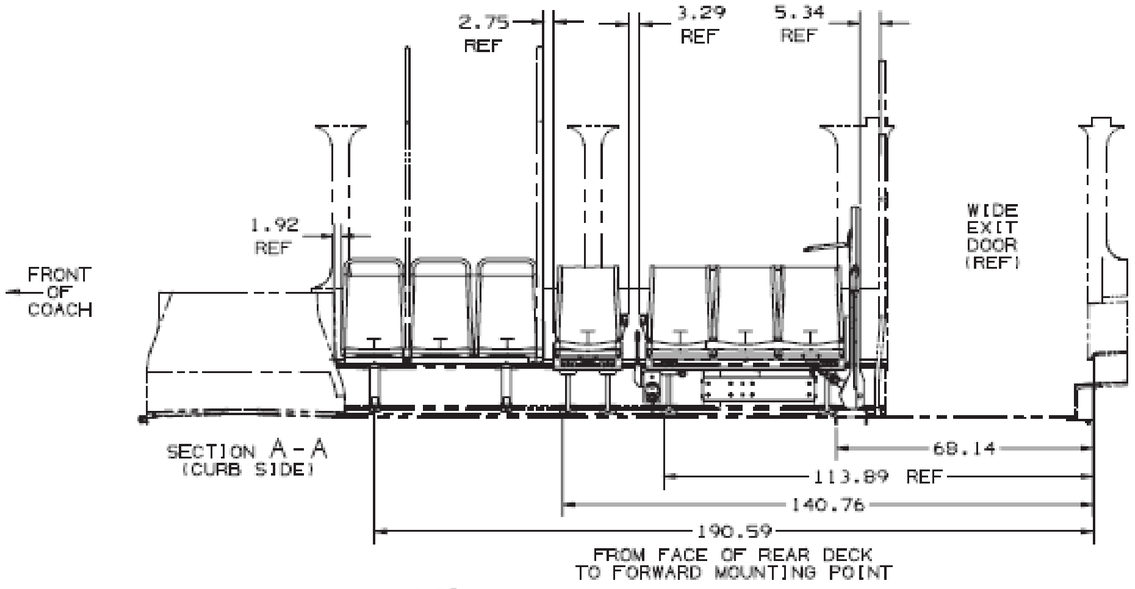
SCALE NTS | D | SHEET 1 OF 1

OVERALL DIMENSIONS

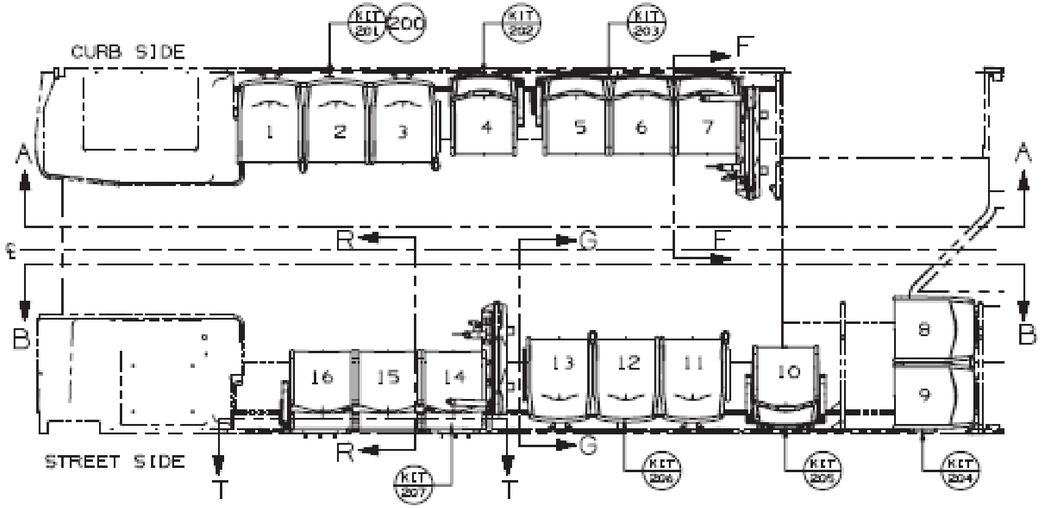
ADDITIONAL INFORMATION CAN BE OBTAINED BY REFERENCING THREE DIMENSIONAL DESIGN DATA. CONTACT YOUR NEW FLYER REPRESENTATIVE AS REQUIRED.

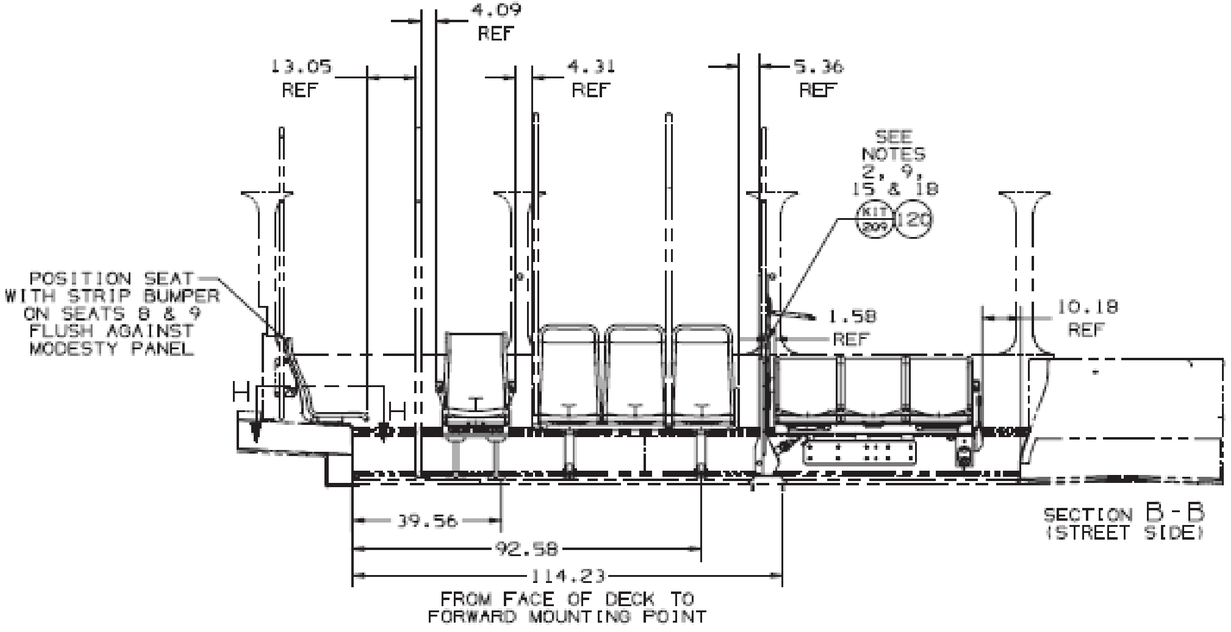
NOTE: FOR INSTALLATION DRAWINGS PLEASE REFER TO ATTACHED WRP BOM SHEET FOR PARTS LISTING

DRAWING Nº
718313



SECTION A-A (CURB SIDE)





SECTION B-B (STREET SIDE)

FRONT OF COACH

DESIGN REFERENCE NOTES:

- 40NE ARIES SEATS WITH CANTILEVER MOUNTING
- STAINLESS STEEL GRABRAILS ON SEATS 1-3 & 11-13
- Q'POD W/C SYSTEM ON BOTH STREET SIDE AND CURB SIDE W/ MUNI SPECIFIC PUSH BUTTON ON SEATS 6 & 15
- STREETSIDE MODESTY PANEL

- FOR 40' XCELSIOR
- NO FLOOR HEATERS
- DIESEL, DIESEL ELECTRIC, CNG
- WIDE EXIT DOOR

SEE NOTE 4

QTY	U/M	ITEM	PART NO.	DESCRIPTION	WEIGHT
1	EA	200	718312	KIT-SEATING L/D ARIES	-
1	EA	123	510604	SPEC-40NE SEAT TORQUE VALUE	-
0.010	EA	120	081034	LOCTITE-243 MEDIUM 10ML	-
40	EA	79	356596	T-BOLT-SEAT MOUNTING	0.05 LBS
8	EA	77	20805024	BOLT HEX 5/16-18 X 1.50	-
6	EA	43	296055	WASHER-SPACER 3/4 OD X .40 ID	.02 LB
1	EA	42	058614	INSERT-5/16-18UNC STL	-
6	EA	41	395734	WASHER-LARGE 5/16 SST	.02 LBS
6	EA	40	20805020	BOLT HEX SS 5/16-18 X 1.25 LG	-
8	EA	36	20806032	BOLT-HEX SST 3/8UNC 2.00	-
8	EA	33	50W05000	WASHER FLAT SS 5/16 NOM	-
40	EA	32	8410536	NUT-CRN 3/8UNC GR5	0.03 LBS
68	EA	30	50W06000	WASHER FLAT SS 3/8 NOM	-

DO NOT SCALE DRAWING				
DIMENSIONS IN [ ] ARE IN m.m.				
THD ANGLE				
DRAWN BY				
BRIAN NUESSLER				
DATE (DD-MMM-YY)	E	1) UPDATED VENDOR PART GEOMETRY FOR KIT ITEMS 201 & 204 ALL DIMENSIONS AND VIEWS UPDATED ACCORDINGLY	ECN-113791	
28-AUG-18	REV	DESCRIPTION	ECO	

MATERIAL
NOT APPLICABLE
-

WEIGHT
-

TREATMENT
NOT REQUIRED
-

UNSPEC'D TOLS. | DEC. IN.
.X ±.12
.XX ±.06
.XXX ±.03
HOLE DIA. ±.015
BEND RADII ±.03
ANGLE TOL. ±1°

SIMILAR TO

TITLE
TMPLT-SEATING L/D ARIES

NEW FLYER

PART Nº
718313

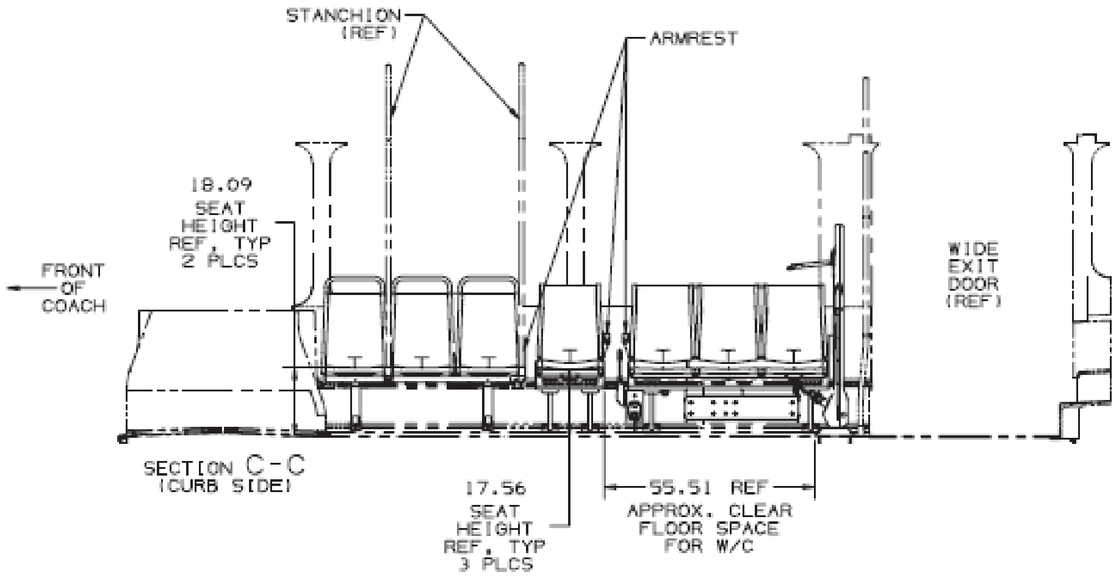
SCALE 1:20 | D | SHEET 1 OF 3

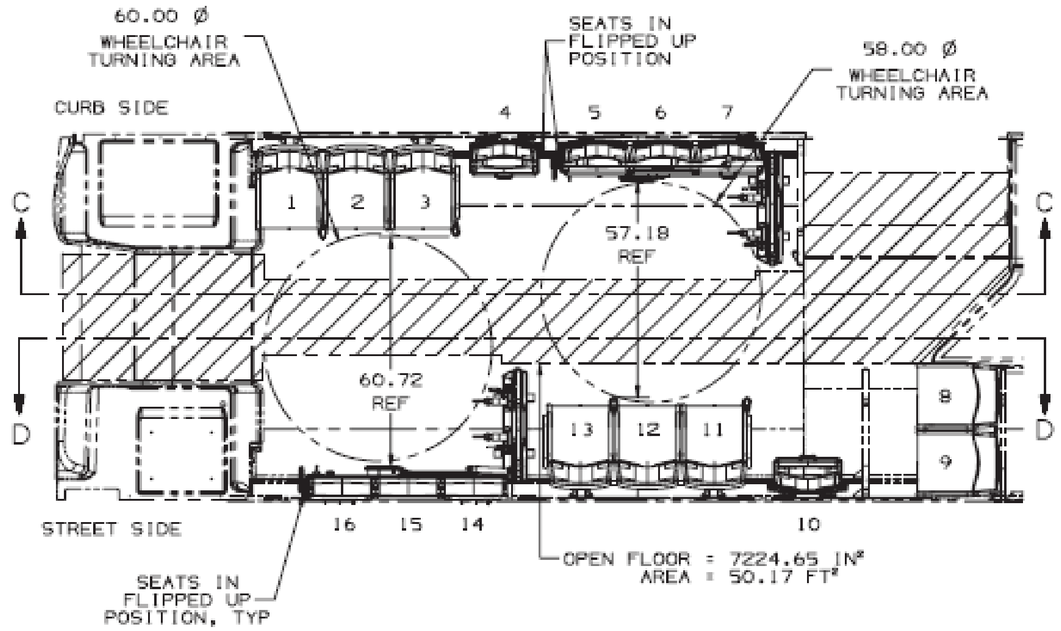
REPORT ALL ERRORS TO ENG. DEPT.

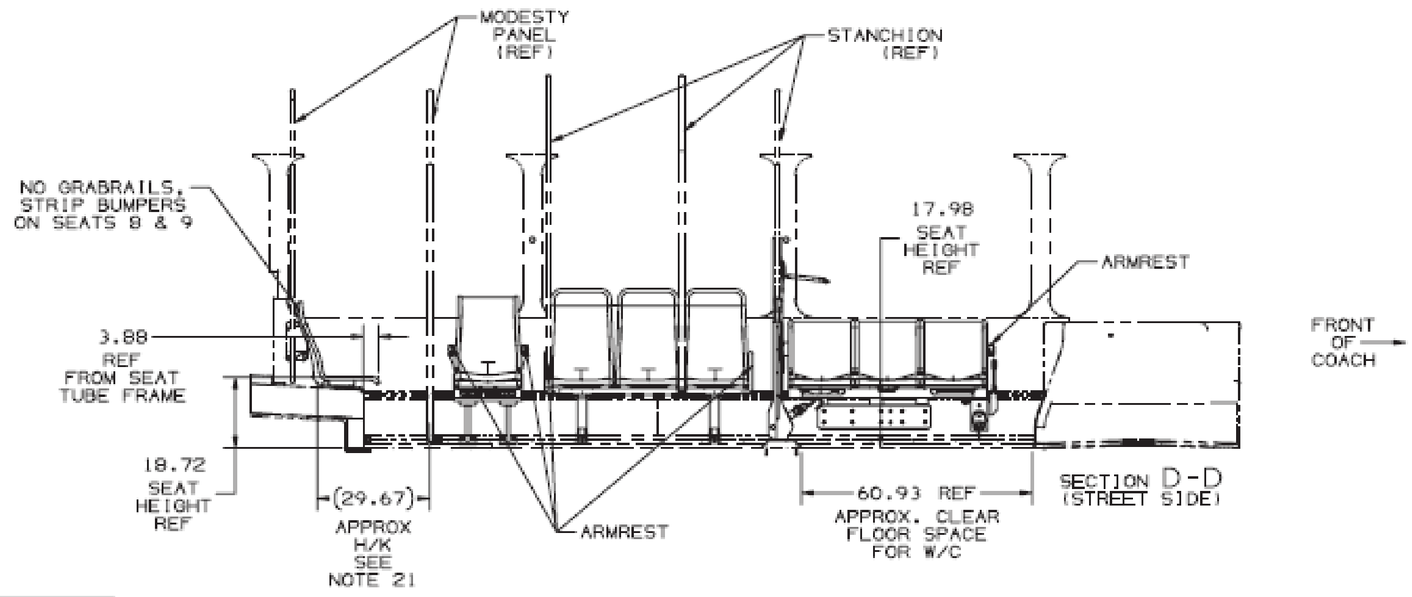
ADDITIONAL INFORMATION CAN BE OBTAINED BY REFERENCING THREE DIMENSIONAL DESIGN DATA. CONTACT YOUR NEW FLYER REPRESENTATIVE AS REQUIRED.

NOTE: FOR INSTALLATION DRAWINGS PLEASE REFER TO ATTACHED WRP BOM SHEET FOR PARTS LISTING

DRAWING N°
718313







NOTES:

21) DIMENSIONS IN BRACKETS REPRESENT THE APPROXIMATE HIP TO KNEE WITH T2C ONSERT. SUBTRACT A 1/2" FROM THE HIP TO KNEE DIMENSION FOR PADDED ONSERTS (1/2" OR 1-1/4") . REFER TO CUSTOMER SPEC DWG P/N 265402-XXXX, WHERE XXXX IS THE SR#, FOR THE TYPE OF SEAT ONSERT THAT IS REQUIRED. NOTE THAT H/K DIMENSIONS ARE ONLY AFFECTED BY THE PADDING ON THE SEAT BACK INSERT AND FOOT ROOM DIMENSIONS ARE ONLY AFFECTED BY SEAT CUSHION INSERT PADDING.

DO NOT SCALE DRAWING			
DIMENSIONS IN [ ] ARE IN m.m.			
THD ANGLE			
DRAWN BY			
BRIAN NUESSLER			
DATE (DD-MMM-YY)	E	SEE SHEET 1	ECN-113794
29-AUG-18	REV	DESCRIPTION	ECO

MATERIAL NOT APPLICABLE -	UNSPEC'D TOLS.	DEC. IN. ±.12 ±.06 ±.03 ±.015 ±.03 ±1°
WEIGHT -	.X .XX .XXX HOLE DIA. BEND RADII. ANGLE TOL.	
TREATMENT NOT REQUIRED -	SIMILAR TO	

TITLE
TMPLT-SEATING L/D ARIES

NEW FLYER

PART N°
718313

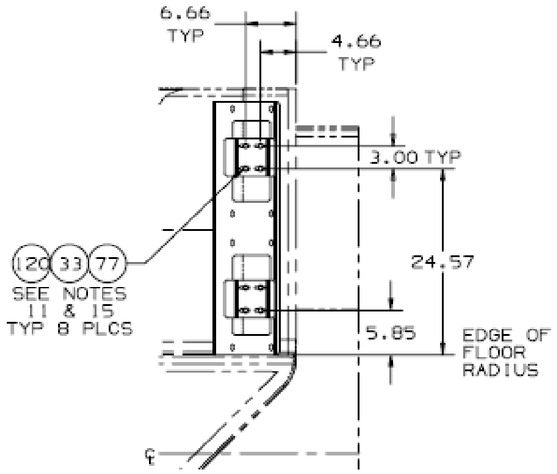
SCALE 1:20 | D | SHEET 2 OF 3

REPORT ALL ERRORS TO ENG. DEPT.

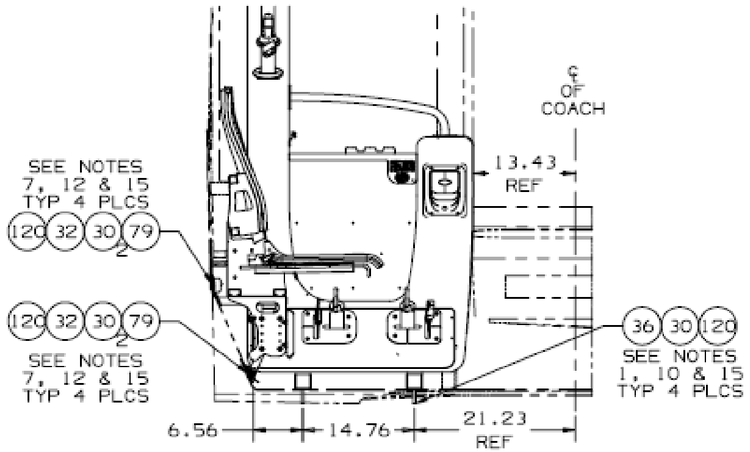
ADDITIONAL INFORMATION CAN BE OBTAINED BY REFERENCING THREE DIMENSIONAL DESIGN DATA. CONTACT YOUR NEW FLYER REPRESENTATIVE AS REQUIRED.

NOTE: FOR INSTALLATION DRAWINGS PLEASE REFER TO ATTACHED MRP BOM SHEET FOR PARTS LISTING

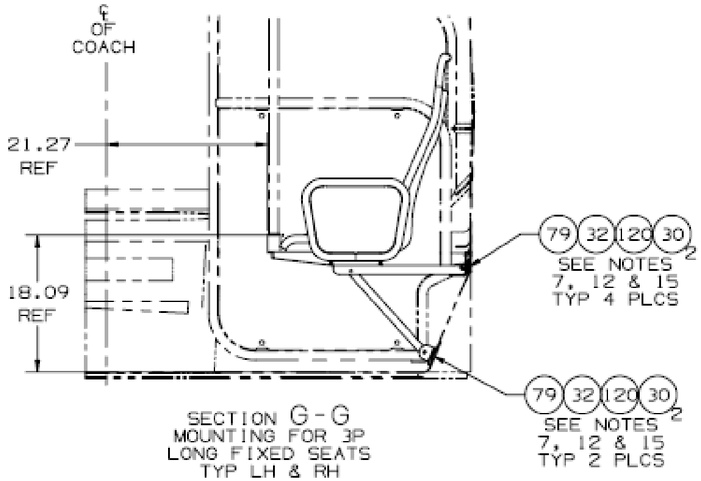
DRAWING N°
718313



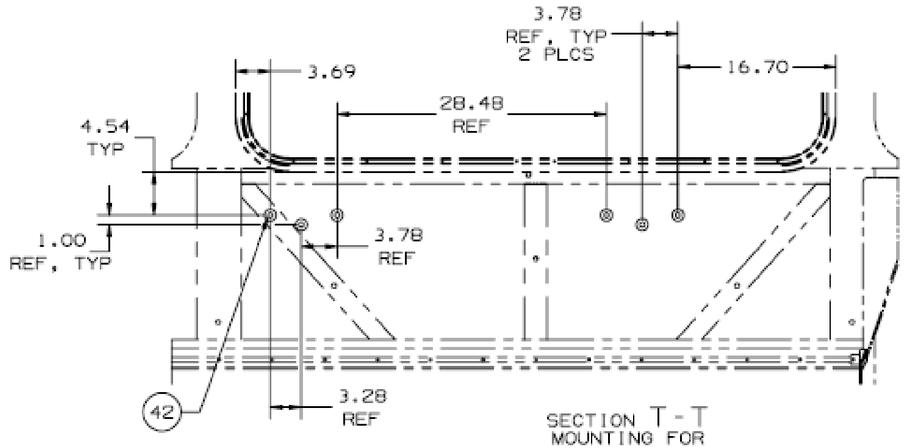
SECTION H-H
(SEAT BOTTOMS
REMOVED FOR CLARITY)



SECTION F-F
MOUNTING FOR
Q'POD BARRIERS
(RH SHOWN, TYP FOR LH)
& LONG FLIP SEATS
(TYP 3 PLCS)

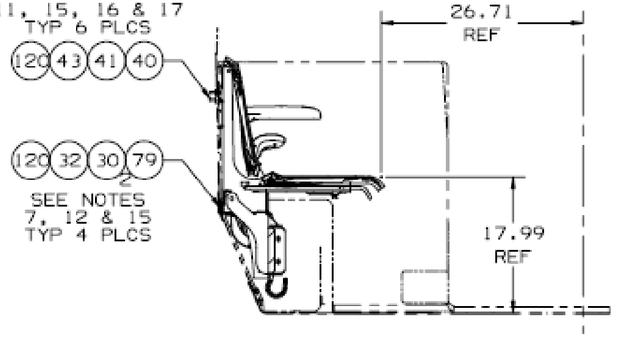


SECTION G-G
MOUNTING FOR 3P
LONG FIXED SEATS
TYP LH & RH



SECTION T-T
MOUNTING FOR
SLIM FLIP SEATS

FOR LOCATIONS
WITHOUT INSERTS
SEE NOTES
11, 13, 15 & 17
FOR LOCATIONS
WITH INSERTS
SEE NOTES
11, 15, 16 & 17
TYP 6 PLCS



SECTION R-R
MOUNTING FOR
SLIM FLIP SEATS

NOTES (WHERE APPLICABLE):

1. DRILL AND TAP FOR 3/8-16 HARDWARE.
2. TRIM STANCHION TO FIT. ENSURE THAT STANCHION IS NOT CUT TOO SHORT & THAT IT FITS TIGHTLY IN THE TEE CLAMPS.
3. REFER TO SEAT VENDOR DRAWINGS FOR MORE DETAILS WITH REGARDS TO INSTALLING SEATS AND RESTRAINTS.
4. KIT 718312 IS A TEMPLATE. REFER TO ORACLE BOM FOR CONTRACT SPECIFICATIONS.
5. SALES TO SEND SEAT SPECIFICATION DRAWING 265402-XXXX TO CUSTOMER, WHERE XXXX IS THE CONTRACT SR NUMBER.
6. ALL H/K DIMENSIONS HAVE ±.50 TOLERANCE, WHERE H/K = HIP TO KNEE.
7. TORQUE HARDWARE TO 30-35 FT-LBS.
8. SPLIT BALLOONS SUCH AS (KIT XXX) REFER TO ITEM XXX IN KIT ITEM 200. ALL SPLIT BALLOONS ARE REFERENCED ITEMS.
9. TORQUE HARDWARE TO 5-7 FT-LBS.
10. TORQUE HARDWARE TO 17 FT-LBS.
11. TORQUE HARDWARE TO 12 FT-LBS.
12. SLIDE ALL SEAT RAIL T-BOLTS (ITEM 79) FOR BOTH STREET SIDE AND CURB SIDE SEATS INTO SEAT RAIL BEFORE INSTALLING ANY SEATS. SEE SHEET 1 FOR ACCESS LOCATIONS.
13. DRILL & TAP FOR 5/16-18 HARDWARE
15. APPLY 1 TO 2 DROPS OF LOCTITE (ITEM 120) TO THREADS OF HARDWARE. IF ANY HARDWARE IS ALREADY SUPPLIED WITH LOCTITE, NO LOCTITE WILL BE REQUIRED. IF ANY HARDWARE IS LOOSENED FOR ADJUSTMENTS, RE-APPLY NEW LOCITE TO THREADS.
16. DRILL .531 DIA HOLE THRU STRUCTURE TUBE
17. TO PREVENT CRACKING OF WALL PANEL, DRILL 3/4" DIA HOLE THRU WALL PANEL USING SEAT AS A TEMPLATE AND INSERT SPACER (ITEM 43) INTO HOLE.
18. DRILL .50 Ø THRU HOLE USING STANCHION CUP AS A TEMPLATE.
19. TORQUE ALL SEAT VENDOR HARDWARE ACCORDING TO SPEC 510604 (ITEM 123). IF ANY HARDWARE IS LOOSENED FOR ADJUSTMENTS, RE-TORQUE HARDWARE.

DO NOT SCALE DRAWING	
DIMENSIONS IN [ ] ARE IN m.m.	
THD ANGLE	
DRAWN BY	
BRIAN NUESSLER	
DATE (DD-MMM-YY)	
28-AUG-18	

REV	DESCRIPTION	ECN
E	SEE SHEET 1	ECN-113791

MATERIAL NOT APPLICABLE -	UNSPEC'D TOLS.	DEC. IN. ±.12 ±.06 ±.03 ±.015 ±.03 ±1°
WEIGHT -	.X .XX .XXX HOLE DIA. BEND RADII. ANGLE TOL.	
TREATMENT NOT REQUIRED -	SIMILAR TO	

TITLE
TMPLT-SEATING L/D ARIES

NEW FLYER

PART N°
718313
(NX)

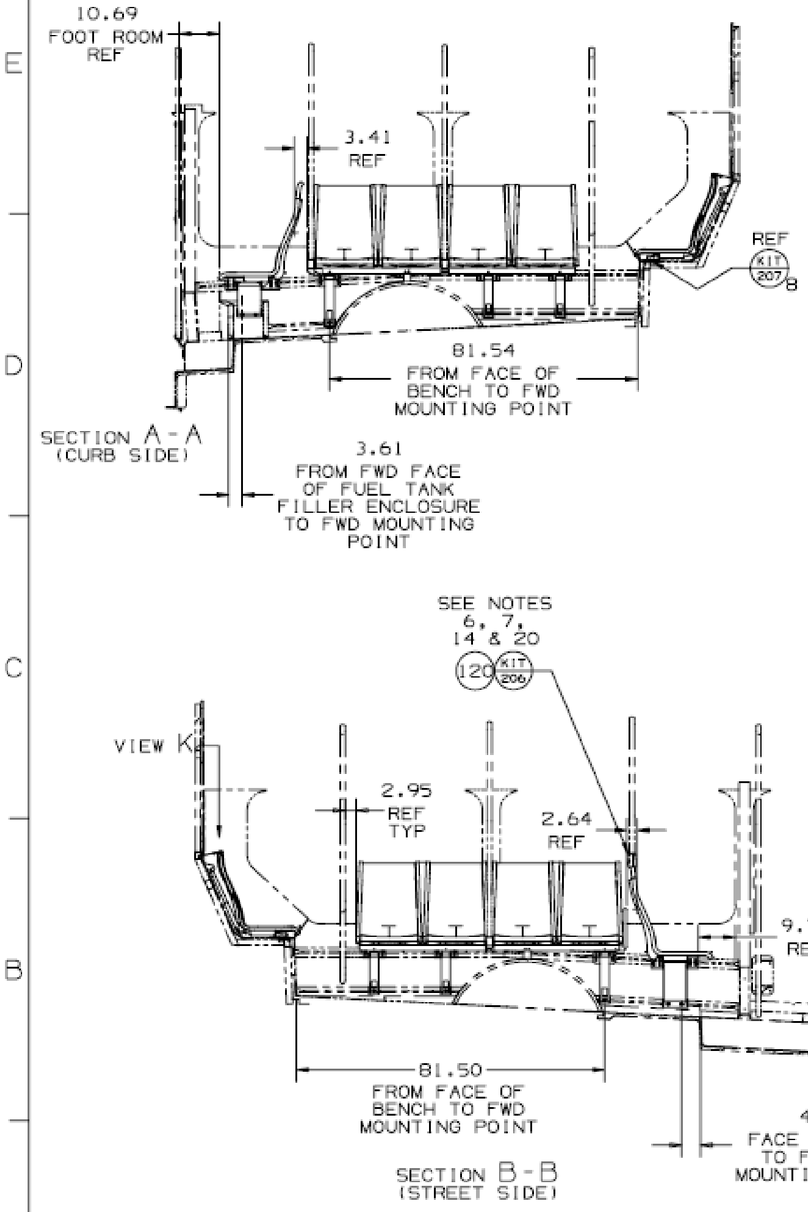
SCALE 1:10 | D | SHEET 3 OF 3

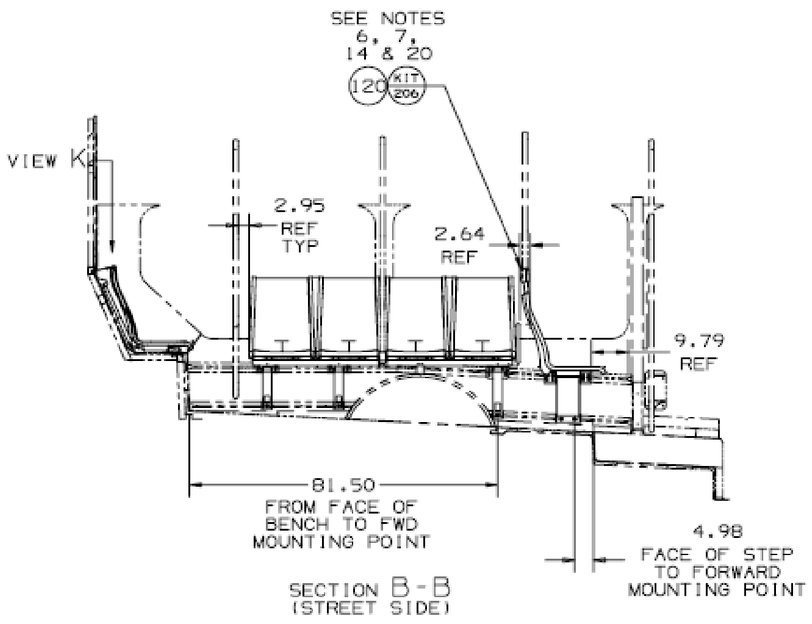
REPORT ALL ERRORS TO ENG. DEPT.

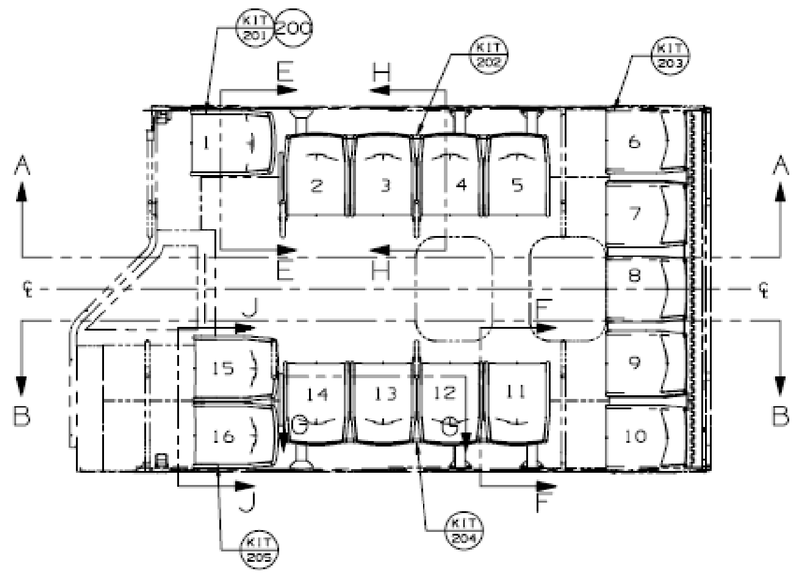
ADDITIONAL INFORMATION CAN BE OBTAINED BY REFERENCING THREE DIMENSIONAL DESIGN DATA. CONTACT YOUR NEW FLYER REPRESENTATIVE AS REQUIRED.

NOTE: FOR INSTALLATION DRAWINGS PLEASE REFER TO ATTACHED MRP BOM SHEET FOR PARTS LISTING

DRAWING N°
718315







NOTES (WHERE APPLICABLE):

2. DRILL .281 DIA HOLE.
5. DRILL .531 DIA HOLE. TRIM AWAY FLOORING SO THAT THE INSERT CAN SIT FLUSH WITH THE STRUCTURE OF THE REAR SHELF.
6. APPLY 1 TO 2 DROPS OF LOCTITE (ITEM 120) TO THREADS OF HARDWARE. IF ANY HARDWARE IS ALREADY SUPPLIED WITH LOCTITE, NO LOCTITE WILL BE REQUIRED. IF ANY HARDWARE IS LOOSENED FOR ADJUSTMENTS, RE-APPLY NEW LOCTITE TO THREADS.
7. TRIM STANCHION TO FIT. ENSURE THAT STANCHION IS NOT CUT TOO SHORT & THAT IT FITS TIGHTLY IN THE TEE CLAMPS.
8. REFER TO SEAT VENDOR DRAWINGS FOR MORE DETAILS WITH REGARDS TO INSTALLING SEATS AND RESTRAINTS
9. KIT 718314 IS A TEMPLATE. REFER TO ORACLE BOM FOR CONTRACT SPECIFICATIONS.
10. SALES TO SEND SEAT SPECIFICATION DRAWING 265402-XXXX TO CUSTOMER, WHERE XXXX IS THE CONTRACT SR NUMBER.
11. ALL H/K DIMENSIONS HAVE ±.50 TOLERANCE, WHERE H/K = HIP TO KNEE.
12. TORQUE HARDWARE TO 30-35 FT-LBS (TORQUE FOR GRADE 8 BOLT-WET).
13. SPLIT BALLOONS SUCH AS (KIT XXX) REFER TO ITEM XXX IN KIT ITEM 200. ALL SPLIT BALLOONS ARE REFERENCED ITEMS.
14. TORQUE HARDWARE TO 5-7 FT-LBS.
15. TORQUE HARDWARE TO 22 FT-LBS.
16. TORQUE HARDWARE TO 12 FT-LBS.
17. DRILL .390 DIA HOLE THRU.
18. SLIDE ALL SEAT RAIL T-BOLTS (ITEM 79) FOR BOTH STREET SIDE AND CURB SIDE SEATS INTO SEAT RAIL BEFORE INSTALLING ANY SEATS.
20. DRILL 0.50 DIA THRU HOLE USING STANCHION CUP AS A TEMPLATE.

DESIGN REFERENCE NOTES:

- 40NE ARIES SEATS WITH CANTILEVER MOUNTING EXCEPT FOR 4P LONG WHEELHOUSE AND REAR CROSS SEATS
- STAINLESS STEEL GRABRAILS

- FOR ALL XCELSIOR COACH LENGTHS
- DIESEL, DIESEL ELECTRIC, CNG
- VALID WITH OR WITHOUT REAR WINDOW

SEE NOTE 9

QTY	U/M	ITEM	PART NO.	DESCRIPTION	WEIGHT
1	EA	200	718314	KIT-SEATING U/D ARIES	-
1	EA	123	510604	SPEC-40NE SEAT TORQUE VALUE	-
10.0	ML	121	242702	ADHESIVE-SIKA 221 WHITE	-
0.01	EA	120	081034	LOCTITE-243 MEDIUM 10ML	-
4	EA	80	050294	INSERT-10-32 X .585	-
28	EA	79	356596	T-BOLT-SEAT MOUNTING	0.05 LBS
4	EA	47	15S00012	SCREW-MACH 10-32X.75 LG	
4	EA	45	50W00000	WASHER FLAT SS 10	
7	EA	44	34S04016	SCREW-1/4-20 X 1.0	-
7	EA	43	50W04000	WASHER-FLAT 1/4 NOM	-
8	EA	41	14S05016	SCREW 5/16 X 1.00 SS	-
8	EA	40	34S05016	SCREW-5/16-18X1.0 S/TAP	-
8	EA	39	083651	INSERT 5/16-18 STEEL	-
6	EA	36	20B06020	BOLT SS 3/8 X 1.25 L	-
6	EA	35	50N06000	NUT SST 3/8 UNC	-
16	EA	33	50W05000	WASHER FLAT SS 5/16 NOM	-
28	EA	32	8410536	NUT-CRN 3/8UNC GR5	0.03 LBS
68	EA	30	50W06000	WASHER FLAT SS 3/8 NOM	-

REV	DESCRIPTION	ECO
C	11 UPDATED VENDOR PART GEOMETRY FOR KIT ITEMS 202 & 204 ALL DIMENSIONS AND VIEWS UPDATED ACCORDINGLY	ECN-11379

DO NOT SCALE DRAWING
DIMENSIONS IN [ ] ARE IN m.m.
THD ANGLE
DRAWN BY
BRIAN NUESSLER
DATE (DD-MMM-YY)
28-AUG-18

MATERIAL
N/A
WEIGHT
TREATMENT
N/A
UNSPEC'D TOLS. DEC. IN.
.X ±.12
.XX ±.06
.XXX ±.03
HOLE DIA. ±.015
BEND RADII. ±.03
ANGLE TOL. ±1°
SIMILAR TO

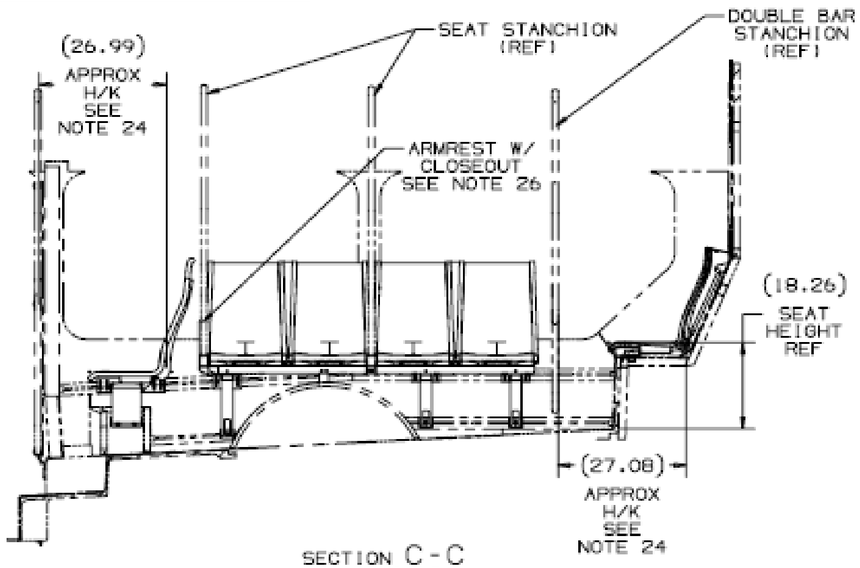
TITLE
TMPLT-SEATING U/D ARIES
NEW FLYER
PART N°
718315
(NX)
SCALE 1:20
D
SHEET 1 OF 3

REPORT ALL ERRORS TO ENG. DEPT.

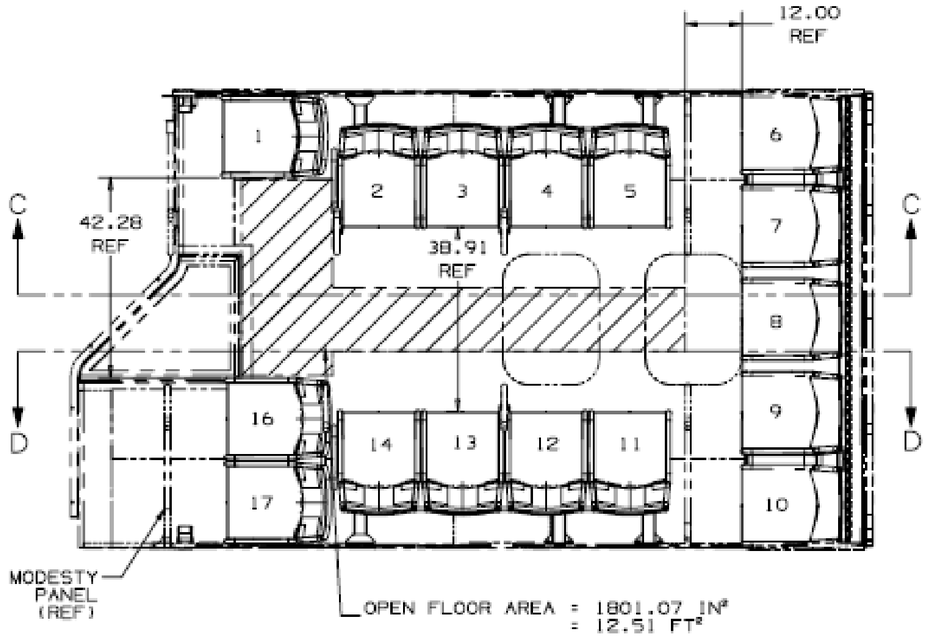
ADDITIONAL INFORMATION CAN BE OBTAINED BY REFERENCING THREE DIMENSIONAL DESIGN DATA. CONTACT YOUR NEW FLYER REPRESENTATIVE AS REQUIRED.

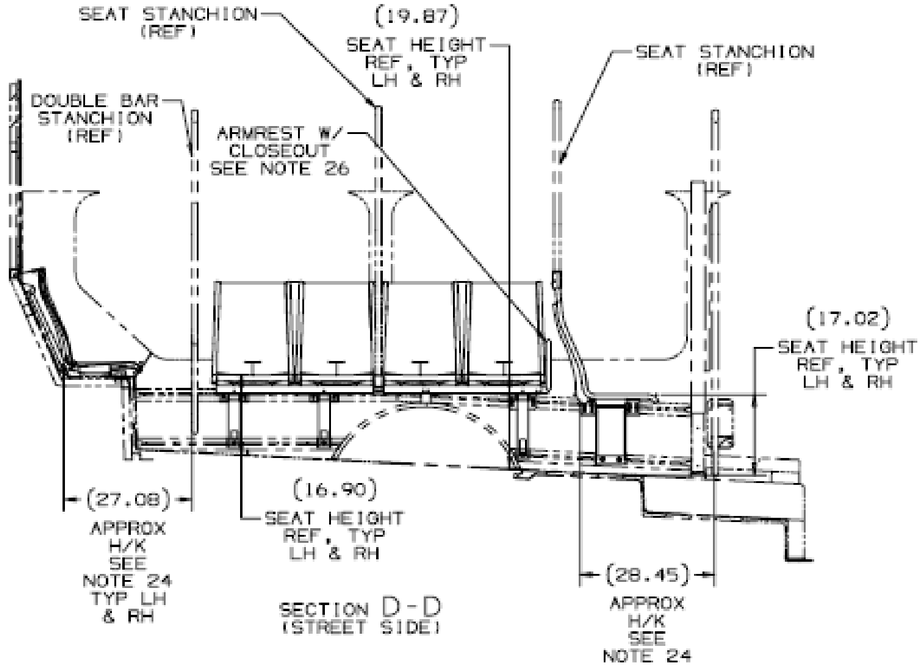
NOTE: FOR INSTALLATION DRAWINGS PLEASE REFER TO ATTACHED MRP BOM SHEET FOR PARTS LISTING

DRAWING N°
718315



SECTION C-C
(CURB SIDE)





SECTION D-D
(STREET SIDE)

NOTES:

24) DIMENSIONS IN SQUARE BRACKETS REPRESENT THE APPROXIMATE HIP TO KNEE WITH T2C INSERT AND FOOT ROOM. SUBTRACT A 1/2" FROM DIMENSIONS FOR 1/2" PADDED INSERTS AND 1" FOR 1" PADDED INSERTS RESPECTIVELY. REFER TO CUSTOMER SPEC DWG P/N 265402-XXXX, WHERE XXXX IS THE SR#, FOR THE TYPE OF SEAT INSERT THAT IS REQUIRED. NOTE THAT H/K DIMENSIONS ARE ONLY AFFECTED BY THE PADDING ON THE SEAT BACK INSERT AND FOOT ROOM DIMENSIONS ARE ONLY AFFECTED BY THE SEAT CUSHION INSERT PADDING.

26) REFER TO CUSTOMER SPEC DWG P/N 265402-XXXX, WHERE XXXX IS THE SR#, FOR THE TYPE OF ARMREST & THE TYPE OF CLOSEOUT.

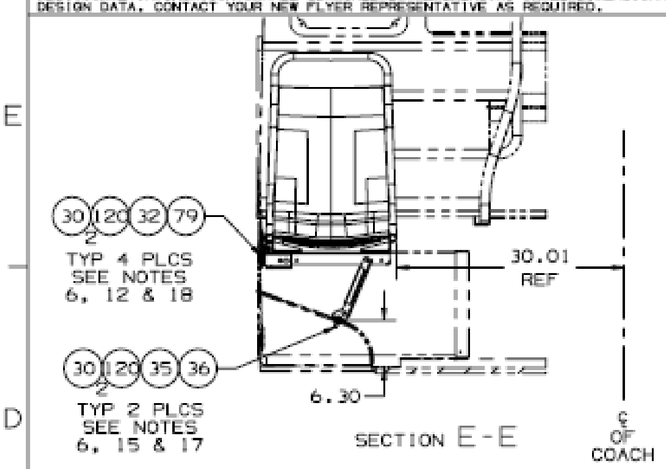
DO NOT SCALE DRAWING			
DIMENSIONS IN [ ] ARE IN m.m.			
THD ANGLE			
DRAWN BY			
BRIAN NUESSLER			
DATE (DD-MMM-YY)	C	SEE SHEET 1	ECN-113791
28-AUG-18	REV	DESCRIPTION	ECO

MATERIAL N/A	UNSPEC'D TOLS.	DEC. IN.	TITLE: TMPLT-SEATING U/D ARIES
WEIGHT	.X .XX .XXX HOLE DIA. BEND RADII. ANGLE TOL.	±.12 ±.06 ±.03 ±.015 ±.03 ±1°	PART N° 718315
TREATMENT N/A	SIMILAR TO		NEW FLYER
			SCALE 1:20 / D / SHEET 2 OF 3

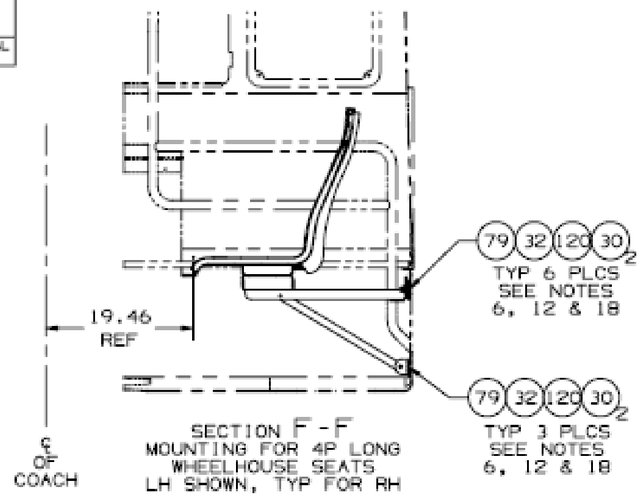
REPORT ALL ERRORS TO ENG. DEPT.

NOTE: FOR INSTALLATION DRAWINGS PLEASE REFER TO ATTACHED MRP BOM SHEET FOR PARTS LISTING

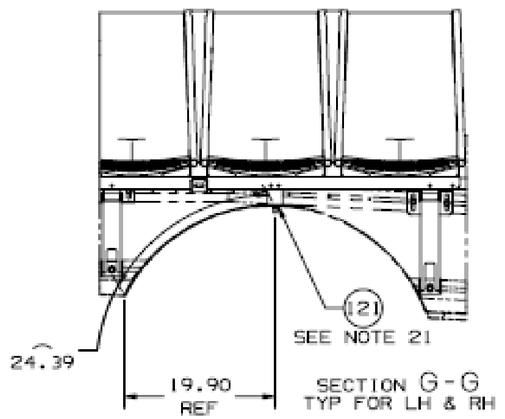
DRAWING N° 718315



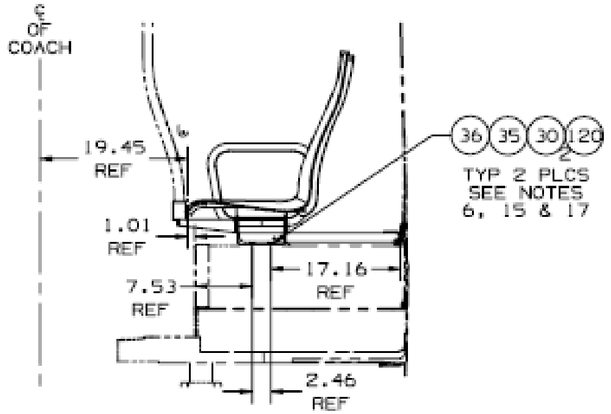
SECTION E-E



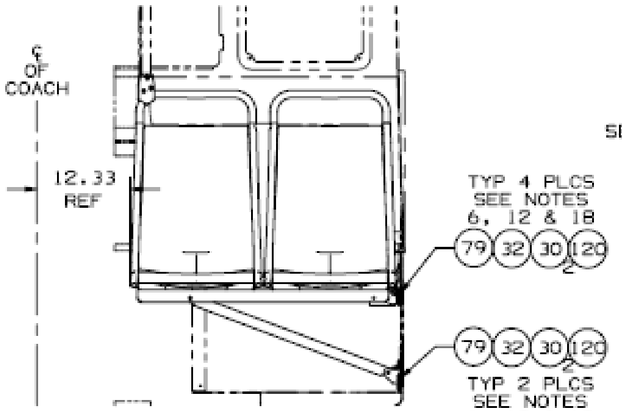
SECTION F-F
MOUNTING FOR 4P LONG WHEELHOUSE SEATS
LH SHOWN, TYP FOR RH



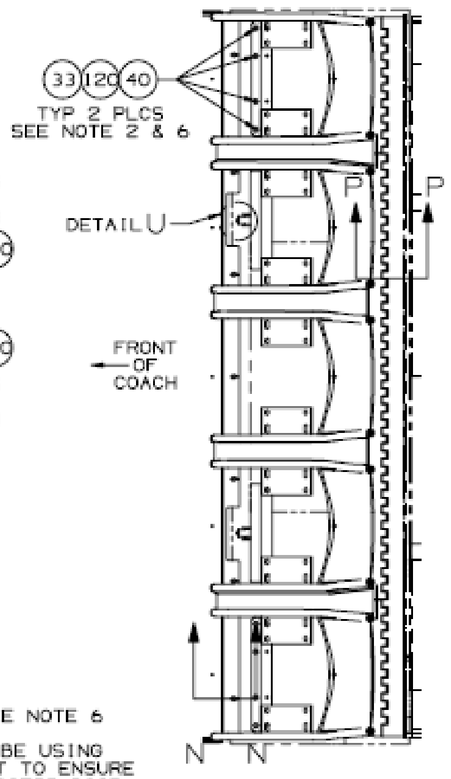
SECTION G-G
TYP FOR LH & RH



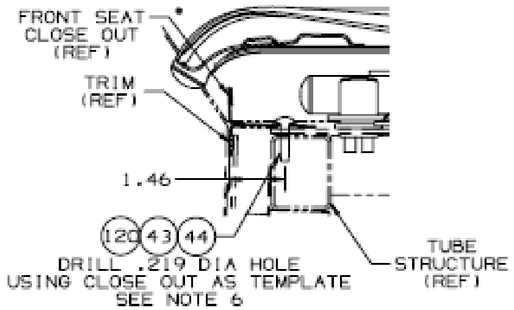
SECTION H-H
WHEELHOUSE MOUNTING
FOR 4P LONG SEATS
RH SHOWN, TYP FOR LH



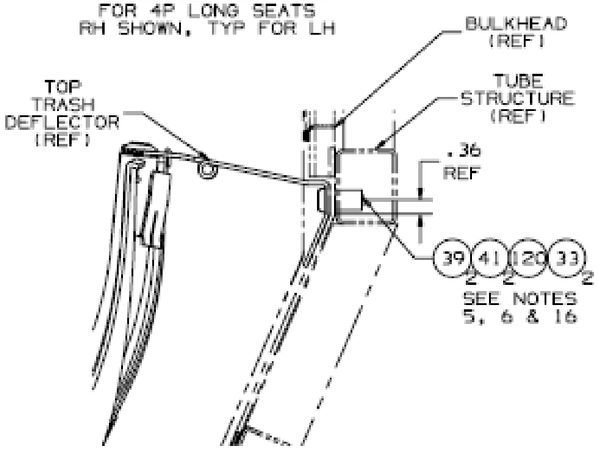
SECTION J-J
2P TRANSV CANT SEAT



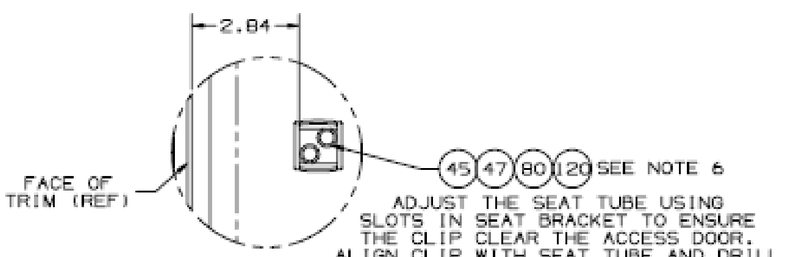
VIEW ON
ARROW K



SECTION N-N
TYP 6 PLCS
SCALE 1:2



SECTION P-P
TYP 4 PLCS
SCALE 1:2



ADJUST THE SEAT TUBE USING SLOTS IN SEAT BRACKET TO ENSURE THE CLIP CLEAR THE ACCESS DOOR. ALIGN CLIP WITH SEAT TUBE AND DRILL .297 DIA HOLES USING CLIP AS TEMPLATE.

DETAIL U
TYP 2 PLCS

NOTES: (CONT.)

21. AFTER DRILLING HOLES FOR TRANSVERSE WHEELHOUSE SEATS (ITEMS 202 & 204) APPLY SIKA SEALANT (ITEM 121) AS NEEDED TO HARDWARE AND OUTSIDE SURFACE OF WHEEL WELL TO PREVENT WATER INFILTRATION. TORQUE HARDWARE TO RECOMMENDED VALUE.
22. INSTALL SHIMS (KIT ITEM 207) TO SPRING CLIPS OF REAR CROSS SEAT AS REQUIRED TO ENSURE PROPER ENGAGEMENT OF SEAT INTO SPRING CLIP.
23. TORQUE ALL SEAT VENDOR HARDWARE ACCORDING TO SPEC 510604 (ITEM 123). IF ANY HARDWARE IS LOOSENED FOR ADJUSTMENTS, RE-TORQUE HARDWARE.

DO NOT SCALE DRAWING	
DIMENSIONS IN ( ) ARE IN m.m.	
THD ANGLE	
DRAWN BY	BRIAN NUESSLER
DATE (DD-MMM-YY)	28-AUG-18

REV	DESCRIPTION	ECO
C	SEE SHEET 1	ECN-113791

MATERIAL N/A	UNSPEC'D TOLS.	DEC. IN.
	.X	±.12
	.XX	±.06
	.XXX	±.03
	HOLE DIA.	±.015
WEIGHT	BEND RADII	±.03
	ANGLE TOL.	±1°
TREATMENT N/A	SIMILAR TO	

TITLE
TMPLT-SEATING U/D ARIES

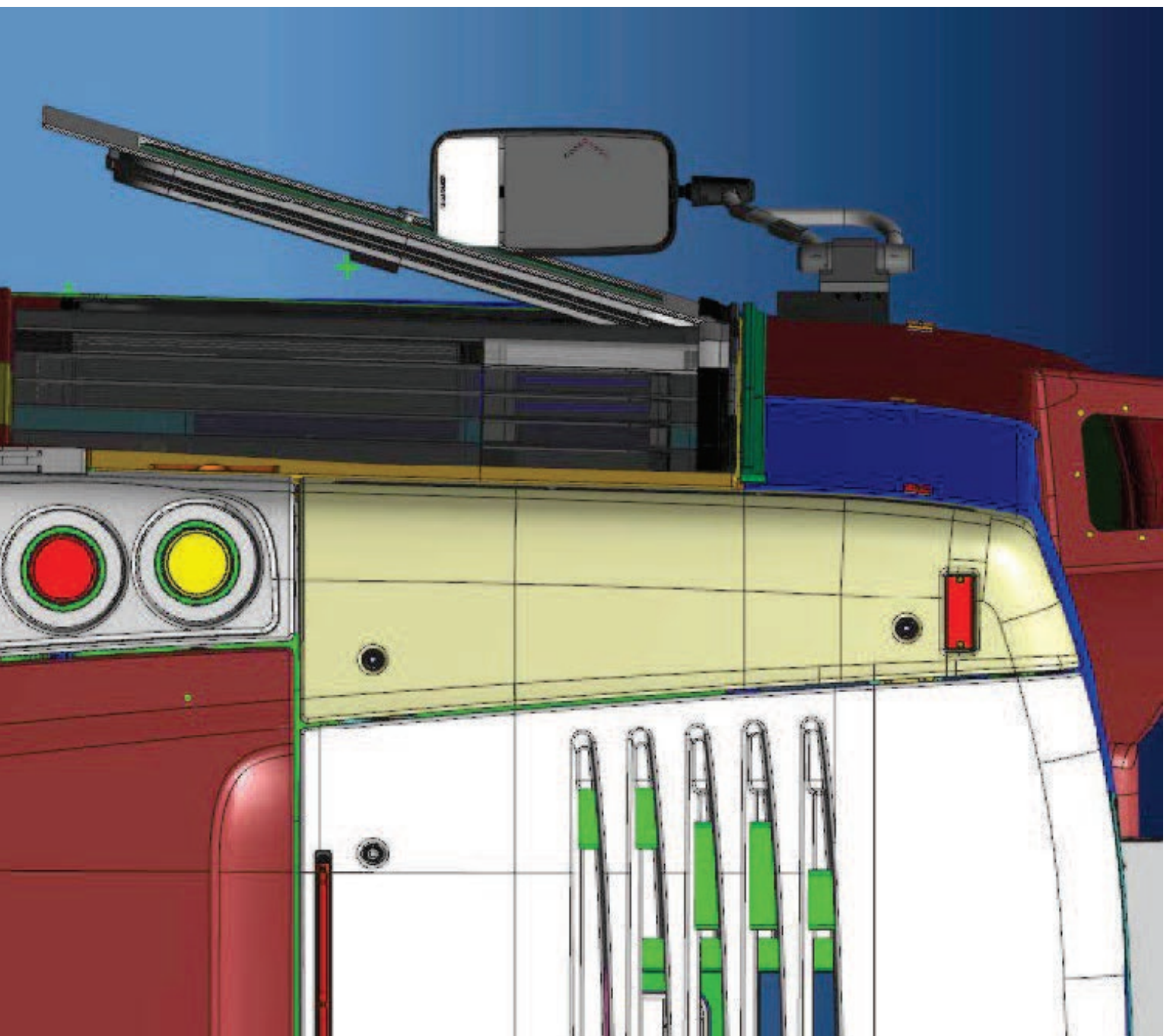
NEW FLYER

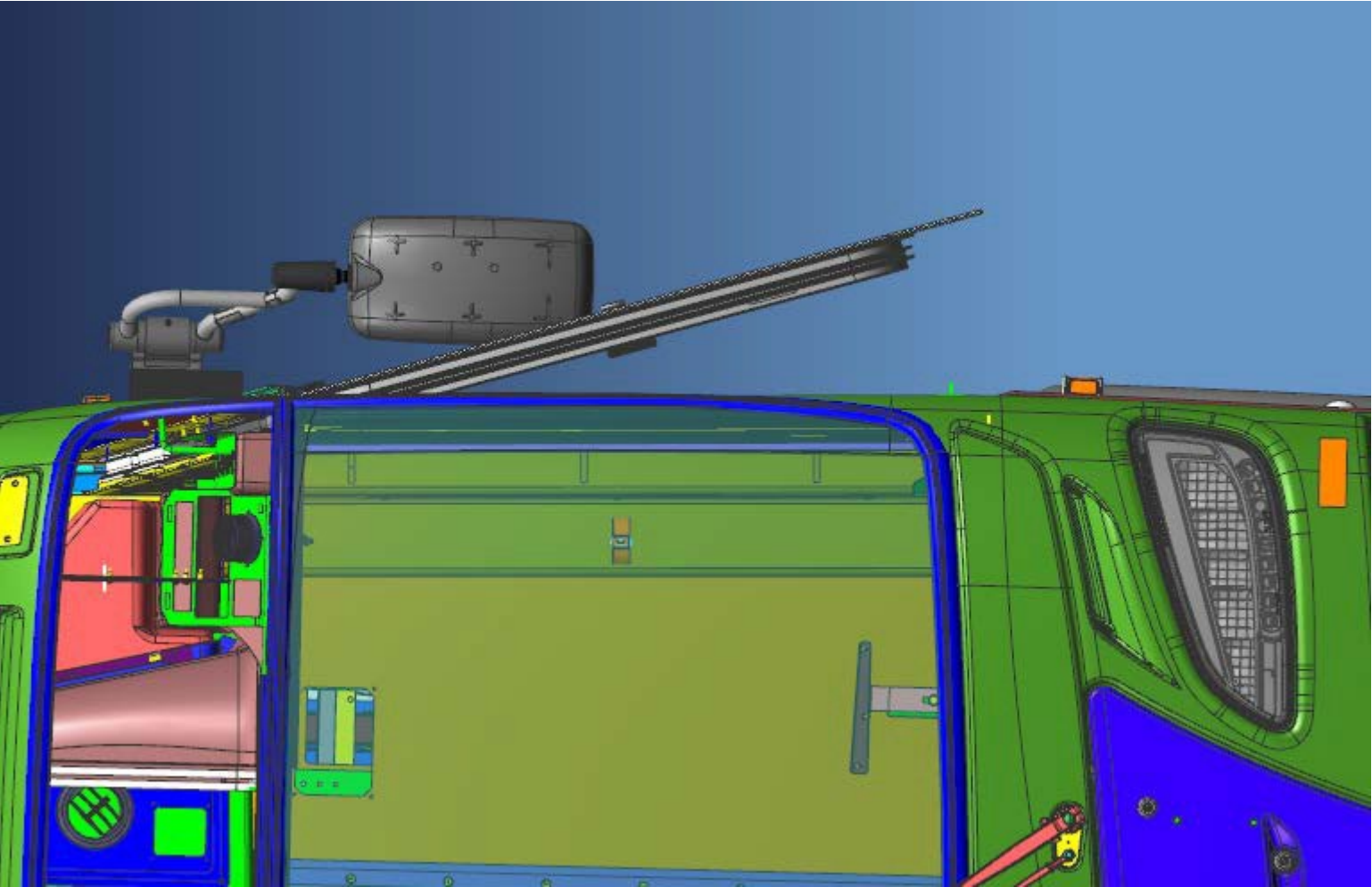
PART N° 718315

SCALE 1:20 | D | SHEET 3 OF 3

REPORT ALL ERRORS TO ENG. DEPT.


TORONTO
YIELD
CÉDEZ





LED Headlights

Product Features

New Flyer is the first North American OEM to offer LED Headlights to the Transit Industry. This headlight assembly introduces LED low and high beam, and an integrated turn signal.

Benefits

- Maintenance cost savings is estimated at $2,860 over 12 years per bus which is more than a 50% reduction versus conventional incandescent lights. On a fleet size of 100 buses, this could represent a maintenance cost savings of $286,000 over 12 years.
- The brightness of the bulbs will not disturb the vision of opposing traffic
- Improved front mask styling with an automotive look

Warranty

Headlight assemblies are warranted for six years; however, these lights have been designed to last 12 years.

Testing

Headlights are certified compliant to FM-VSS-108.

Environmental Characteristics

Test Standards	SAE J2139
Sealing standard	IP 66
Gasket	Poron with PSA on one side

Construction Characteristics

Lens Material	Hard-coated polycarbonate
Base Material	Polycarbonate
Reflector	High-temperature Polycarbonate

Compliance Characteristics

FMVSS/CMVSS 108	High & Low Beam for DOT
SAE J 2261	Turn signal
Reflector	High-temperature Polycarbonate

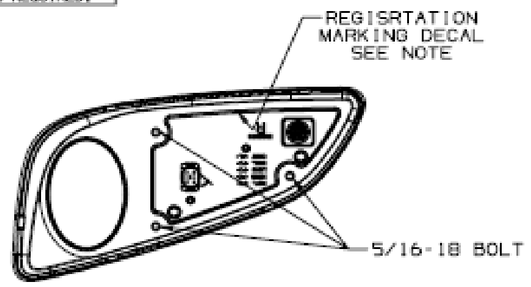
Electrical Characteristics

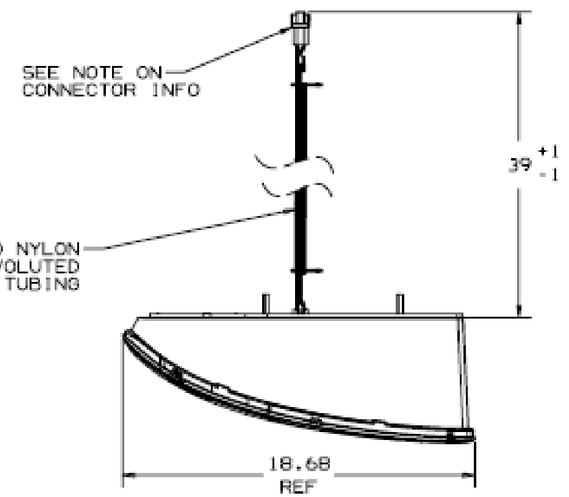
Nominal Voltage	12 Vdc
Operating Voltage	9-18 Vdc
Max current draw (LED) Low beam: Max current draw High Beam:	6.1A at 12 Vdc 4.5A at 12 Vdc
Connection	Integral connector
Light source: High Beam Low Beam Turn signal	 LED LED Discreet LED
Mating Connector: High beam bulb Low beam/turn signal	 Packard connector 8 pin Deutsch DT06-08SA
Transient Protection	150 v for 10 pulses - 40 ms long pulses, 1 sec between pulses
Electrical Interference	ECE regulation 10

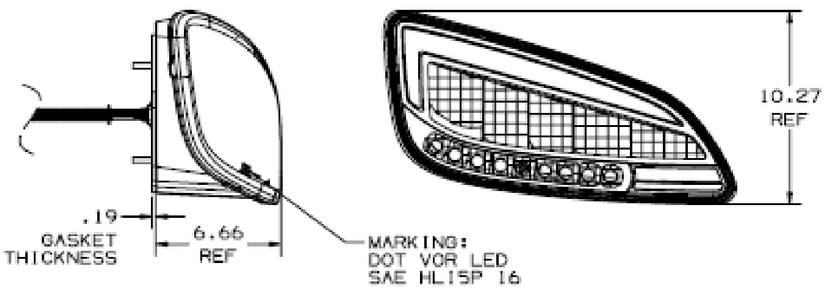
ADDITIONAL INFORMATION CAN BE OBTAINED BY REFERENCING THREE DIMENSIONAL DESIGN DATA. CONTACT YOUR NFI GROUP INC. REPRESENTATIVE AS REQUIRED.

NOTE: FOR INSTALLATION DRAWINGS PLEASE REFER TO ATTACHED MRP BoM SHEET FOR PARTS LISTING

PART Nº
621840







ISOMETRIC VIEW
REFERENCE ONLY

NOTES:

FEATURES: LED LOW BEAM,
LED HIGH BEAM, AND
LED AMBER TURN INDICATOR
BUILT-IN DRIVER MODULE
POWER VOLTAGE: 12V
VOLTAGE RANGE: 10-16V
REFERENCE CURRENT DRAW AT 13.5VDC:
A) HI BEAM: 0.90 AMPS (HB ONLY)
B) LO BEAM: 1.55 AMPS
C) TURN: 0.70 AMPS

COMPLIANCE SPEC & REGULATORY CERTIFICATION:
(TESTS RESULTS AND/OR CERTIFICATE REQUIRED)

1. PHOTOMETRY - LOW BEAM & HIGH BEAM
   FMVSS/CMVSS 108 Dec. 2007
2. PHOTOMETRY TURN SIGNAL
   FMVSS/CMVSS 108 Dec. 2007, SAE J2261
3. COLOR TEST
   SAE J578, 3.1.2
4. VIBRATION
   SAE J1455 section, 4.10 2 or 40 Sine Sweep 10-2000 Hz
5. MECHANICAL SHOCK
   JWS shock - 200's, 5ms, 100 cycles
6. MOISTURE/SPRAY
   SAE J575 section 4.3
7. HIGH PRESSURE SPRAY
   1,600 psi for 30 seconds, 10 in. from surface, front of lamp only
8. HUMIDITY
   FMVSS 108 Dec. 2007 S14.6.7.1.1
9. DUST
   FMVSS 108 Dec. 2007 S14.6.5.1
10. CORROSION
    FMVSS 108 Dec. 2007 S14.6.3.1
11. CHEMICAL RESISTANCE
    FMVSS 108 Dec. 2007 S14.6.2.1
12. TEMPERATURE CYCLE
    FMVSS 108 Dec. 2007 S14.6.6.3.1
13. STORAGE TEMPERATURE
    -50°F FOR 24 HOURS, 150°F FOR 24 HOURS
14. THERMAL SHOCK
    -50°F FOR 4 HOURS, 150°F FOR 4 HOURS FOR 6 CYCLES
15. INTERNAL HEAT
    FMVSS 108 Dec. 2007 S14.6.6.4.1
16. IMPACT
    SAE J575 SECTION 4.13
17. ABRASION
    FMVSS 108 DEC. 2007 S14.6.1.1
18. LAMP SEAL RATING
    FRONT: IP66
    REST OF LAMP: IP65
19. HIGHLY ACCELERATED LIFE TESTING

CONNECTIOR INFO: 8-PIN DEUTSCH DT04-08PA
PIN INFO:

1-YELLOW	HEADLAMP FAULT
2-BROWN	LOW BEAM SIGNAL
3-BROWN	TURN SIGNAL
4-BROWN	HI BEAM SIGNAL
5-BROWN	NOT IN USE
6-YELLOW	TURN SIGNAL FAULT
7-BLUE	POWER
8-WHITE	GROUND

REGISTRATION MARKING: 1.75" x 0.5" SILVER WITH BLACK LETTERING
DECAL ON INSIDE FACE SHALL STATE:

Ⓓ New Flyer Industries Canada ULC
U.S. Design Patent D680670
http://www.newflyer.com/index/terms_of_use

VENDOR: J.W. SPEAKER

VENDOR P/N: 0552931

DO NOT SCALE DRAWING			
DIMENSIONS IN [ ] ARE IN m.m.			
THD ANGLE			
DRAWN BY			
ARTEM KASUMOV			
DATE (DD-MMM-YY)	E	REMOVED "NEW FLYER 621840" FROM MARKING (A6)	ECN-23250Z
28-JUL-23	REV	DESCRIPTION	ECO

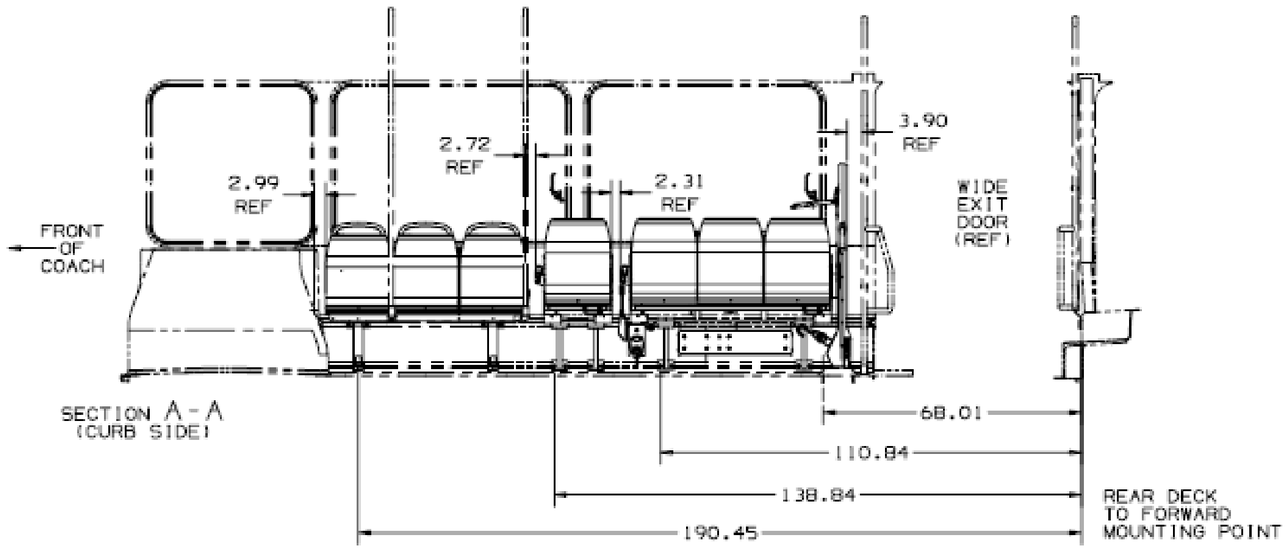
MATERIAL SEE NOTES	TITLE: ASSY-HEADLAMP LED CS		
TREATMENT NONE	UNSPEC'D TOLS.	DEC. IN.	PART Nº 621840
WEIGHT -	.X	±.12	
SIMILAR TO 344058	.XX	±.06	
	.XXX	±.03	
	HOLE DIA.	±.015	
	BEND RADII.	±.03	
	ANGLE TOL.	±1°	
	SCALE 1:4	D	SHEET 1 OF 1

REPORT ALL ERRORS TO ENG. DEPT.

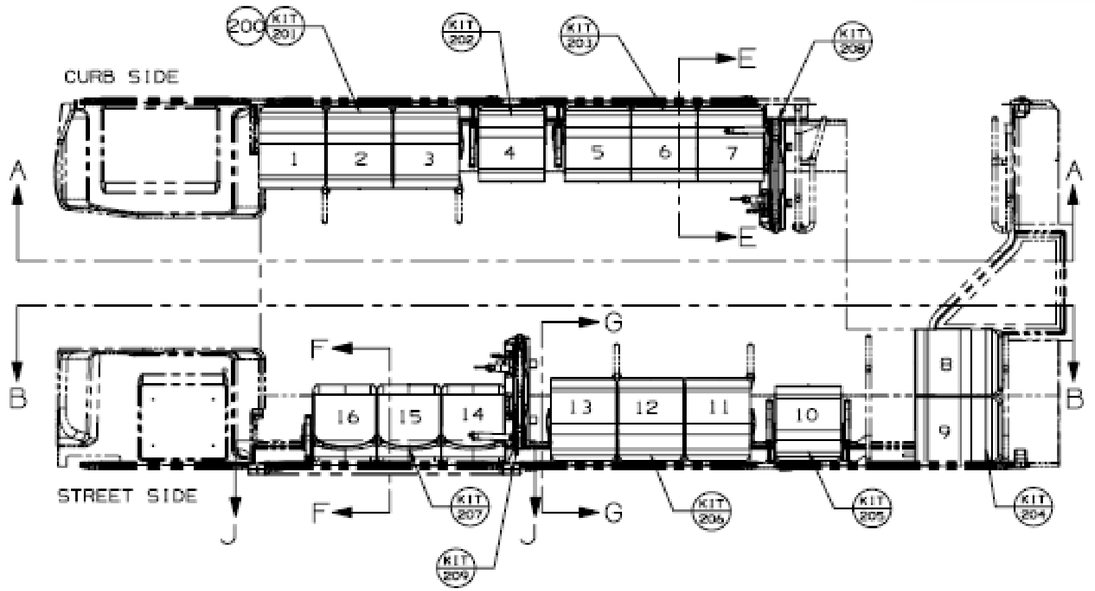
ADDITIONAL INFORMATION CAN BE OBTAINED BY REFERENCING THREE DIMENSIONAL DESIGN DATA. CONTACT YOUR NEW FLYER REPRESENTATIVE AS REQUIRED.

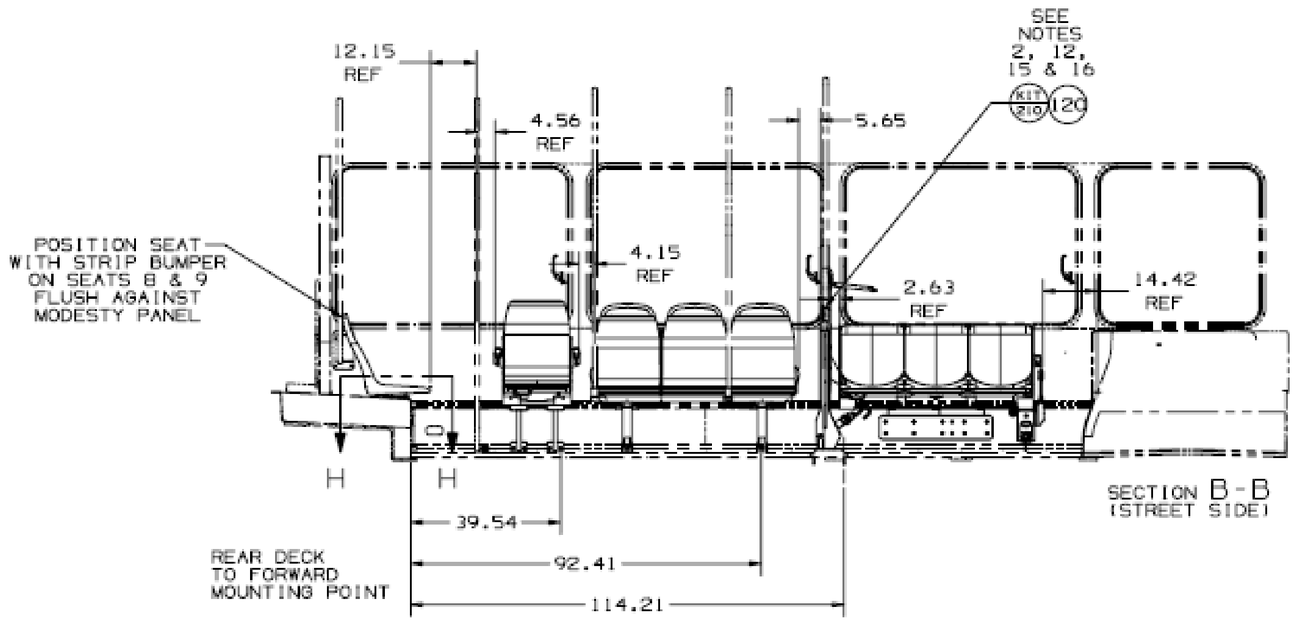
NOTE: FOR INSTALLATION DRAWINGS PLEASE REFER TO ATTACHED MRP BOM SHEET FOR PARTS LISTING

DRAWING N°
865674



SECTION A-A
(CURB SIDE)





SECTION B-B
(STREET SIDE)

FRONT OF COACH

DESIGN REFERENCE NOTES:

- USS GEMINI SEATS WITH CANTILEVER MOUNTING
- THERMOPLASTIC GRABRAILS ON SEATS 1-3 & 11-13
- Q'POD W/C SYSTEM ON BOTH STREET SIDE AND CURB SIDE W/ MUNI SPECIFIC PUSH BUTTON ON SEATS 6 & 15
- STREETSIDE MODESTY PANEL
- THIS LAYOUT ONLY USED WITH SAN FRANCISCO STANDEE LINE ONLY

- FOR 40' XCELSIOR
- NO FLOOR HEATERS
- DIESEL, DIESEL ELECTRIC,

SEE NOTE 4

QTY	U/M	ITEM	PART NO.	DESCRIPTION	WEIGHT
1	EA	200	865673	KIT-SEATING L/D GEMINI	-
1	EA	123	510604	SPEC-40NE SEAT TORQUE VALUE	-
0.010	EA	120	081034	LOCTITE-243 MEDIUM 10ML	-
40	EA	79	356596	T-BOLT-SEAT MOUNTING	0.05 LBS
8	EA	77	20805024	BOLT HEX 5/16-18 X 1.50	-
6	EA	43	296055	WASHER-SPACER 3/4 OD X .40 ID	.02 LB
1	EA	42	058614	INSERT-5/16-18UNC STL	-
6	EA	41	395734	WASHER-LARGE 5/16 SST	.02 LBS
6	EA	40	20805020	BOLT HEX SS 5/16-18 X 1.25 LG	-
8	EA	36	20806032	BOLT-HEX SST 3/8UNC 2.00	-
8	EA	33	50W05000	WASHER FLAT SS 5/16 NOM	-
40	EA	32	8410536	NUT-CRN 3/8UNC GR5	0.03 LBS
88	EA	30	50W06000	WASHER FLAT SS 3/8 NOM	-

DO NOT SCALE DRAWING				
DIMENSIONS IN [ ] ARE IN m.m.				
THD ANGLE				
DRAWN BY				
STEVE ESTES				
DATE (DD-MMM-YY)	C	1) OPEN AREA WAS 6849.93 IN SQ AND 47.57 FT SQ (E-1) 2) ADDED NOTE TO DESIGN REF NOTES (C-2)		ECN-184443
23-AUG-21	REV	DESCRIPTION		ECO

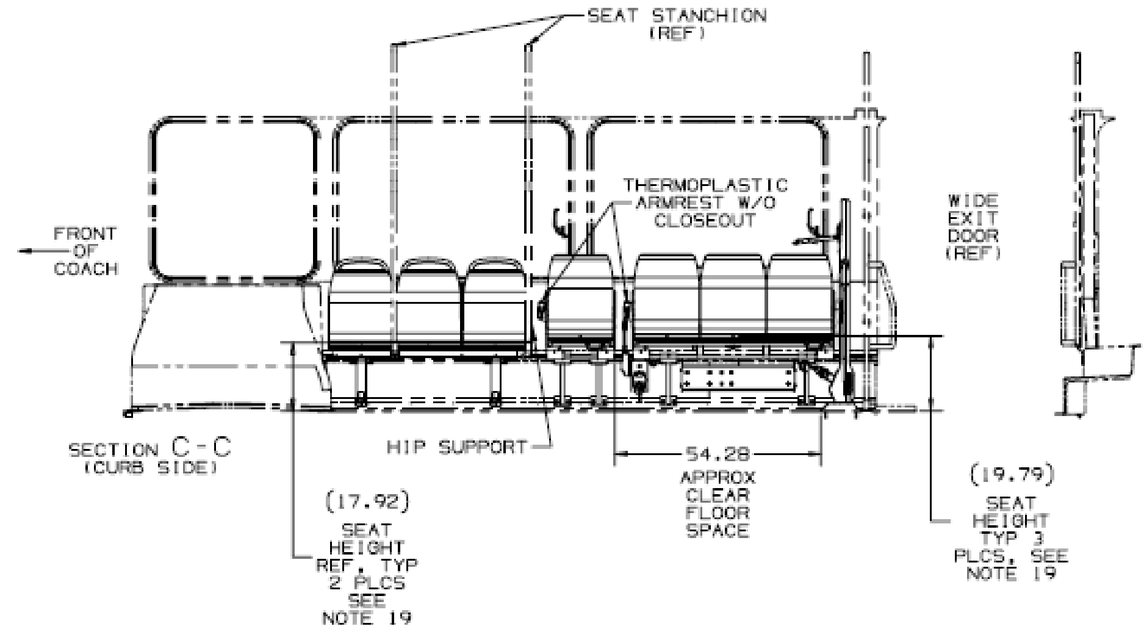
MATERIAL	UNSPEC'D TOLS.	DEC. IN.	TITLE
	.X	±.12	TMPLT-SEATING L/D GEMINI
WEIGHT	.XX	±.06	
-	.XXX	±.03	
	HOLE DIA.	±.015	NEW FLYER
	BEND RADII	±.03	PART N°
	ANGLE TOL.	±1°	865674
TREATMENT	SIMILAR TO		SCALE 1:20 / D / SHEET 1 OF 3
NONE			

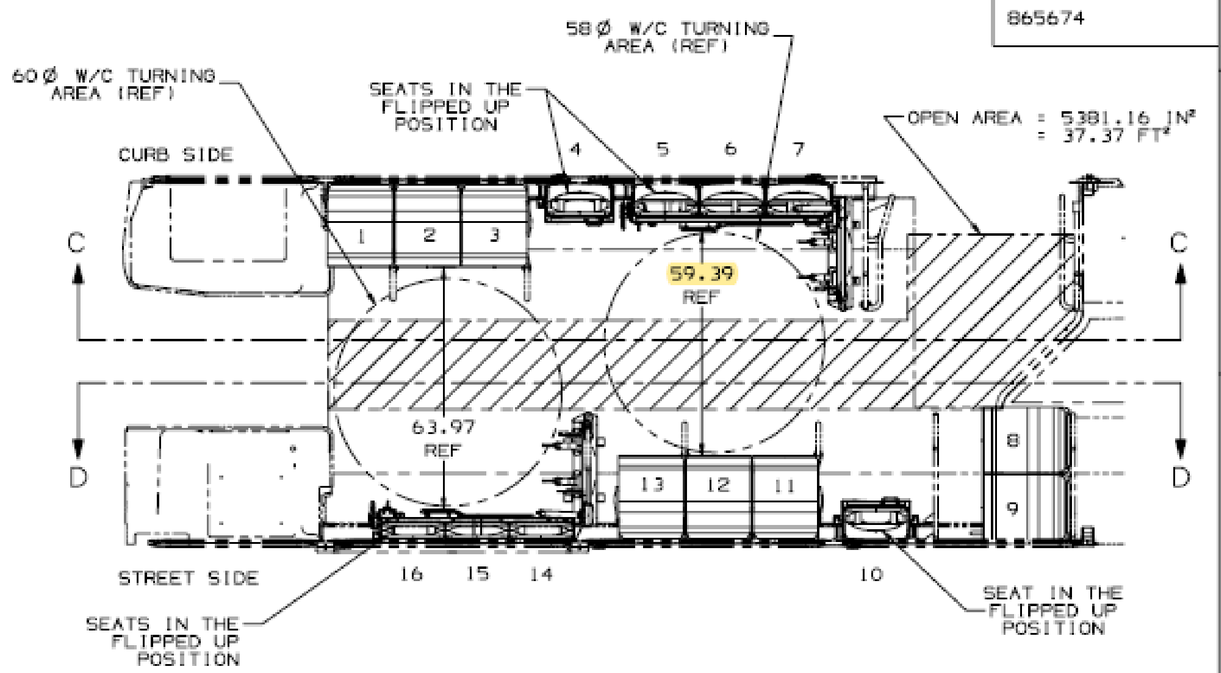
REPORT ALL ERRORS TO ENG. DEPT.

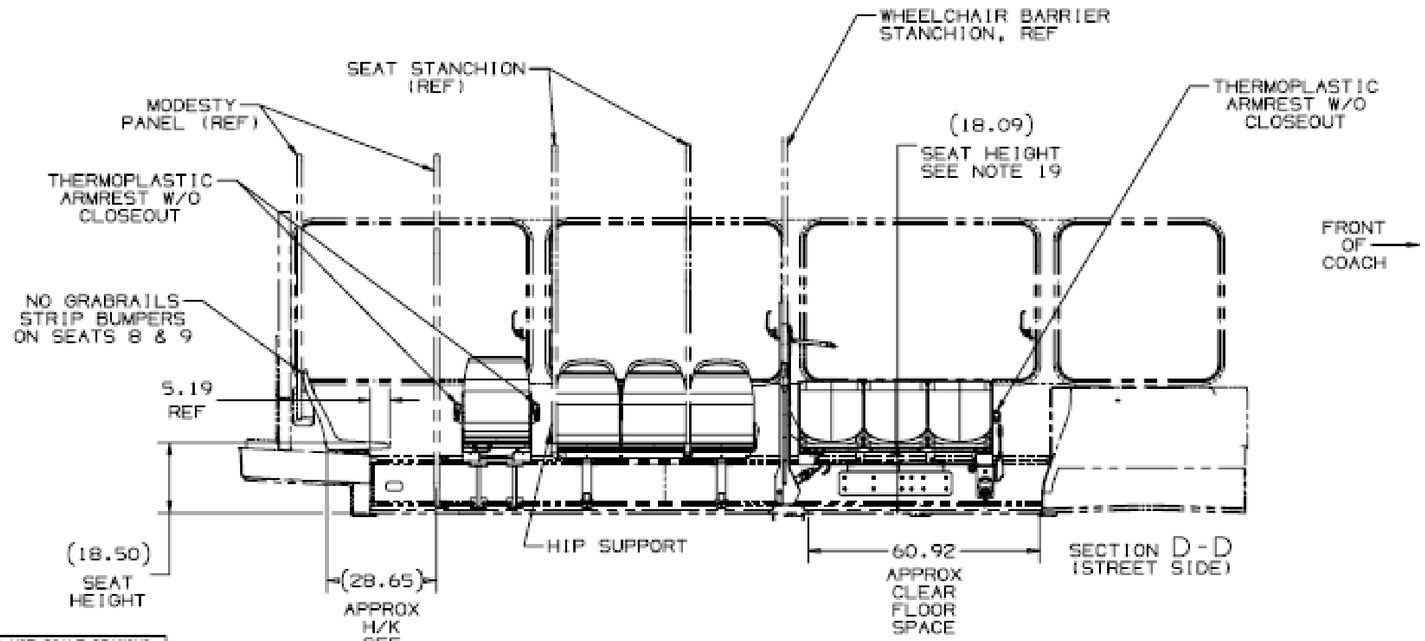
ADDITIONAL INFORMATION CAN BE OBTAINED BY REFERENCING THREE DIMENSIONAL DESIGN DATA. CONTACT YOUR NEW FLYER REPRESENTATIVE AS REQUIRED.

NOTE: FOR INSTALLATION DRAWINGS PLEASE REFER TO ATTACHED MRP BOM SHEET FOR PARTS LISTING

DRAWING N°
865674







NOTES:

19) DIMENSIONS IN BRACKETS REPRESENT THE APPROXIMATE SEAT HEIGHT WITH T2C INSERT. ADD 1/2" TO THE SEAT HEIGHT DIMENSION FOR 1/2" PADDED INSERTS AND 1" FOR 1" PADDED INSERTS RESPECTIVELY.
20) DIMENSIONS IN BRACKETS REPRESENT THE APPROXIMATE HIP TO KNEE WITH T2C ONSERT. SUBTRACT A 1/2" FROM THE HIP TO KNEE DIMENSION FOR PADDED ONSERTS (1/2" OR 1-1/4") . REFER TO CUSTOMER SPEC DWG P/N 265402-XXXX, WHERE XXXX IS THE SR#, FOR THE TYPE OF SEAT ONSERT THAT IS REQUIRED. NOTE THAT H/K DIMENSIONS ARE ONLY AFFECTED BY THE PADDING ON THE SEAT BACK INSERT AND FOOT ROOM DIMENSIONS ARE ONLY AFFECTED BY SEAT CUSHION INSERT PADDING.

DO NOT SCALE DRAWING	
DIMENSIONS IN ( ) ARE IN m.m.	
THD ANGLE	
DRAWN BY	STEVE ESTES
DATE (DD-MMM-YY)	23-AUG-21

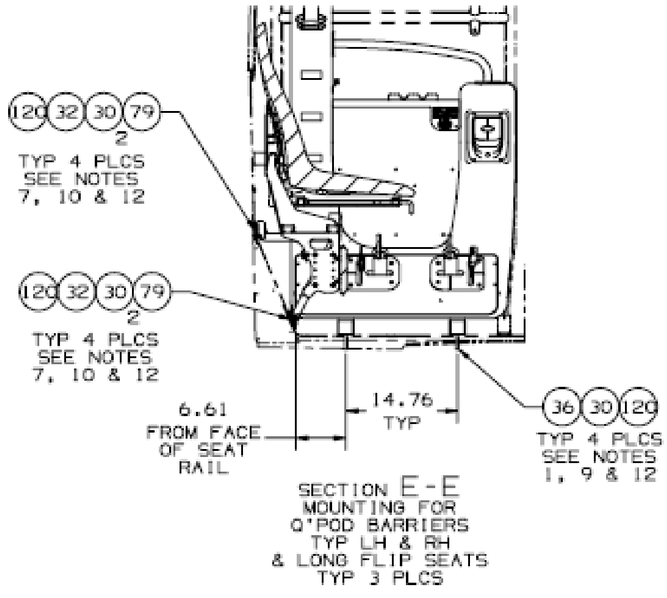
REV	DESCRIPTION	ECN
C	SEE SHEET 1	ECN-184443

MATERIAL	UNSPEC'D TOLS.	DEC. IN.	TITLE: TMPLT-SEATING L/D GEMINI
WEIGHT -	.X ±.12 .XX ±.06 .XXX ±.03 HOLE DIA. ±.015 BEND RADII. ±.03 ANGLE TOL. ±1°		NEW FLYER
TREATMENT NONE	SIMILAR TO		PART N° 865674 (NX)
			SCALE 1:20 · D · SHEET 2 OF 3

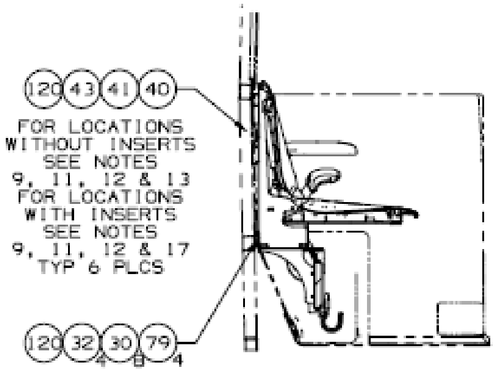
REPORT ALL ERRORS TO ENG. DEPT.

NOTE: FOR INSTALLATION DRAWINGS PLEASE REFER TO ATTACHED MRP BOM SHEET FOR PARTS LISTING

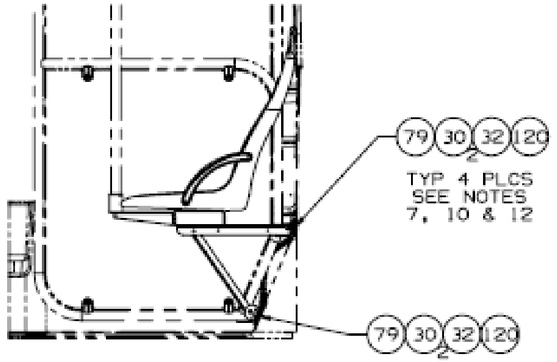
DRAWING Nº
865674



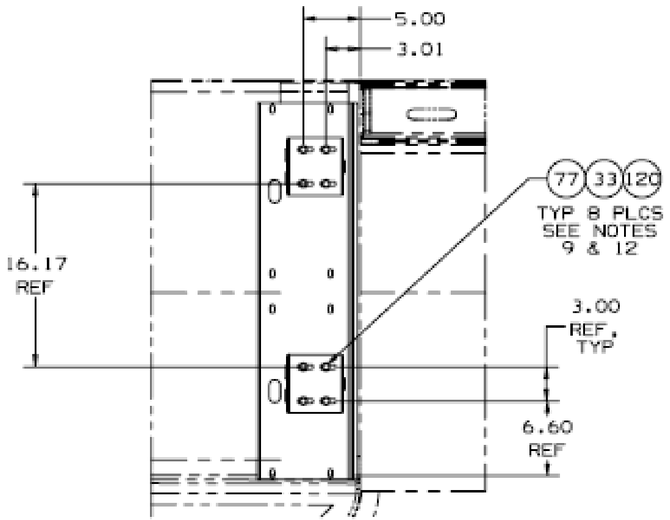
SECTION E-E
MOUNTING FOR
Q'POD BARRIERS
TYP LH & RH
& LONG FLIP SEATS
TYP 3 PLCS



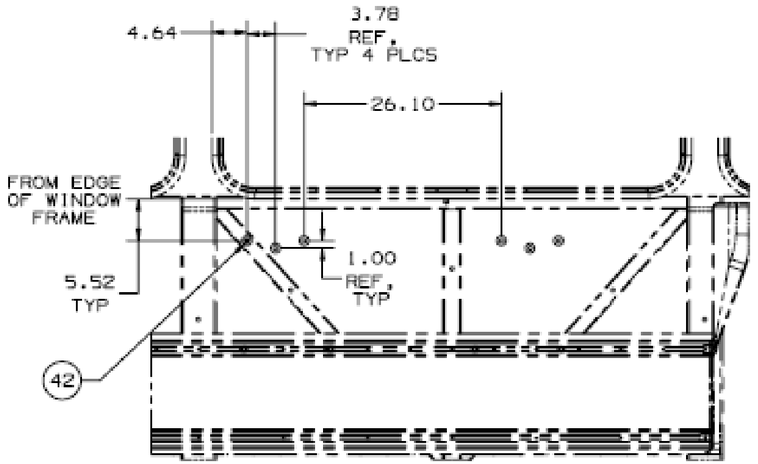
SECTION F-F
MOUNTING FOR
SLIM FLIP SEATS



SECTION G-G
MOUNTING FOR
LONGITUDINAL
FIXED SEATS



SECTION H-H
SEAT INSERTS REMOVED
FOR CLARITY. DISCARD
SCREWS FROM C-SIDE
SUPPORT PLATE INSTALL



SECTION J-J
MOUNTING FOR
SLIM FLIP SEATS

NOTES (WHERE APPLICABLE):

1. DRILL .312 PILOT HOLE AND TAP FOR 3/8-16 HARDWARE.
2. ADJUST THE ANGLE ON THE SEAT BOLT-ON STANCHION CUP SO THAT THE STANCHION IS VERTICAL REFER TO VENDOR DRAWING FOR INSTALLATION INSTRUCTIONS FOR MOUNTING STANCHION CUP TO SEAT GRABRAIL.
3. REFER TO SEAT VENDOR DRAWINGS FOR MORE DETAILS WITH REGARDS TO INSTALLING SEATS AND RESTRAINTS
4. KIT 865673 IS A TEMPLATE. REFER TO ORACLE BOM FOR CONTRACT SPECIFICATIONS.
5. SALES TO SEND SEAT SPECIFICATION DRAWING 265402-XXXX TO CUSTOMER, WHERE XXXX IS THE CONTRACT SR NUMBER.
6. ALL H/K DIMENSIONS HAVE ±.50 TOLERANCE, WHERE H/K = HIP TO KNEE.
7. TORQUE HARDWARE TO 35 FT-LBS.
8. SPLIT BALLOONS SUCH AS (KIT XXX) REFER TO ITEM XXX IN KIT ITEM 200. ALL SPLIT BALLOONS ARE REFERENCED ITEMS.
9. TORQUE HARDWARE TO 17 FT-LBS.
10. SLIDE ALL REQUIRED SEAT-RAIL BOLT-ANCHORS (ITEM 79) WITHIN SEAT-RAIL OPENINGS PROVIDED ON CS AND SS.
11. TO PREVENT WALL PANEL FROM CRACKING, DRILL .750 HOLE THRU WALL PANEL ONLY USING SEAT FRAME AND SEAT CROSSBRACE AS TEMPLATES. INSERT SPACER (ITEM 43) INTO HOLE
12. APPLY 1 TO 2 DROPS OF LOCTITE (ITEM 120) TO THREADS OF HARDWARE. IF ANY HARDWARE IS ALREADY SUPPLIED WITH LOCTITE, NO LOCTITE WILL BE REQUIRED. IF ANY HARDWARE IS LOOSENED FOR ADJUSTMENTS, RE-APPLY NEW LOCTITE TO THREADS.
13. DRILL .257 PILOT HOLE AND TAP FOR 5/16-18 HARDWARE.
14. TORQUE ALL SEAT VENDOR HARDWARE ACCORDING TO SPEC 510604 (ITEM 123). IF ANY HARDWARE IS LOOSENED FOR ADJUSTMENTS, RE-TORQUE HARDWARE.
15. TORQUE HARDWARE TO 5-7 FT-LBS.
16. DRILL .50 Ø THRU HOLE USING STANCHION CUP AS A TEMPLATE.
17. DRILL .531 DIA HOLE THRU STRUCTURE TUBE.

DO NOT SCALE DRAWING	
DIMENSIONS IN [ ] ARE IN m.m.	
THD ANGLE	
DRAWN BY	STEVE ESTES
DATE (DD-MMM-YY)	23-AUG-21

REV	DESCRIPTION	ECO
C	SEE SHEET 1	ECN-184443

MATERIAL	UNSPEC'D TOLS.	DEC. IN.
WEIGHT -	.X ±.12 .XX ±.06 .XXX ±.03 HOLE DIA. ±.015 BEND RADII ±.03 ANGLE TOL. ±1°	
TREATMENT NONE	SIMILAR TO	

TITLE
TMPLT-SEATING L/D GEMINI

NEW FLYER

PART Nº
865674

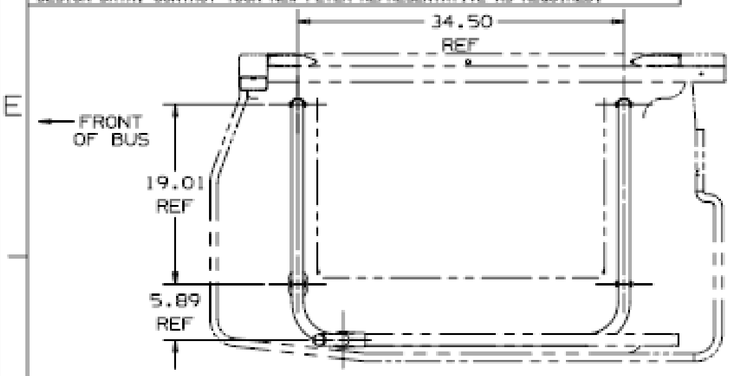
SCALE 1:10 | D | SHEET 3 OF 3

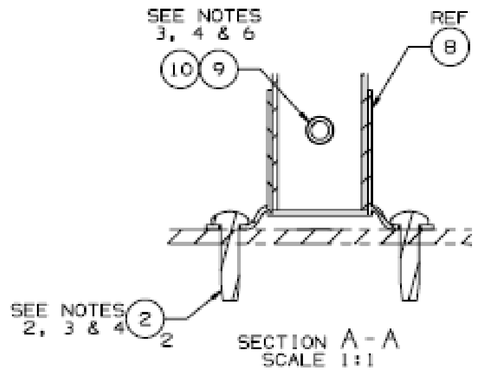
REPORT ALL ERRORS TO ENG. DEPT.

ADDITIONAL INFORMATION CAN BE OBTAINED BY REFERENCING THREE DIMENSIONAL DESIGN DATA, CONTACT YOUR NEW FLYER REPRESENTATIVE AS REQUIRED.

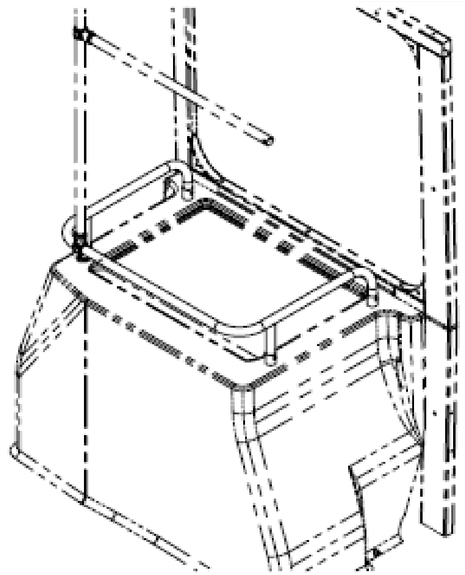
NOTE: FOR INSTALLATION DRAWINGS PLEASE REFER TO ATTACHED MRP BOM SHEET FOR PARTS LISTING

DRAWING N°
866390

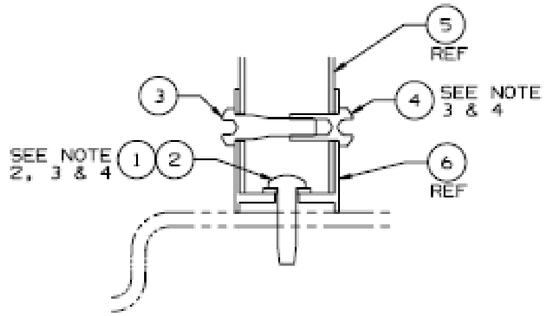




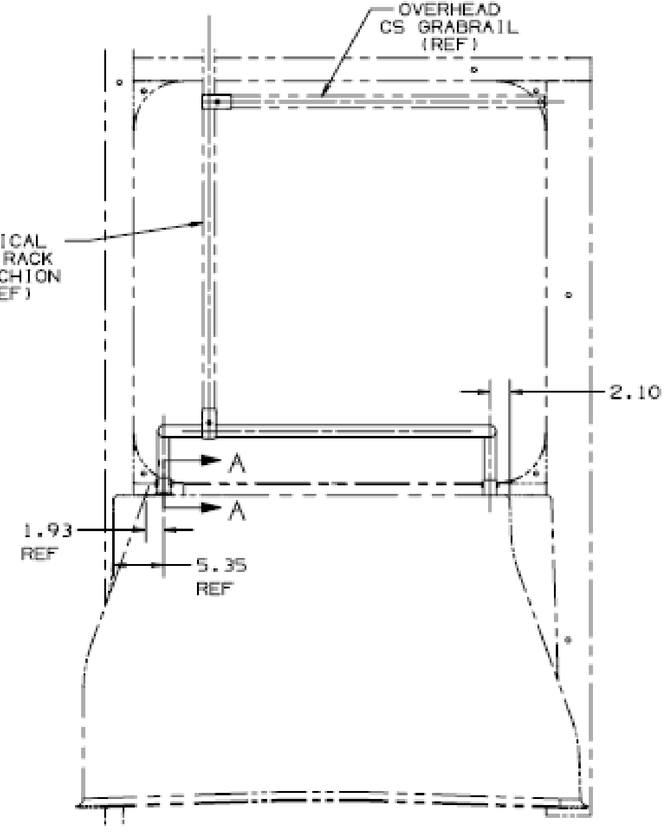
SECTION A-A
SCALE 1:1

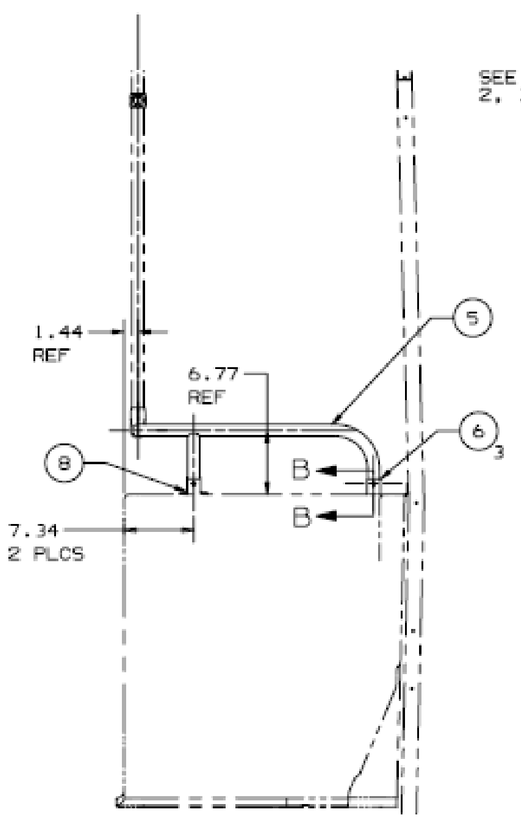


ISOMETRIC VIEW
FOR REFERENCE ONLY



SECTION B-B
SCALE 1:1
3 PLCS





NOTES:

1. DEBURR ALL FASTENERS AFTER INSTALLATION PER NFIL SPEC #412828.
2. DRILL 0.228 DIA HOLES USING FITTINGS (ITEM 6 & 8) AS TEMPLATES.
3. APPLY 1 TO 2 DROPS OF LOCTITE (ITEM 120) TO THREADS OF HARDWARE. IF HARDWARE IS SUPPLIED WITH LOCTITE, ADDITIONAL LOCTITE IS NOT REQUIRED. IF HARDWARE IS LOOSENED FOR ADJUSTMENT REAPPLY LOCTITE TO THREADS.
4. TORQUE HARDWARE 4-5 FT-LBS.
5. DRILL 0.358 DIA HOLES FOR ALL LOCATIONS USING SCREWS & NUT-SLEEVES (ITEMS 9 & 10) IF REQUIRED

DESIGN REFERENCE NOTES:

- SST LUGGAGE RACK
- FOR CURVED O/HEAD STANCHION DESIGN
- STAINLESS STEEL CAST FITTING
- 4 PINNED STANCHION CUPS WITH PROVISION TO ROUTE WIRES THROUGH FWD CUP ON AISLE SIDE

QTY	U/M	ITEM	PART NO.	DESCRIPTION	WEIGHT
0.010	EA	120	081034	LOCTITE-243 MEDIUM 10ML	-
1	EA	10	044329	NUT-SLEEVE PH 1/4-20	
1	EA	9	044328	SCREW-SHOULDER PH 1/4-20	
1	EA	8	039709	FITTING-CUP SS	-
3	EA	6	5925440	FTG-STANCHION CUP	0.15 LBS
1	EA	5	576745	ASSY-RH LUGG RACK 201 SST	6.98 LBS
3	EA	4	368140	NUT-SLEEVE PH 1/4-20 SST	.021 LBS
3	EA	3	368139	SCREW-SHOULDER PH 1/4-20 SST	.026 LBS
5	EA	2	34S04016	SCREW-1/4-20 X 1.0	-
3	EA	1	10W04000	WASHER FLAT 1/4	-

DO NOT SCALE DRAWING					
DIMENSIONS IN [ ] ARE IN m.m.					
THD ANGLE					
DRAWN BY					
JOHNNY SALANDAD					
DATE (DD-MMM-YY)	A	RELEASE FOR PRODUCTION			ECN-160848
29-SEP-20	REV	DESCRIPTION			ECO

MATERIAL
N/A

WEIGHT
0 LB

TREATMENT
NONE

UNSPEC'D TOLS. / DEC. IN.
.X ±.12
.XX ±.06
.XXX ±.03
HOLE DIA. ±.015
BEND RADII. ±.03
ANGLE TOL. ±1°

SIMILAR TO
576792

TITLE
INSTL-RH LUGG RACK, SST

NEW FLYER

PART N°
866390

SCALE 1:10 | D | SHEET 1 OF 1

REPORT ALL ERRORS TO ENG. DEPT.

ADDITIONAL INFORMATION CAN BE OBTAINED BY REFERENCING THREE DIMENSIONAL DESIGN DATA. CONTACT YOUR NEW FLYER REPRESENTATIVE AS REQUIRED.

REV	DESCRIPTION	ECO
A	RELEASE TO PRODUCTION.	ECN-100891

DESCRIPTION - DECAL-FLEET NO 14" BLACK
MATERIAL - 3M 180C-12 BLACK
- ADHESIVE BACKING WITH APPLICATION PREMASK (SCPM-44X)
COLOR - BLACK
FONT - HELVETICA BOLD

FLEET NUMBERS FOR SR-2117 SAN FRANCISCO ARE 8902 THRU 8969

TO BE SUPPLIED IN A KIT OF 4 INDIVIDUAL NUMBERS.
NO UNDERLYING BAR REQUIRED.

DO NOT SCALE DRAWING	MATERIAL SEE NOTES	UNSPEC'D TOLS.	DEC.IN.
DIMENSIONS IN [ ] ARE IN m.m.		.X .XX .XXX HOLE DIA. BEND RADII. ANGLE TOL.	±.12 ±.06 ±.03 ±.015 ±.03 ±1°
THD ANGLE	WEIGHT		
DRAWN BY			
JASON STEWART			
DATE (DD-MMM-YY)	TREATMENT SEE NOTES	SIMILAR TO	
14-FEB-18			

TITLE

DECAL-FLEET NO 14" BLACK

NEW FLYER

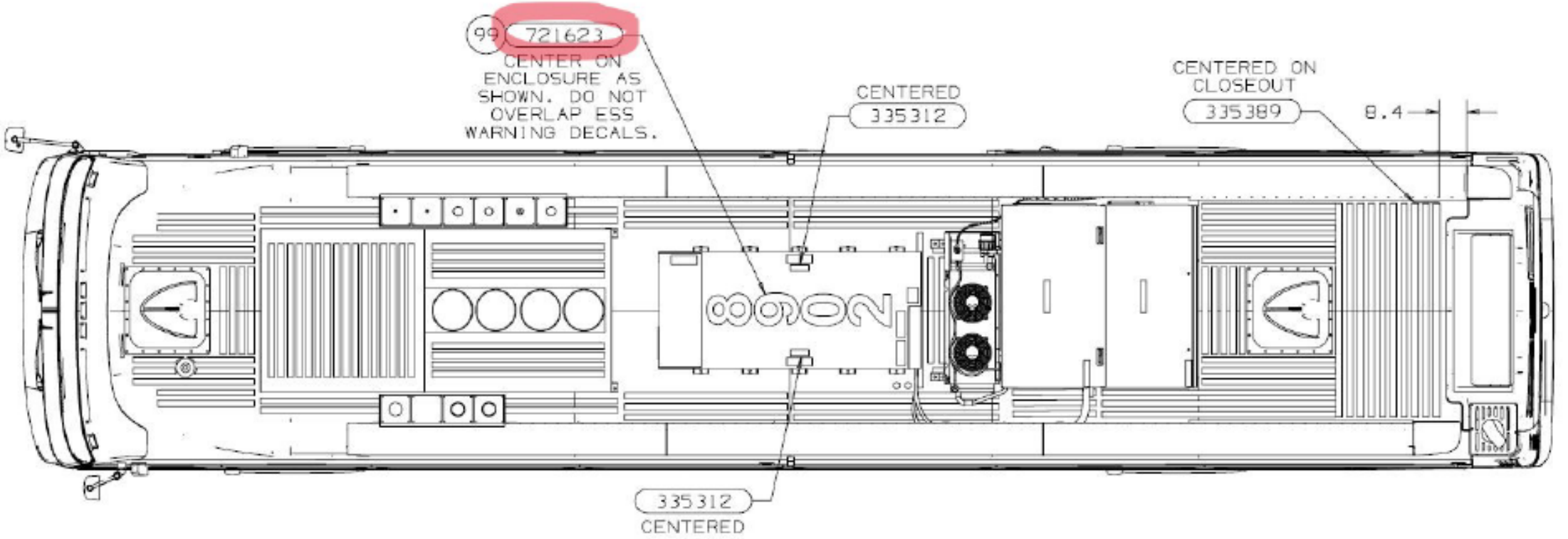
PART Nº

721623

(NX)

SCALE NTS | A | SHEET 1 OF 1

REPORT ALL ERRORS TO ENG. DEPT.


99 721623
CENTER ON ENCLOSURE AS SHOWN. DO NOT OVERLAP ESS WARNING DECALS.
CENTERED
335312
CENTERED ON CLOSEOUT
335389
8.4
335312
CENTERED

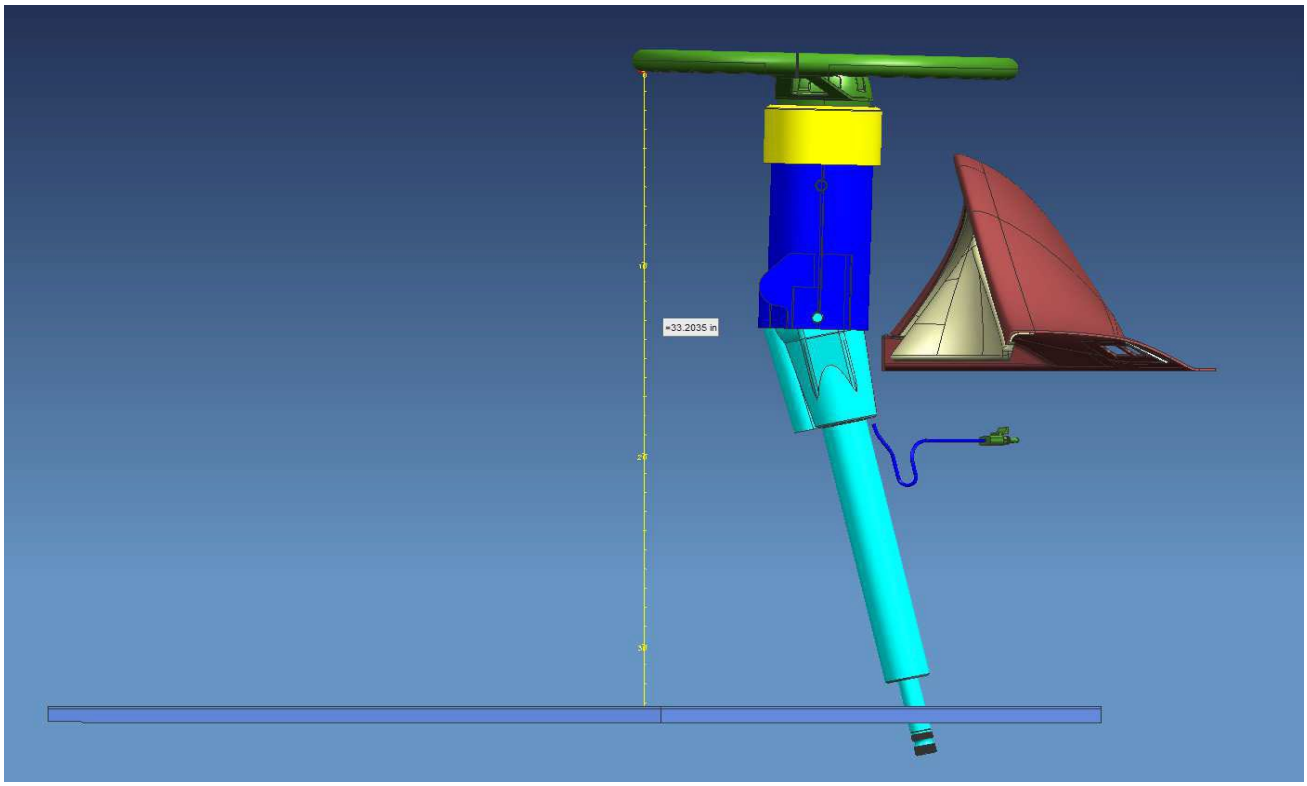
TS 32.2.4	**Steering Wheel Telescopic Adjustment**
Telescopic range of 1.88"	

Table 5

Steering wheel Height relative to angle of slope			
At Minimum Telescopic Height (+0")		At Maximum Telescopic Height (+1.88")	
Angle of Slope	Height	Angle of Slope	Height
-1.5 degrees	31.4"	-1.5 degrees	33.2"
5.5 degrees	30.2"	5.5 degrees	32.1"
12.5 degrees	28.9"	12.5 degrees	30.7"
19.5 degrees	27.4"	19.5 degrees	29.1"
26.5 degrees	25.7"	26.5 degrees	27.4"
33.5 degrees	24.0"	33.5 degrees	25.6"

Note: slopes away from driver 1.5 de

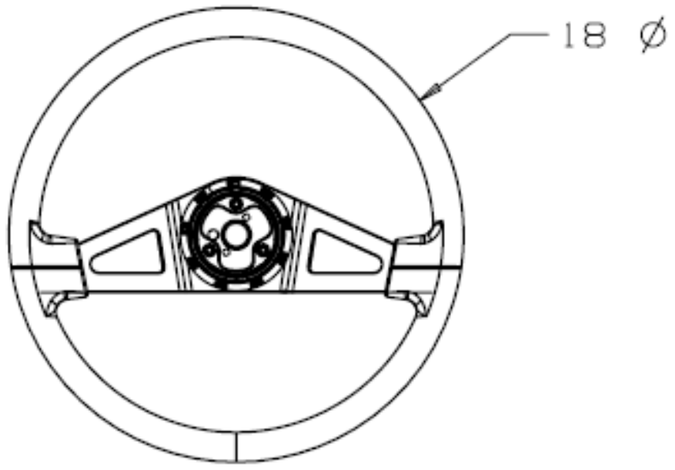
Measurement as per below sketch

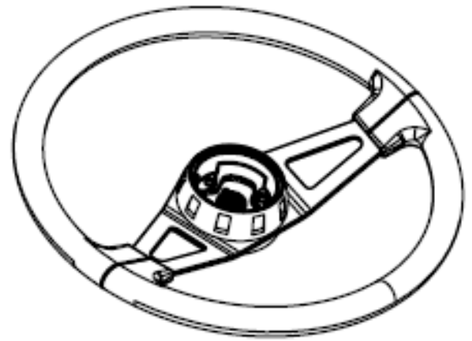


Steering column shown at -1.5-degrees tilt and maximum telescopic height

NOTE: FOR INSTALLATION DRAWINGS PLEASE REFER TO ATTACHED MRP BOM SHEET FOR PARTS LISTING

REV	DESCRIPTION	ECO
D	VENDOR PART # WAS BKBL1824D4V	ECN-070210





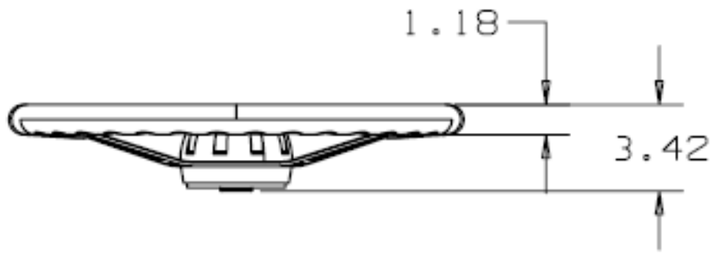
ISOMETRIC VIEW
REFERENCE ONLY

VENDOR: VEHICLE IMPROVEMENT PRODUCTS

VENDOR PART NO.: BKBL1824D4SS

DESCRIPTION: STEERING WHEEL ASSY-2 SPOKE
W/HUB, BLACK, 18.00 DIA.
INJECTION MOLDED PVC WITH FINGER GRIP
HARDNESS: 70-75 SHORE A.

ALL DIMENSIONS ARE FOR REFERENCE ONLY.



ADDITIONAL INFORMATION CAN BE OBTAINED BY REFERENCING THREE DIMENSIONAL DESIGN DATA. CONTACT YOUR NEW FLYER REPRESENTATIVE AS REQUIRED.

DO NOT SCALE DRAWING	THE INFORMATION CONTAINED IN THIS DRAWING IS PROPRIETARY TO NEW FLYER INDUSTRIES CANADA ULC OR ITS AFFILIATES ("NEW FLYER"). THIS DRAWING AND ALL MATERIAL DELIVERED WITH IT MUST BE RETURNED UPON REQUEST, AND SHALL NOT BE DISCLOSED TO THIRD PARTIES WITHOUT THE PRIOR WRITTEN CONSENT OF NEW FLYER. ONE OR MORE PATENTS MAY BE PENDING FOR THE PRODUCTS DEPICTED HEREIN.
DIMENSIONS IN [ ] ARE IN m.m.	
THD ANGLE	
DRAWN BY	
HAN YONG LEE	
DATE (DD-MMM-YY)	
19-JUL-16	

MATERIAL SEE NOTE -	UNSPEC'D TOLS.	DEC. IN.
WEIGHT TBD	.X .XX .XXX HOLE DIA. BEND RADII. ANGLE TOL.	±.12 ±.06 ±.03 ±.015 ±.03 ±1°
TREATMENT NONE -	SIMILAR TO -	

TITLE

WHL-STEERING 18" 2 SPOKE PADDED

NEW FLYER

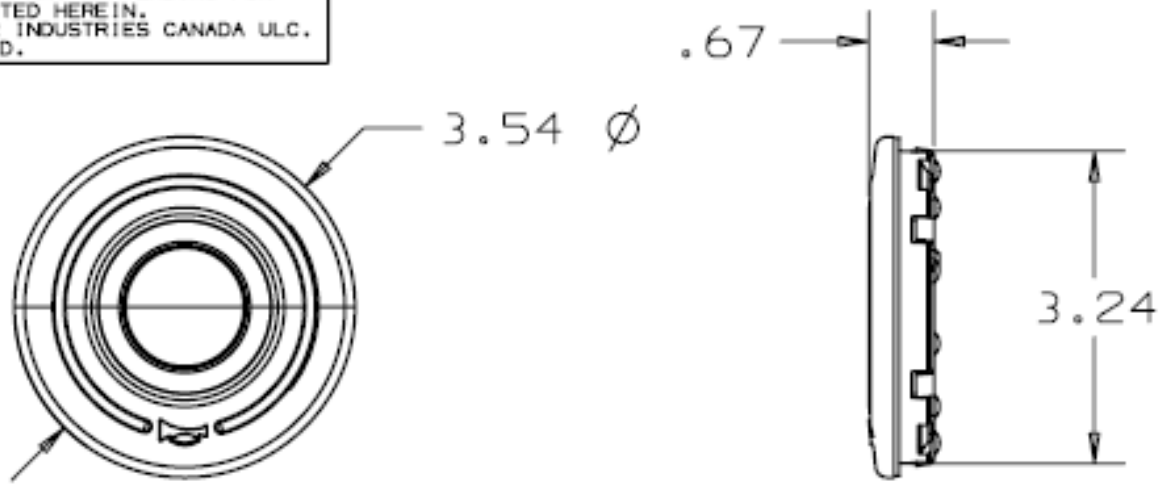
PART Nº

064449 (NX)

SCALE 1:6 | B | SHEET 1 OF 1

REPORT ALL ERRORS TO ENG. DEPT.

REV	DESCRIPTION	ECO
A	RELEASED TO PRODUCTION	ECN-034644



DESCRIPTION: HORN BUTTON ASSY. BLACK WITHOUT NEW FLYER LOGO

VENDOR: VEHICLE IMPROVEMENT PRODUCTS INC

VENDOR P/N : HB10BL

DO NOT SCALE DRAWING	MATERIAL - -	UNSPEC'D TOLS.	DEC. IN.
DIMENSIONS IN [ ] ARE IN m.m.		.X .XX .XXX HOLE DIA. BEND RADII. ANGLE TOL.	±.12 ±.06 ±.03 ±.015 ±.03 ±1°
THD ANGLE	WEIGHT -		
DRAWN BY BO HUANG			
DATE (DD-MMM-YY) 11-APR-14	TREATMENT NONE -	SIMILAR TO 6381576	

TITLE

BUTTON-HORN NO LOGO

NEW FLYER

PART N°

557082

(NX)

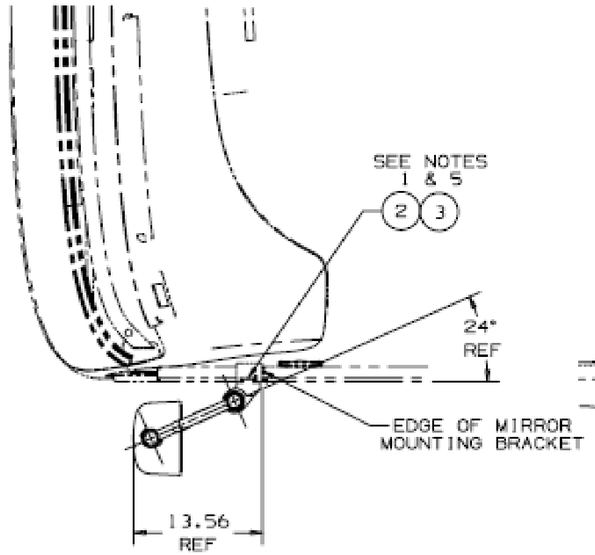
SCALE 1 = 2 | A | SHEET 1 OF 1

REPORT ALL ERRORS TO ENG. DEPT.

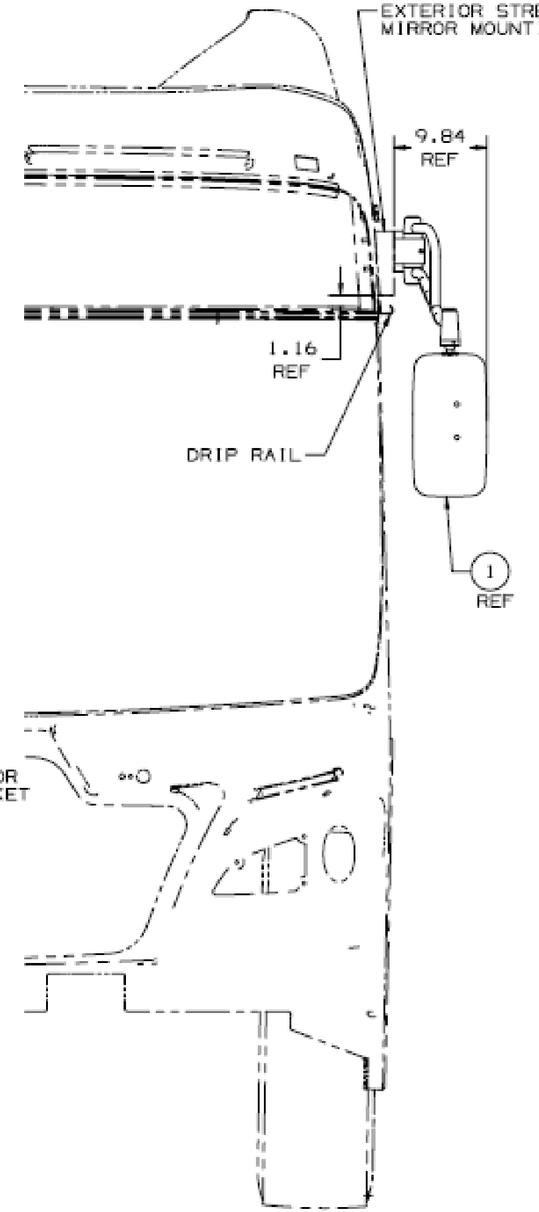
ADDITIONAL INFORMATION CAN BE OBTAINED BY REFERENCING THREE DIMENSIONAL DESIGN DATA. CONTACT YOUR NEW FLYER REPRESENTATIVE AS REQUIRED.

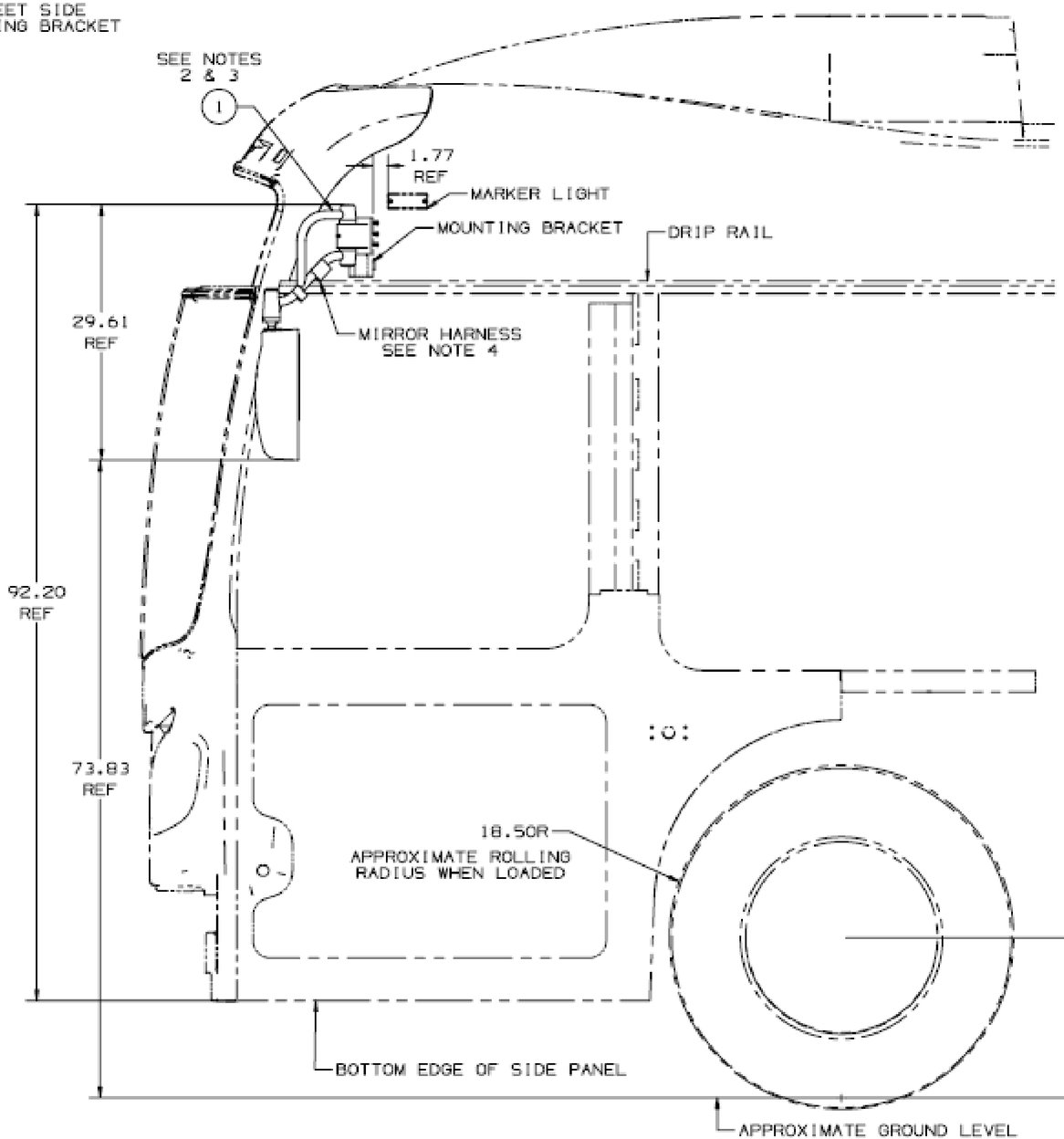
NOTE: FOR INSTALLATION DRAWINGS PLEASE REFER TO ATTACHED MRP BOM SHEET FOR PARTS LISTING

DRAWING N°
604058



TOP VIEW OF STREETSIDE





NOTES:

1) APPLY A COATING OF LUBRICANT TO THE INSIDE SURFACES OF THE DOVETAIL GROOVE OF EXISTING MOUNTING BASE.
2) POSITION THE MALE DOVETAIL TONGUE OF THE MIRROR INTO THE DOVETAIL GROOVE OF THE MOUNTING BASE AND SLIDE DOWN TO THE BOTTOM OF THE GROOVE.
3) SECURE THE STREET SIDE MIRROR ASSEMBLY IN PLACE USING THE SET SCREWS (48-72 IN-LBS).
4) PLUG MIRROR HARNESS INTO THE FEMALE PLUG PROVIDED IN THE SIDE OF THE MOUNTING BASE.
5) APPLY LOCTITE TO ALL THREADED FASTENERS WHERE LOCK NUTS NOT USED, (EXCEPT FOR ELECTRICAL CONNECTIONS).

QTY	U/M	ITEM	PART NO.	DESCRIPTION	WEIGHT
0.010	EA	3	081034	LOCTITE-243 MEDIUM 10ML	-
0.010	EA	2	8111767	ANTI-CORROSION COMPOUND NYK-77	-
1	EA	1	604059	ASSY-EXT MIRROR, SS	-

MATERIAL
N/A

WEIGHT
-

TREATMENT
N/A

UNSPEC'D TOLS. DEC. IN.
.X ±.12
.XX ±.06
.XXX ±.03
HOLE DIA. ±.015
BEND RADII ±.03
ANGLE TOL. ±1°

SIMILAR TO
565543

TITLE
INSTL-EXT MIRROR,SS

NEW FLYER

PART N°
604058

SCALE NTS | D | SHEET 1 OF 1

DO NOT SCALE DRAWING
DIMENSIONS IN [ ] ARE IN m.m.
THD ANGLE
DRAWN BY
CODY NEUSTAEDTER
DATE (DD-MMM-YY)
06-MAY-19

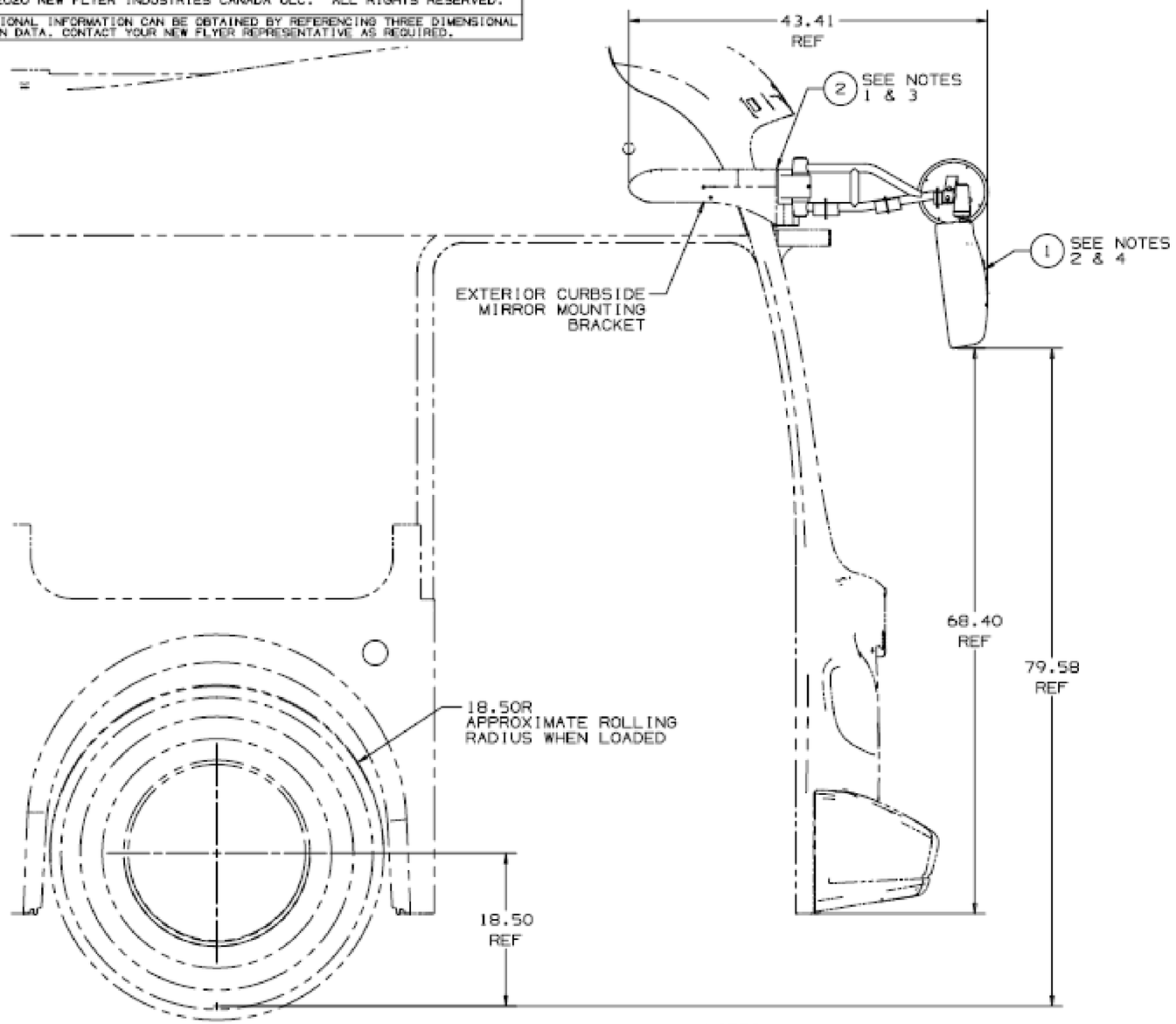
REV	DESCRIPTION	ECO
B	1.UPDATED NOTE 3	ECN-129295

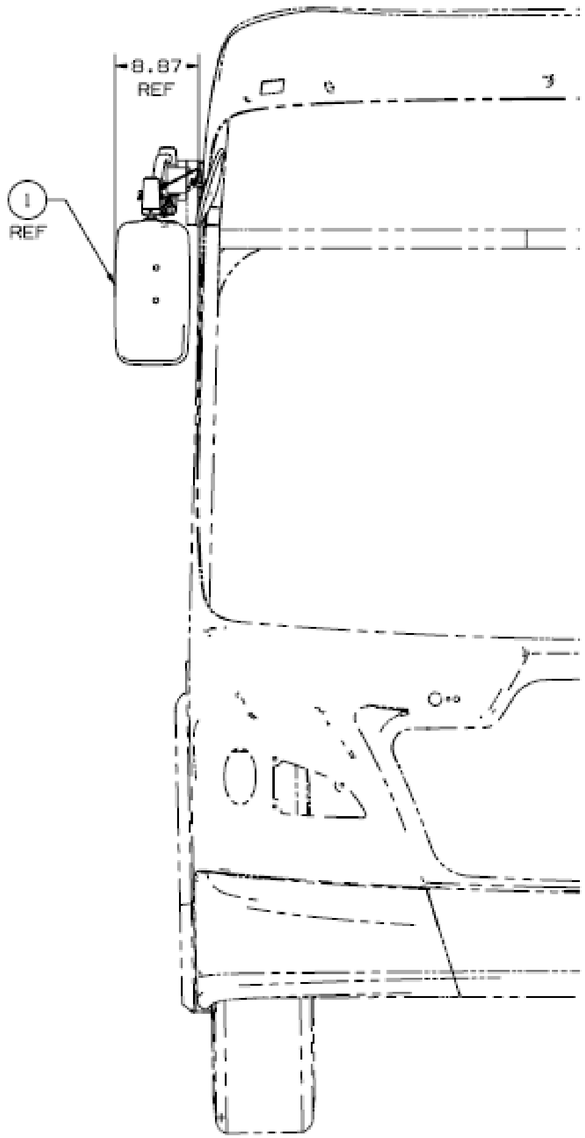
REPORT ALL ERRORS TO ENG. DEPT.

ADDITIONAL INFORMATION CAN BE OBTAINED BY REFERENCING THREE DIMENSIONAL DESIGN DATA. CONTACT YOUR NEW FLYER REPRESENTATIVE AS REQUIRED.

NOTE: FOR INSTALLATION DRAWINGS PLEASE REFER TO ATTACHED MRP BOM SHEET FOR PARTS LISTING

DRAWING N°
869848





NOTES:

1) APPLY A COATING OF LUBRICANT TO THE INSIDE SURFACES OF THE DOVETAIL GROOVE OF EXISTING MOUNTING BASE.

2) POSITION THE MALE DOVETAIL TONGUE OF THE MIRROR INTO THE DOVETAIL GROOVE OF THE MOUNTING BASE AND SLIDE DOWN TO THE BOTTOM OF THE GROOVE.

3) APPLY A COATING OF LUBRICANT TO THE SET SCREWS PROVIDED IN THE MOUNTING BASE AND THEN SECURE THE CURBSIDE MIRROR ASSY IN PLACE USING THE SET SCREWS.

4) PLUG MIRROR HARNESS INTO THE FEMALE PLUG PROVIDED IN THE BOTTOM OF THE MOUNTING BASE.

5) APPLY LOCTITE TO ALL THREADED FASTENERS WHERE LOCK NUTS NOT USED, (EXCEPT FOR ELECTRICAL CONNECTION)

QTY	U/M	ITEM	PART NO.	DESCRIPTION	WEIGHT
0.010	EA	3	081034	LOCTITE-243 MEDIUM 10ML	-
0.010	EA	2	8111767	ANTI-CORROSION COMPOUND NYK-77	-
1	EA	1	869847	ASSY-EXT MIRROR, CS	-

MATERIAL
N/A

WEIGHT
-

UNSPEC'D TOLS. DEC. IN.
.X ±.12
.XX ±.06
.XXX ±.03
HOLE DIA. ±.015
BEND RADII ±.03
ANGLE TOL. ±1°

TREATMENT
NOT REQUIRED

SIMILAR TO
604060

TITLE
INSTL-EXT MIRROR, CS

PART N°
869848

NEW FLYER

SCALE 1:8 | D | SHEET 1 OF 1

DO NOT SCALE DRAWING
DIMENSIONS IN [ ] ARE IN m.m.
THD ANGLE
DRAWN BY
VISHESH VERMA
DATE (DD-MMM-YY)
27-OCT-20

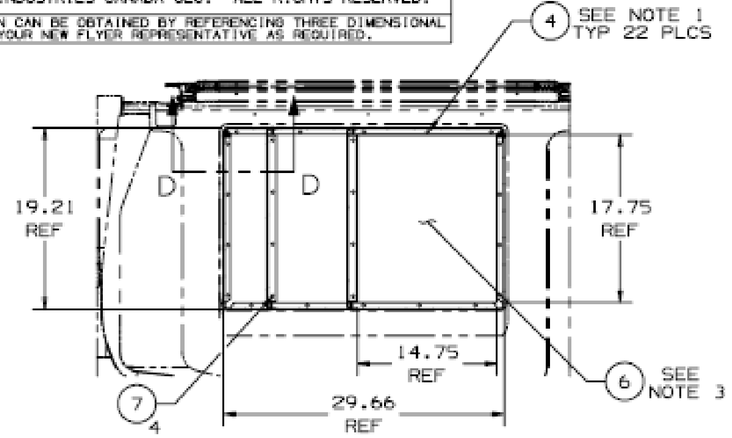
REV	DESCRIPTION	ECO
A	RELEASED TO PRODUCTION	ECN-159639

REPORT ALL ERRORS TO ENG. DEPT.

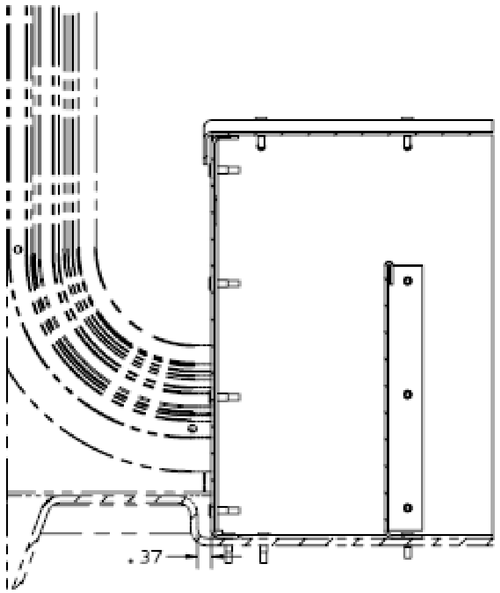
ADDITIONAL INFORMATION CAN BE OBTAINED BY REFERENCING THREE DIMENSIONAL DESIGN DATA. CONTACT YOUR NEW FLYER REPRESENTATIVE AS REQUIRED.

NOTE: FOR INSTALLATION DRAWINGS PLEASE REFER TO ATTACHED MRP BOM SHEET FOR PARTS LISTING

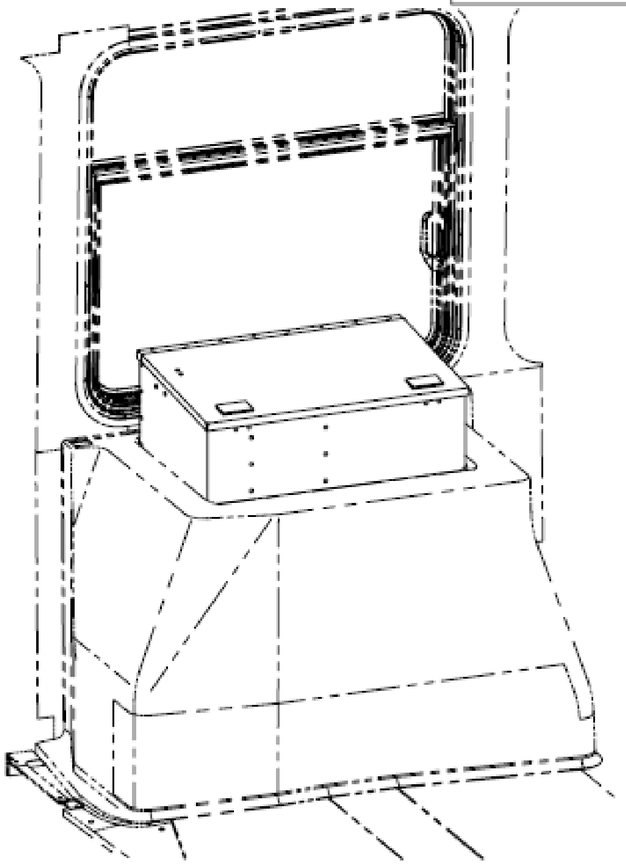
DRAWING N°
501275



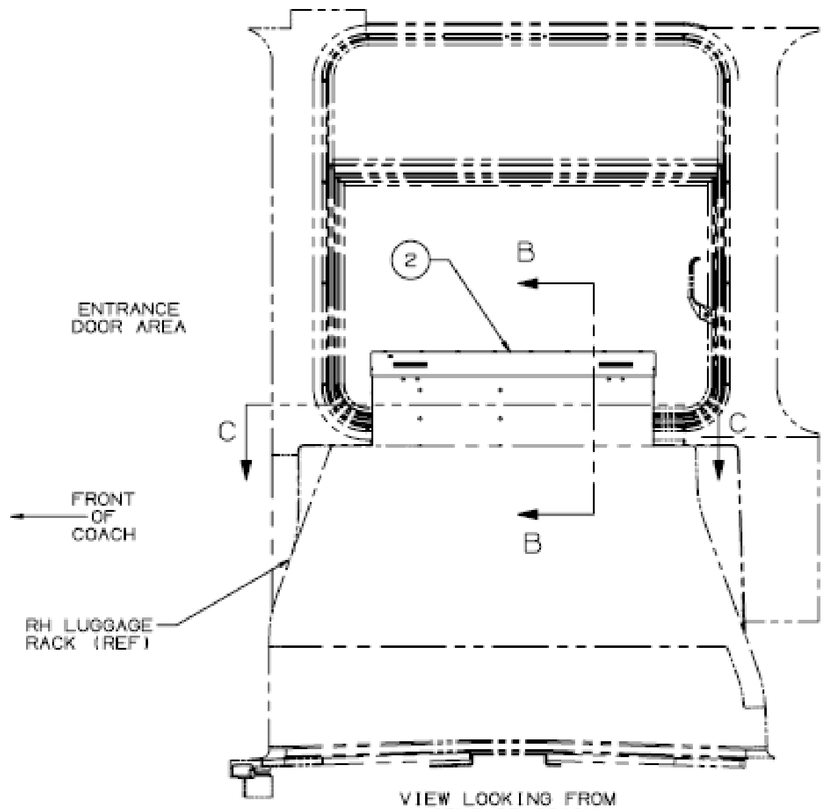
SECTION C-C
SCALE 1:8



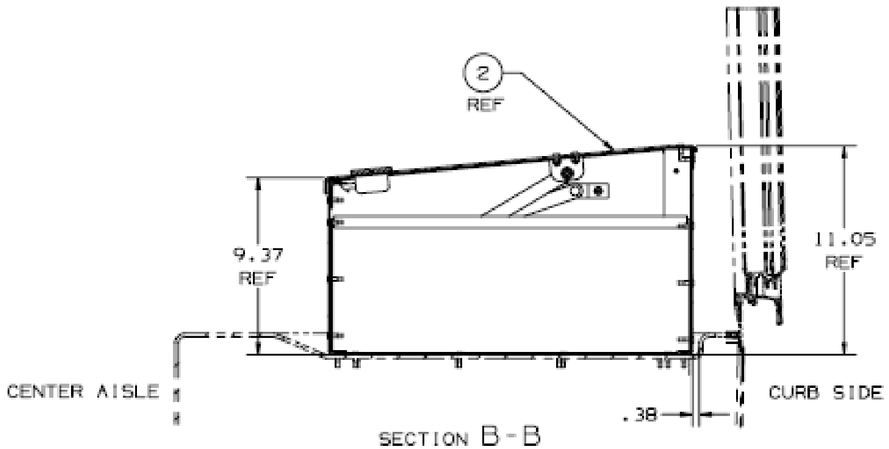
SECTION D-D
SCALE 1:2



ISOMETRIC VIEW
(REFERENCE ONLY)



VIEW LOOKING FROM AISLE OF COACH TO CURB SIDE



SECTION B-B
SCALE 1:4

DESIGN REFERENCE:
- OVERALL DIMENSIONS ARE 29.66 X 19.21 X 11.05
- TWO NON-KEYED PADDLE LATCHES
- PAINTED FLAT BLACK
- FOR XCELSIOR COACH CONFIGURATIONS ONLY

NOTES:

1) USING EQUIPMENT BOX AS A TEMPLATE, DRILL .199 DIA HOLES THRU THE LUGGAGE RACK.

3) CENTER THE PROTECTION SHEET (ITEM 5) IN THE BOX. USE SIKACOLL ADHESIVE (ITEM 6) TO BOND SHEET TO THE TOP SURFACE OF LUGGAGE RACK. APPLY A BRUSH COAT OF ADHESIVE TO THE UNDERSIDE OF THE SHEET AND TO THE TOP SURFACE OF THE LUGGAGE RACK. ALLOW THE ADHESIVE TO DRY TO A NON-TACKY STATE BEFORE BRINGING THE TWO SURFACES TOGETHER. MAKE SURE THAT ALL SURFACES ARE SMOOTH AND FREE OF ANY FOREIGN MATERIALS.

QTY	U/M	ITEM	PART NO.	DESCRIPTION	WEIGHT
4	EA	7	60R03007	RIVET ALUM 3/16	-
0.010	GAL	6	372691	ADHESIVE-3M 30-H GREEN	-
1	EA	5	501426	SHEET-PROTECTION LUGGAGE RACK	1.40 LBS
22	EA	4	60R03010	RIVET-ALUM-3/16	-
1	EA	2	613115	ASSY-EQUIPMENT BOX, PADDLE LATCH	15.08 LBS

MATERIAL: NONE	UNSPEC'D TOLS. .X ±.12, .XX ±.06, .XXX ±.03, HOLE DIA. ±.015, BEND RADII ±.03, ANGLE TOL. ±1°	DEC. IN.	TITLE: INSTL-EQUIPMENT BOX
WEIGHT: 16.48 LBS			PART N° 501275
TREATMENT: NONE	SIMILAR TO 425264		SCALE 1:4 · D · SHEET 1 OF 1

DO NOT SCALE DRAWING		
DIMENSIONS IN ( ) ARE IN m.m.		
THD ANGLE		
DRAWN BY		
GUYLAIN NKONGOLO		
DATE (DD-MMM-YY)	H	1. ADDED ITEM 7 2. ITEM 4 WAS QTY 26
13-OCT-17	REV	DESCRIPTION

ECN-094095
ECO

REPORT ALL ERRORS TO ENG. DEPT.

REV	DESCRIPTION	ECO
A	I. CAD MODEL UPDATED, VIEWS ADDED	192946

DESCRIPTION: 1/4-IN NIPPLE SERIES 10 WITH 1/4-NPT MALE END "TRU-FLATE" OR "AUTOMOTIVE" INTERCHANGE

VENDOR: PARKER

VENDOR PN: 2C

NOTE: MATE 1/4-IN QUICK-COUPLER SERIES 10 NIPPLE WITH 1/4-IN RECEIVER. 1/4-IN FEMALE NPT, PN 145952

1/4-NPT MALE-

/

DO NOT SCALE DRAWING

DIMENSIONS IN | | ARE IN m.m.

THO ANGLE -@- -E3-

BY NAME DD-MMM-YY -

DRAWN B.M. 20-AUG-09

CHK'D

MATERIAL

WEIGHT

TREATMENT
NOT REQUIRED

UNSPEc·o TOLS. DEC. IN.

.x	±.12
.xx	±.06
.XXX	:t.03

HOLE DIA. :t.015
BEND RAD||.:t. 0 3

ANGLE TOL. .:: I°

SIMILAR TO
145952

TITLE
NIPPLE 1/4 MPT SERIES 10

PART N°
145951

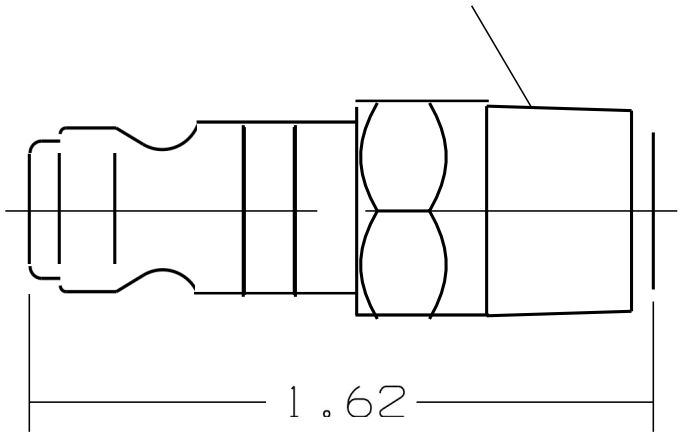
INXI

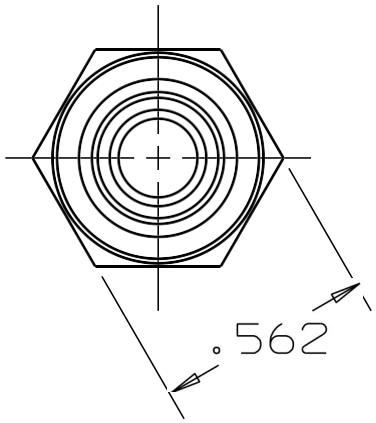
APP'D

SCALE 2:I

A SHEET I OF I

REPORT ALL ERRORS
TO ENG. DEPT.





CCB-002833 Gates Hoses

NEW FLYER

MCI

Best Bus Value

A New Flyer Continuous Improvement Initiative to enhance *Best Bus Value* for our customers.

Best Bus Value encompasses the ideals of:

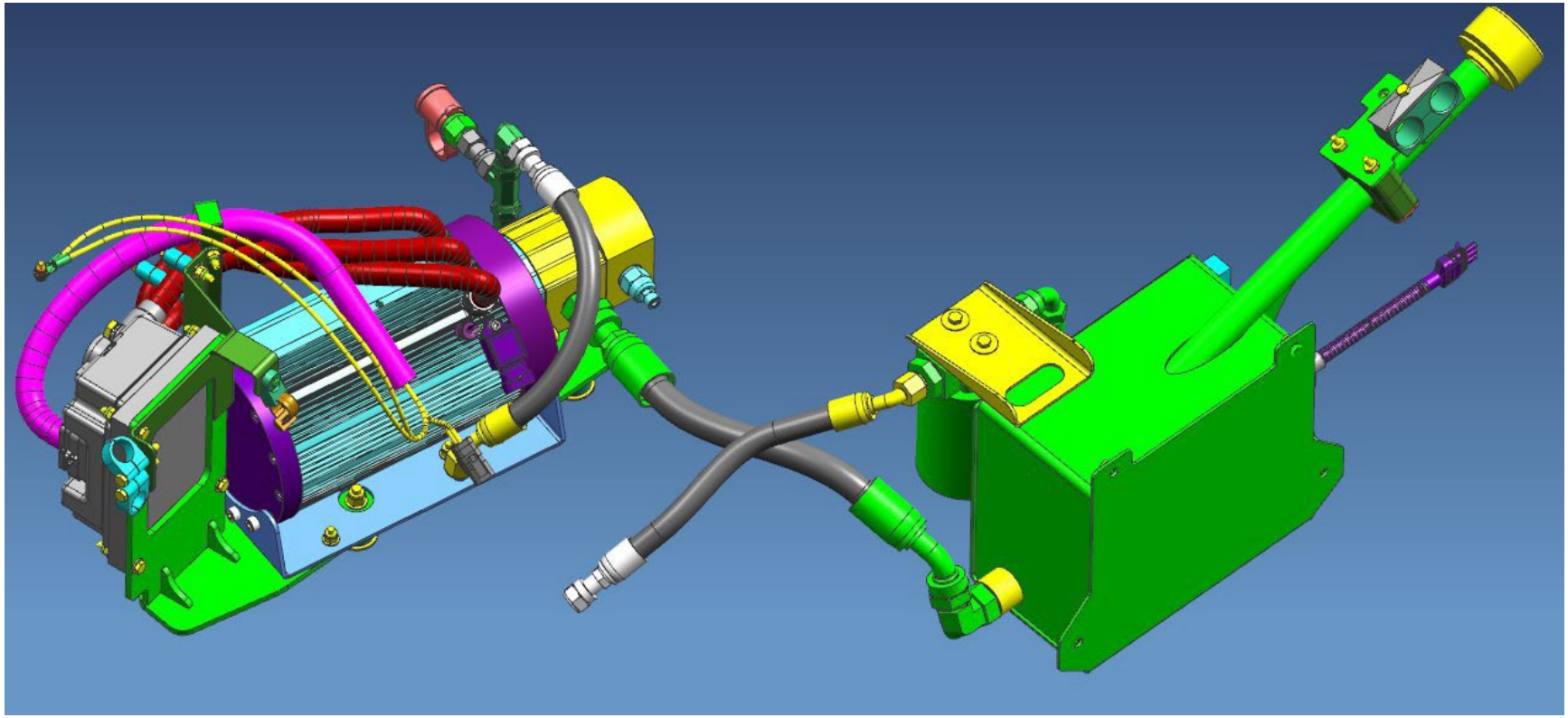
- Meeting and exceeding customer expectations
- Providing quality products
- Considering cost effectiveness over the life of the vehicle
- Ensuring due diligence through rigorous testing and analysis
- Considering the impact of mass
- Assuring ease of serviceability

Overview

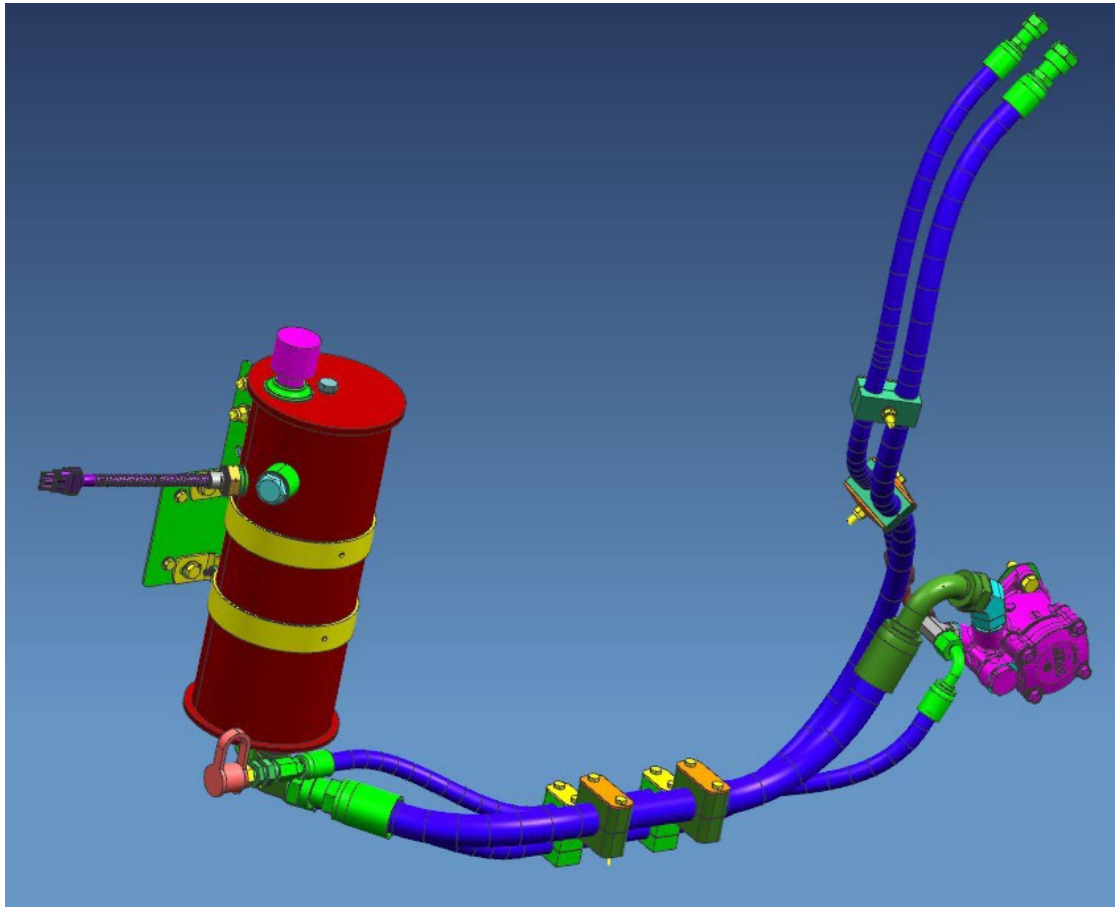
- Switch from Manuli hoses to Gates hoses for all hoses except -20.
- For -20 hoses, New Flyer recommends using the current available Aeroquip FC355-20 hose.
- New Flyer is currently using the Manuli hoses for the cooling system, engine oil, and power steering system.

Background

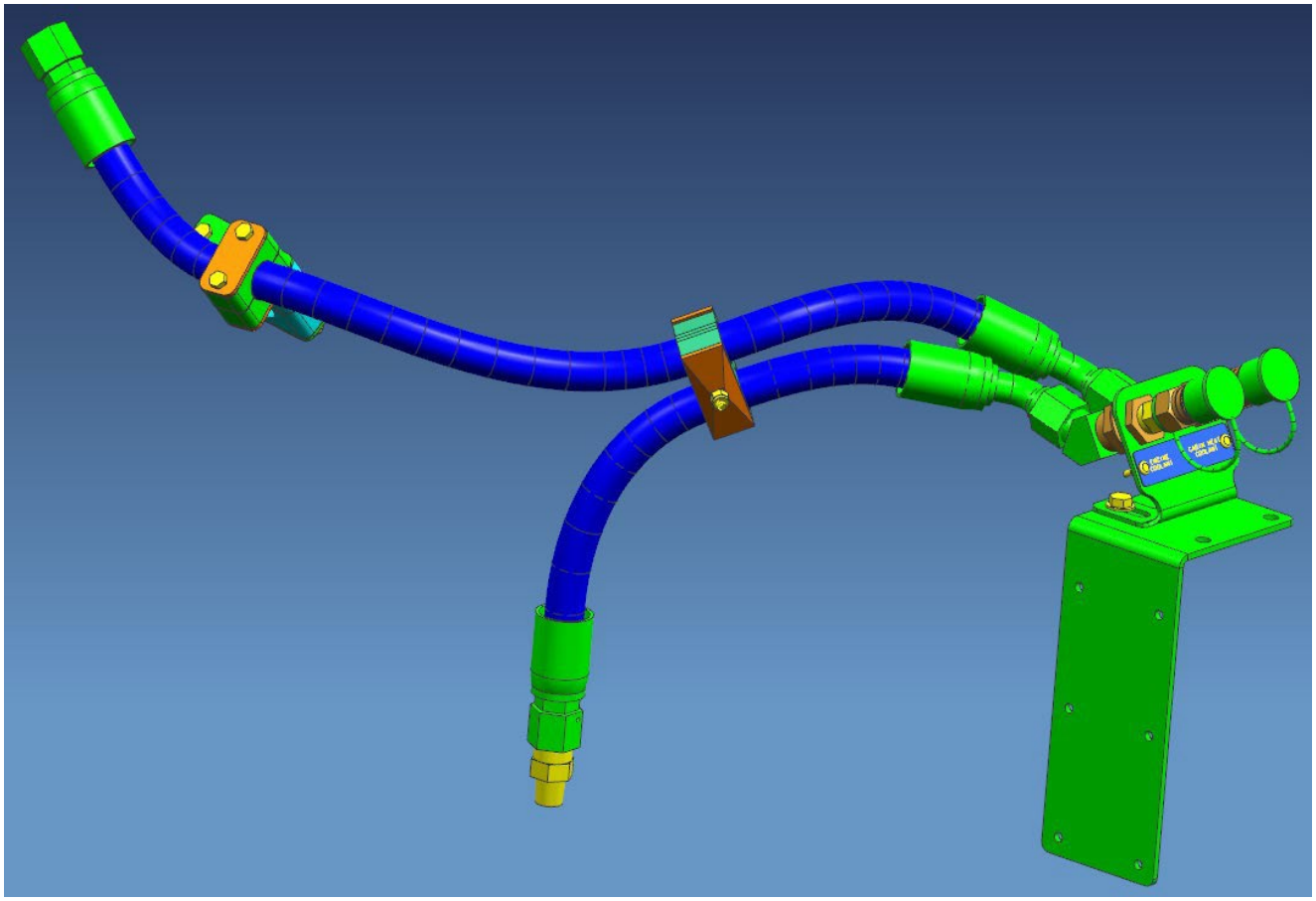
- Geopolitical uncertainties causing disproportionate cost increases to Manuli hoses.
- Increased lead times due to European manufacturing.



ELECTRIC POWER STEERING HOSES



CONVENTIONAL POWER STEERING HOSES



HANSEN DISCONNECT HOSES

Gates Hose Implementation

Gates - 2 wire (G2XH) vs MANULI (EQ2)					
HOSE	CONSTRUCTION			APPLICATION	FLUIDS
	TUBE	REINFORCEMENT	COVER		
G2XH	Black, oil & chemical resistant, synthetic rubber	Two braids of high-tensile steel wire	Blue, oil & abrasive resistant, thin synthetic rubber	Extremely high-temperature high-pressure hydraulic applications	Petroleum base of phosphate ester fluids
EQ2	Oil-resistant synthetic rubber	Two high-tensile steel braids	Black synthetic rubber with high ozone, weather & heat resistance	Medium to high pressure lines in extreme temperature conditions (hydraulic within engine compartment	Mineral oil, transmission fluid, air with oil vapors

Benefits

- Improved durability over the life of the vehicle.
- Local manufacturing resulting in additional “Buy America” content.
- Greater supply certainty with reduced lead-time.
- Reduced lifecycle cost.

Compatibility / Maintenance / Warranty

- 2-year warranty, no change from Manuli.
- All proposed parts are interchangeable and backwards compatible with current parts.
- New part numbers will be created for the Gates hoses.


NEW FLYER®


MCI

ALCOA WHEELS

FEBRUARY 2022

Service Manual for Alcoa® Wheels – North America

HEAVY & MEDIUM DUTY TRUCK | TRAILER | BUS | MOTORHOME

IMPORTANT: Federal OSHA Regulations require all employers to make sure their employees who service rims/wheels are properly trained. If you are a service technician, do not service rims/wheels unless you are thoroughly trained and completely understand how to safely service wheels.

Visit **www.alcoawheels.com/service** for the complete installation, maintenance and safety guidance available in the Service Manual for Alcoa® Wheels.

Visit **alcoawheels.com/contactus** or call **1-800-242-9898** for questions.

LIMITED WARRANTY FOR ALCOA® WHEELS1

(Rev. April 2020)

This limited warranty applies to new Alcoa Wheels, including forged aluminum wheels for medium duty and heavy-duty trucks, truck trailers, bus, RV or motorhome wheels ("Wheels") and the surface or rim flange treatments applied to the Wheels. "Transit Wheels" means Wheels used on transit vehicles, such as buses and vans, whose primary purpose is to transport people. The warranties set forth in this document apply to all Alcoa Wheels manufactured by Howmet (Seller) and sold by Seller or its authorized distributor to an original purchaser of the Wheel or the end user of the Wheel.

Seller warrants that the Wheel is free from defects in material and workmanship for the applicable time period set forth below, provided that Seller does not warrant against and does not provide remedies for immaterial cosmetic defects such as minor discoloration, buffing marks, or nicks:

a. Except as stated in (b) of this section, Wheels are warranted for 60 months from the date of manufacture as shown on the Wheel.

b. Transit Wheels and RV and motorhome Wheels are warranted for 120 months from the date of manufacture as shown on the Wheel.

Seller agrees, without charge, to repair or replace a Wheel that fails in normal use or service (see the qualifications section below) because of defects in material and workmanship.

Seller warrants the Alcoa Dura-Bright® surface treatment against:

i. filiform corrosion (worm or hair like lines underneath surface protective treatment and emanating from damage to the surface treatment); and

ii. blistering or peeling due to loss of adhesion of the surface treatment.

The Alcoa Dura-Bright® surface treatment warranty is for the applicable period of time set forth below:

a. Except as stated in (b) of this section, Alcoa Dura-Bright® surface treatment on Wheels is warranted for 60 months from the date of manufacture as shown on the Wheel.

b. Alcoa Dura-Bright® surface treatment for RV and motorhome Wheels is warranted for 120 months from the of date of manufacture as shown on the Wheel.

Seller warrants the Alcoa Dura-Flange® rim flange treatment against wear which creates a sharp edge that would require maintenance for 24 months from the date of manufacture as shown on the Wheel.

For 36 months from the date of manufacture as shown on the Wheel, Seller warrants the Alcoa® Dura-Black™ surface treatment against:

i. filiform corrosion (worm or hair like lines underneath surface protective treatment and emanating from damage to the surface treatment); and

ii. blistering or peeling due to loss of adhesion of the surface treatment.

If the Alcoa Dura-Flange® rim flange treatment or the Alcoa Dura-Bright® or Alcoa Dura-Black™ surface treatments fail in normal use or service (see the qualifications section below) to meet the foregoing warranties on a Wheel, Seller agrees, without charge, to replace the Wheel with a like or similar product.

Repair or replacement, as provided for in this limited warranty, are subject to adherence to Seller's return material authorization process.

Qualifications: Seller is not liable for, does not warrant, and will not repair or replace or make adjustment, with respect to any Wheel or surface or rim flange treatment on such Wheel that has been subjected to misuse, abuse, or improper modification, including any of the following:

a. Using a tire which is oversized according to standards recommended by the Tire and Rim Association, Inc. or other recognized tire and rim agencies such as ETRTO (Europe);

b. Failure to install, use and maintain Wheels in strict conformity with all applicable laws, regulations, codes and industry standards;

c. Loading the Wheel beyond the applicable maximum Wheel load as specified by Seller;

d. Inflating tires beyond the applicable maximum pressure as specified by Seller;

e. Except as permitted by the Service Manual for Alcoa Wheels ("Service Manual"), changing the original condition of the Wheel by alteration or by subjecting it to any processing or changes, such as welding, straightening, painting, coating, installing a new tire valve, or heat treating;

f. Accidents or abnormal or severe operating conditions, including without limitation tire fires, brake fires, severe brake system drags or seizures or running with a flat tire;

g. Failure to follow maintenance, instructions or warnings set forth in the Service Manual, Technical Bulletins or other literature for Wheels. Recommended maintenance includes, without limitation, using proper torque, periodic cleaning, polishing, replacing the valve, inspecting rim flange wear and following maintenance procedures and periodically inspecting tires and system components connected to the Wheel for damage and loose lug nuts;

h. Nicks, scratches and other surface blemishes resulting from neglect, road salt, harsh conditions, improper maintenance, cleaning, road debris, curbing, accident or operation;

i. Rim flange wear (unless the rim flange has been treated with Dura-Flange®);

j. Using a spacer or adaptor of any kind;

k. Damaging the surface during tire mounting and installation due to the use of improper tools or balancing with wheel weights; or

l. Damage due to cleaning with strong chemicals (acids or alkaline) or abrasives, such as abrasive brushes, steel wool, or scouring pads; or

m. further use of a Wheel after discovery of a defect.

THERE IS NO WARRANTY THAT THE WHEEL SHALL BE MERCHANTABLE OR FIT FOR ANY PARTICULAR PURPOSE, NOR IS THERE ANY OTHER WARRANTY, EXPRESS OR IMPLIED, EXCEPT SUCH AS IS EXPRESSLY SET FORTH HEREIN. SELLER SHALL NOT BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL, INDIRECT OR SPECIAL DAMAGES FOR ANY BREACH OF WARRANTY. SELLER'S LIABILITY AND THE EXCLUSIVE REMEDY AVAILABLE TO ANY PARTY IS LIMITED TO REPAIR OR REPLACEMENT OF THE WHEEL AS STATED IN THIS LIMITED WARRANTY.

THIS LIMITED WARRANTY DOES NOT APPLY TO AND SELLER MAKES NO WARRANTY WHATSOEVER WITH RESPECT TO GOODS MANUFACTURED BY THIRD PARTY SUPPLIERS, SUCH AS TIRE PRESSURE MONITORING SYSTEMS AND VALVE FILTERS. ANY WARRANTIES WITH RESPECT TO SUCH GOODS ARE LIMITED TO THOSE WHICH ARE OFFERED BY SUCH SUPPLIERS AND ARE TRANSFERABLE.

This limited warranty should be used in conjunction with the Service Manual and the Wheels cleaning guides online. The Service Manual contains important safety information and warnings. Failure to read and understand that information may result in serious injury or death. If you do not have copies of the Service Manual or cleaning guide, you may obtain copies free of charge at www.alcoawheels.com or by contacting Seller at (800) 242-9898 or the address below:

Howmet Wheel Systems, 1616 Harvard Avenue, Cleveland, OH 44105

1 The Alcoa trademarks are owned by Alcoa Corporation and used by Howmet Aerospace Inc. under license from Alcoa Corporation.

If you have a warranty claim, click here.

Still have questions? Call us directly at (800) 242-9898, option #1

WARNING

WARNING Wheels that are not properly installed or maintained may not be safe.

Failure to follow proper wheel installation or maintenance practices may result in injury or death.

Follow the proper wheel installation and maintenance practices as contained in this Service Manual for Alcoa Wheels. For additional copies of the manual and other useful items listed below, available free of charge, or for the most recent updates, contact Howmet Wheel Systems at 1-800-242-9898 or on the web at www.alcoawheels.com.

To obtain information on free training on proper installation and maintenance procedures, contact Howmet Wheel Systems at 800-242-9898 or on the web at www.alcoawheels.com/contactus.

Resources available free:

- Service Manual for Alcoa Wheels
- Dura-Bright® Wheels Cleaning Guide
- Rim Flange Wear Gauge

Safety Training Videos available on youtube.com/AlcoaWheelsNorthAmerica:

- Proper Wheel Maintenance
- How to Clean Dura-Bright® Wheels
- Heat Sensitive Indicator
- vHub™ Bore Technology

Technical tips on all things axle ends available on the Behind the Wheels Podcast:

- www.alcoawheels.com/podcast

Information available through industry and government organizations:

TIA (Tire Industry Association)
Info available at www.tireindustry.org or 301-430-7280

OSHA (Occupational Safety and Health Administration) of the US Government
Info available at www.osha.gov or 800-321-OSHA

TMC (Technology & Maintenance Council)
Info available at tmc.trucking.org or 703-838-1763

DOT (U.S. Department of Transportation)
Info available at www.transportation.gov or 855-368-4200

Table of Contents

How to use this manual

This manual is written in a style called structured text.

Throughout the manual you will find numbers which look like this (See Section 3-1).

These numbers are cross references to other sections of the manual.

The numbers (3-1) refer to section 3, subtopic 1. You will find the section number and subtopic number under the heading in each section.

1 Safety

WARNING An inflated tire and wheel assembly contains enough air pressure to cause an explosive separation.

Unsafe handling or failure to follow approved mounting and demounting procedures can lead to serious injury or death.

Study, understand and follow the procedures contained in this manual to ensure your safety.

⚠ WARNING

Tire and rim servicing can be dangerous and must only be performed by trained personnel using proper procedures and tools.

Failure to read and comply with all of these procedures may result in serious injury or death to you and others.

⚠ WARNING

Laws, regulations, industry standards and maintenance and safety codes govern the installation, use and maintenance of Howmet Aerospace (Company) products and may vary widely. It is the responsibility of the owner, OEM, fleet, installer and/or user, consistent with their roles, to install, use and maintain The Company's products according to all applicable laws, regulations, codes and industry standards.

Safety is serious business. All tire shops must know and follow OSHA work regulations...no matter how small the shop. Under U.S. federal law any individual handling tire/wheel assemblies must be trained in OSHA regulations as mentioned in section 6 prior to servicing/handling truck tire and wheel assembly.

Safety is everyone's business. Do not attempt to service any wheel assembly without proper training.

Proper equipment is important. Be sure you have the recommended tools and equipment on hand and use them according to manufacturer's instructions.

Tubeless wheels and tires require equal care. Even though tubeless assemblies have fewer parts than multi-piece wheels, they still require respect and proper handling.

Pay particular attention during crucial steps:
- Removal of tire and wheel assemblies from vehicles
- Demounting tires from wheels
- Wheel inspections
- Inflation of tires
- Handling and storing of inflated tire and wheel assemblies

Safety and service information is readily available. Wheel, tire and service equipment manufacturers offer service manuals and other training materials. Stay up to date on proper procedures and keep current instructional materials handy in the shop. Study safety and service information and use it on the job.

Completely deflate any tire by removing the valve core before removing the tire/wheel assembly from the axle, if there is known or suspected damage to the tire or wheel or if the tire has been operated at 80% or less of its recommended operating pressure. Demount, inspect and match all tire and rim parts before re-inflating in a restraining device.

NEVER use starter fluid, propane, ether, gasoline, or other flammable materials and/or accelerants to lubricate the beads and or seating a tire. This practice can cause the explosive separation of the tire/wheel during servicing or during highway use, which may result in serious injury or death.

NEVER inflate beyond 40 psi to seat any tire beads.

NEVER stand, lean, or reach over the tire rim/wheel assembly in the restraining device during inflation. Even if a tire is in a restraining device, inflating beyond 40 psi when trying to seat the beads is a **DANGEROUS PRACTICE** that may break a tire bead or the rim/wheel with explosive force and possibly result in serious injury or death.

Any inflated tire mounted on a wheel contains explosive energy. The use of damaged, mismatched or improperly assembled tire and wheel components can cause the assembly to separate with explosive force. If struck by an exploding tire, wheel component, or the air blast, you or someone else may be seriously injured or killed.

Mismatching tire and rim diameters is dangerous. A mismatched tire and rim assembly may separate and can result in serious injury or death. This warning applies to 15" and 15.5", 16" and 16.5", 17" and 17.5", 22" and 22.5", 24" and 24.5" tire and rim assemblies as well as other sized assemblies.

NEVER assemble a tire and rim unless you have positively identified and correctly matched the tire and rim diameter.

If an attempt is made to seat the tire bead by inflating on a mismatched rim/wheel, the tire bead will break with explosive force and may result in serious injury or death.

ALWAYS comply with the procedures in the tire/wheel manufacturer's catalogs, instruction manuals or other industry and government instructional materials.

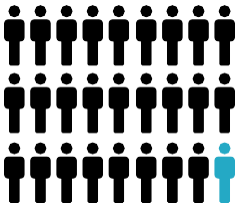
Use a non-flammable vegetable or soap-based rubber lubricant on the beads and rim surfaces. Lubricate tire/wheel beads to make tire demounting and mounting easier and seat the beads properly.

Use the proper tools to demount or mount tires and rims (refer to "Typical Tire Service Tools"). **NEVER** strike the tire/wheel assembly with a steel duck bill hammer to unseat the beads and do not strike the head of the hammer with another hard-faced hammer – use a rubber mallet or plastic dead blow hammer. Slide impact bead unseating tools are the preferred tools for unseating beads on tubeless tires.

NEVER reinflate any tire that has been operated in a run-flat or underinflated condition (i.e., operated at 80% or less of recommended operating pressure). Demount, inspect and match all tire and rim components before reinflating in a restraining device with the valve core removed.

If an emergency puncture repair inflater was used on a tubeless tire, deflate and reinflate the tire several times to remove potentially explosive propellant before servicing the tire.

Statistics show that in most industries, at worst only one in 1000 serious accidents results in a fatality, but when the accident involves tire and wheels, statistically one in every 10 serious accidents is a fatality. That is 100 times more often than in most other industries.



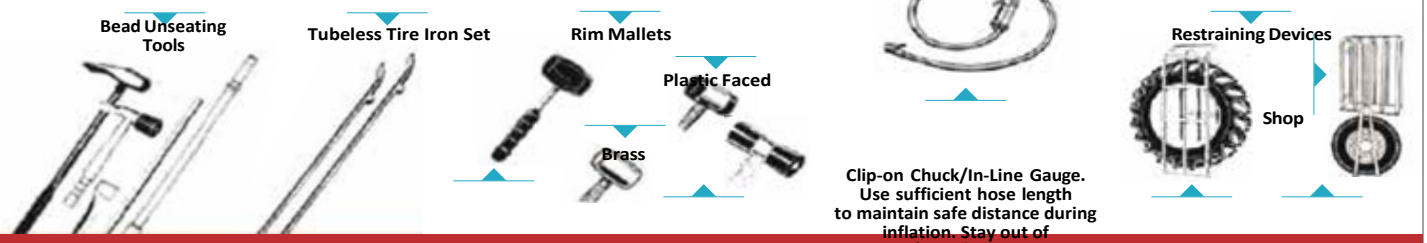
1 in 1000
TYPICAL INDUSTRY

1 in 10
THE SERVICE INDUSTRY

⚠ **WARNING**

IF YOU DO NOT KNOW HOW TO USE TIRE SERVICING TOOLS - STOP!
TIRE SERVICING MUST ONLY BE PERFORMED BY TRAINED PERSONNEL.
FAILURE TO FOLLOW PROPER PROCEDURES CAN RESULT IN SERIOUS INJURY OR DEATH.

- **ALWAYS** wear adequate protective eyewear (or face shield), protective footwear and ear protection while servicing tires to avoid injury.
- **NEVER** use a tire tool for anything except demounting and mounting tires.
- **NEVER** use an extension or "cheater" bar with the irons.
- **ALWAYS** use soft-faced hammers with driving tire irons or assembling components.
- **NEVER** use a hammer with a loose or cracked handle.
- **NEVER** use a bent, cracked, chipped, dented or mushroomed tool. Keep tools clean and inspect them frequently.
- **NEVER** alter or apply heat to any tire service tool.



Source: OSHA 3421-10N 2011

NOTICE: For information on tube type wheels, contact the Company at (800) 242-9898 Option 1.

2 Deflating & Demounting Tubeless Truck & Bus Tires

ALWAYS completely deflate the tire assembly before attempting to demount a tire from a tire/wheel assembly. Remove the valve core and insert a wire down the valve stem to ensure complete deflation.

NEVER demount a tire from a rim unless it is completely deflated.

Lubricate the beads of the tire and bead seat of the wheel. Then use a slide impact bead unseating tool, duck bill hammer with a rubber mallet, or other bead unseating tools. Both beads must be loosened before demounting a tire.

Figure 2-1

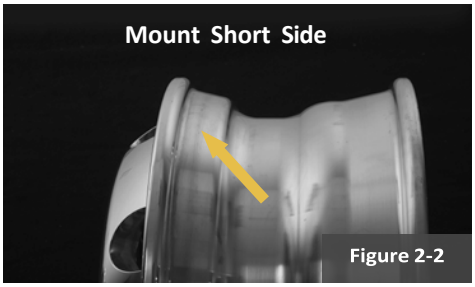


Figure 2-2

Figure 2-3


Figure 2-4


Figure 2-5


Figure 2-6


Figure 2-7

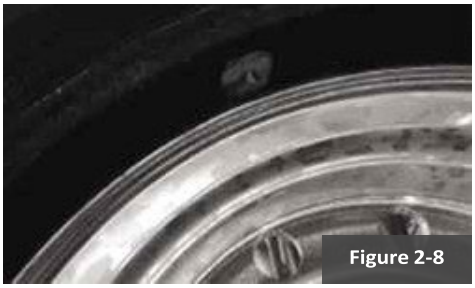


Figure 2-8

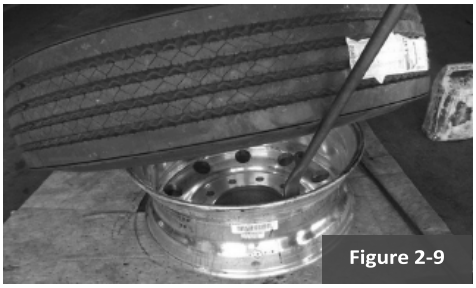


Figure 2-9

For aluminum wheels, a mat should be placed on the floor to prevent damage to the mounting surface of the wheel.

Figures 2-1 through 2-3. Identify the short side of the drop center wheel well. Single piece tubeless rims and wheels must be demounted from the short side of the drop center well. On steel disc wheels, the short side is typically located opposite the disc. Aluminum wheels typically have symmetrical drop centers so tires can be demounted from either side. However, on certain non-symmetrical aluminum wheels, the short side of the drop center well is located on the disc side.

Figure 2-4. Lubricate and unseat both beads in the bead seat area of the tire and wheel. Position the assembly with the short side of the drop center well facing up.

Figure 2-5. Insert tire irons on either side of the valve stem approximately 6 inches (152 mm) apart. Pry the top bead over the rim flange and force the bead opposite the tire irons in the drop center well.

Figure 2-6. Remove one tire iron and insert the curved end between the bead and rim. Pry the rest of the top bead over the rim flange. Repeat this process until the first bead is entirely free from the rim.

Figure 2-7. Stand the tire on its tread. Slide the flat end of the tire iron between the bead and the rim flange; make sure the tip is completely over the rim flange.

Figure 2-8. Pry the tire iron and allow the rim/wheel to drop. **IMPORTANT! Make sure your feet are clear of the rim.** If necessary, rock or bounce the assembly to remove the tire from the tire/wheel.

3 Inspection & Maintenance

3-1 Inspect thoroughly and frequently

Safe operation requires thorough examination of wheels and attaching hardware, at frequent intervals, both on and off the vehicle.

Wheels that are in service need to be inspected at regular intervals to ensure proper and safe performance.

It is not always possible to predict the useful life of a wheel. Wheels eventually wear out, but generally, older wheels and wheels operating in extreme conditions should be examined more frequently for obvious signs they should be removed from service.

Examine all exposed areas frequently. Clean wheels and look for cracks, corrosion, wear or other damage. Also check the inner dualed wheel when the outer wheel is removed.

During tire changes, thoroughly examine the entire wheel. Pay particular attention to the rim contour and the surfaces of the rim.

Hidden Damage

Do not exceed maximum wheel load. Users must compare OEM vehicle load ratings to maximum wheel load ratings and inflation pressures which are roll-stamped onto the wheel. See Section 3-12.

Do not overinflate a tire/wheel assembly. Use the tire/wheel manufacturer's recommended pressure, and under no circumstances exceed the cold tire/wheel pressures as listed by the tire/wheel manufacturer which is moulded/stamped on the tire and wheel. Before mounting the tire, perform a wheel fitment check to ensure proper clearance from any obstructions.

Wheel damage can be hidden beneath the tire, so whenever a tire is removed, thoroughly examine the complete wheel. Remove all grease and road dirt. Use a wire brush or steel wool to remove rubber / corrosion from the bead seats.

WARNING Wheels that are not properly installed or maintained may not be safe.

Failure to follow proper wheel installation or maintenance practices may result in serious injury or death.

Follow the proper wheel installation and maintenance practices as contained in this Service Manual for Alcoa Wheels. For training on proper installation and maintenance, available free of charge from the Company, or for the most recent updates, contact the Company at 1-800-242-9898 or on the web at www.alcoawheels.com/contactus.

3-2 Wheel Alteration

The Company does not approve of any form of alteration to wheels except minor cosmetic buffing for appearance purposes. Sanding and/or grinding is permitted to properly maintain the rim flange area of the wheel.

Welding, brazing, bake-off ovens, or other elevated temperature processes must never be used to repair, straighten, or alter a wheel.

Use of adapter plates or bead-locks are not approved on Alcoa Wheels and should NEVER be used.

Alcoa Wheels should not be painted or otherwise coated in any way that may interfere with the mounting surfaces.

Any wheels that show signs of alteration should be removed from service and scrapped.

The wheel identification required by DOT is stamped on all wheels. Wheels must be taken out of service if this identification is not legible.

WARNING Welding, brazing or otherwise heating any area of an Alcoa Wheel will weaken it's structure. Weakened or damaged wheels can lead to an explosive separation of tires and wheels or wheel failure on the vehicle.

Explosive separations of tires and wheels or wheel failure on the vehicle could cause serious injuries or death.

Never attempt to weld, braze or heat any surface of an Alcoa Wheel.

Alcoa Wheels should never be placed in bake-off and / or curing ovens.

3-3 Heat Damage

WARNING

WARNING Excessive heat from fire, brake malfunction, wheel bearing failure, tire failure or other sources may weaken the metal and cause the wheel/tire assembly to separate explosively.

Exploding tire/wheel assemblies can cause serious injury or death.

Immediately and permanently remove from service any wheel that shows signs of heat damage.

Alcoa Wheels must be inspected for exposure to excessive heat before being returned to service. A wheel that shows signs of heat damage may appear charred or burned, or may even appear to be in good condition if it has been cleaned. Do not use any wheel that has been overheated regardless of appearance. Even if a wheel does not appear to be obviously burned, inspect the labels, tire bead, brake drum and high temperature nylon protection gasket for evidence of charring, melting, blistering or burning. Any wheel run with a flat tire longer than the time necessary to immediately pull off the road should be checked for excessive heat damage.

A wheel with any discoloration may have been exposed to excessive heat. It can appear a dull grayish color and will not polish to a bright finish as an undamaged Alcoa Wheel would.

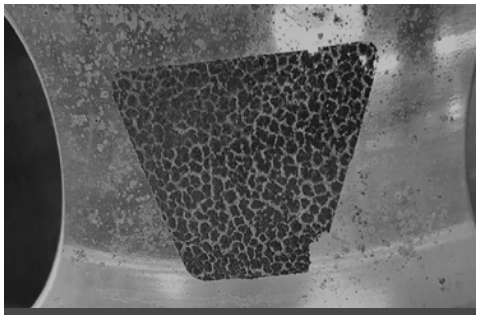


Figure 3-1: Charred Alcoa Wheels sticker (Prior to 2009)

Figure 3-2: Discoloration of Wheel with charred rubber

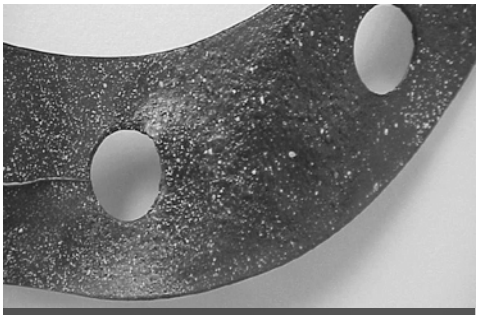


Figure 3-3: Charred high temperature nylon protection gasket

Starting in January 2009, the Alcoa Logo on the wheel may not show heat damage. Inspect all axle end components for signs of exposure to excessive heat. Check the brake drums (Disc Pads on discs), high temperature nylon protection gasket and tire beads for heat damage. If these components show signs of overheating, the entire assembly, including the wheel, should be replaced. A blistered, charred, blackened or cracked-looking logo decal on an Alcoa wheel may indicate that the wheel has been exposed to excessive heat as shown in picture (Figure 3-1), or discoloration as shown in (Figure 3-4).

Wheels manufactured starting in January 2009, will have a 1 inch clear round heat indicator located next to the roll stamp on the inside shown in Figures 3-4 / 3-5, along with the same 1 inch clear round heat indicator located on the tire side drop well as shown in Figure 3-6.

If either of these round labels show signs of blistering, or have a charred, blackened, or cracked appearance, this may indicate the wheel has been exposed to excessive heat. In the instance where these labels have been removed it is recommended to inspect for heat damage to the wheel based on the visual cues noted in this section. If the heat sticker is removed from a wheel, it cannot be replaced with OEM stickers. However, aftermarket heat indicators can be purchased that turn colors to show wheel temperature. Indicators should be capable of displaying ranges associated with 250° - 500° F. Contact the wheel manufacturer for the correct aftermarket heat indicator (Refer to TMC RP 267).

Figure 3-4: Charred Heat Indicator (2009 and after)

Figure 3-5: Charred Heat Indicator (2009 and after)

Figure 3-6: Charred Heat Indicator (2009 and after)

IF ANY OF THE ABOVE CONDITIONS ARE SEEN, REMOVE THE WHEEL FROM SERVICE IMMEDIATELY AND PERFORM DIMENSIONAL CHECKS PER SECTION 3-4. THIS INCLUDES ANY HEAT DAMAGE TO THE TIRE, DISCOLORATION TO THE WHEEL, AND OR BRAKE DRUM, AND ANY BURNT OR CHARRED LABELS.

3-4 Dimensional Checks

Dimension, Heat Damage and other checks

WARNING

WARNING Wheels that have been subjected to high pressure tire and rim separation or excessive heat damage may no longer have sufficient dimension and contour to retain the tire bead while under pressure.

Exploding tire/wheel assembly can cause serious injury or death.

Immediately and permanently remove from service any wheel that has been exposed to high pressure tire/wheel separation or excessive heat.

WARNING

WARNING Wheels that have been run flat or have other physical damage may no longer have sufficient dimension and contour to retain the tire bead while under pressure.

Rims that lack proper dimension and contour can have an explosive separation of the tire and rim, causing serious injury or death.

Any wheel that has been in service must be inspected prior to mounting. Follow the procedures for dimensional checks described in this section during each wheel inspection.

Best Inspection Method - Figure 3-7 shows the TRA Ball Tape

Measure the circumference of the bead seat on the open side (Figure 3-7) with a ball tape. All wheels should be inspected prior to mounting.

The circumference of the bead seat on the open side of the wheel should be checked at each tire change. The open side is the side opposite the disc face. In the case of center flange wide base wheels, or wheels with insets less than 3 inches, both rim flanges should be checked. If the circumference of the bead seat does not match the required dimension as indicated by the TRA certified ball tape, immediately and permanently remove the wheel from service.

Ball tapes used for measuring wheel circumference can be purchased from the Tire and Rim Association, Inc., 4000 Embassy Parkway, Suite 390, Akron, OH 44333, (330) 666-8121 www.us-tra.org. For instructions on the proper use of ball tape, reference the current Tire and Rim Association yearbook.

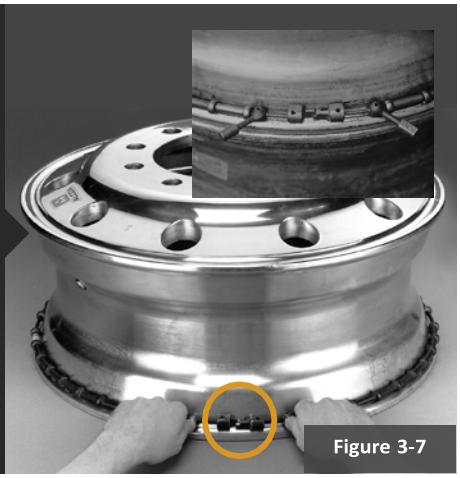
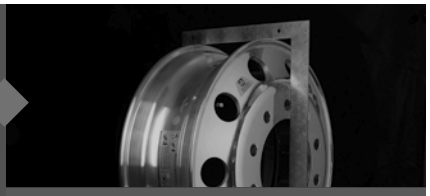


Figure 3-7

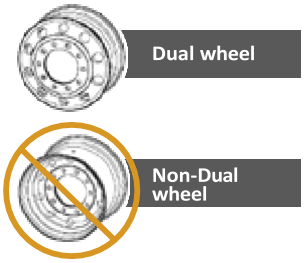
2nd Best Inspection Method

If a ball tape is unavailable



ACCEPTABLE
Figure 3-8: Photo above shows a carpenter square that is contacting both bead seats.

UNACCEPTABLE
Figure 3-9: Photo shows an undersized wheel that you can easily place a credit card (approximately .030 in. or .76mm) between the square and the wheel.



THIS INSPECTION TECHNIQUE ONLY APPLIES TO DUAL OR DISC FACED WHEELS

Check all wheels at each tire change for proper contour of the open side of the rim. Place the long leg of a carpenters square across the center of the disc side of the wheel. Extend the short leg across both rim flanges of the wheel as shown above. Repeat this process at four equidistant points around the wheel.

The short leg should touch both rim flanges at each point. If a space greater than the thickness of a credit card (or .030 in. or .76mm feeler gauge) appears between the short leg and the rim flange opposite the disc, the wheel should be removed from service and scrapped.

3rd Best Inspection Method - Rolling wheel as described on this page.

If a ball tape or carpenters square is unavailable, roll the unmounted wheel a minimum of 10 feet over a smooth, flat, level, clean surface such as asphalt or concrete pavement. Any deviation from rolling in a straight line is an indication of a deformed rim contour. Remove the wheel from service until it can be properly checked with a ball tape.

IF YOU DO NOT FULLY UNDERSTAND ANY OF THESE INSPECTION METHODS AS DESCRIBED IN THIS SECTION CONTACT THE COMPANY AT 800-242-9898 FOR CLARIFICATION. (TMC RP 247)

3-5 Tire Wear or Ride Problems

If you experience tire wear or ride problems it may be helpful to check radial run out. Remove the wheel from the vehicle, deflate and remove the tire (see Section 2, for recommendations and instructions for demounting tubeless tires).

Remount the wheel either on the vehicle (preferred method) or on a tire balance machine without the tire. Be sure to follow proper installation procedures so the wheel is properly centered on the hub and the bead seat area is clear from debris. Place a dial indicator as illustrated in Figure 3-10 to trace the bead seats of the wheel. Rotate the wheel noting the amount of variation shown on the dial indicator. Note: Alcoa Wheels should be tested for radial run out only at the bead seat surface. A total indicator reading of .030 inches or less is acceptable.

Figure 3-10: Inspect tire mounting according to instructions.

Tire wear can also be caused by improperly seated tires. Inspect the tire for proper seating on the wheel, if the tire beads are not seated properly, remove the wheel from the vehicle, deflate and break the bead seats (see Section 2 for recommendations and instructions for demounting tubeless tires). Adequately lubricate the tire/wheel bead seats and properly re-seat the tire beads. Reinflate the tire in a restraining device. Refer to OSHA rule 1910.177, paragraph b. See Section 6.

3-6 Cracked or Damaged Wheel Checks

WARNING

WARNING Cracked or damaged wheels may fail and come off the vehicle.

Wheels that fail or come off the vehicle while it is moving can cause serious injury or death.

Immediately and permanently remove cracked or damaged wheels from service.

Visually inspect wheels for cracks or damage. Remove wheels from service with known or suspected damage. Reference Sections 3-7 thru 3-10.

3-7 Mounting Area

Bolt hole cracks are usually caused by improper torquing (see Section 5-5), excessive loading or insufficient mounting flange support by the hub or brake drum. Remove wheel from service and scrap.

Figures 3-11 and 3-12 are cracks starting from the bolt hole. Causes are: undersized diameter of wheel support surface (see specifications below), support surface not flat, incorrect attachment parts and insufficient torque (see Section 5-11). Remove wheel from service and scrap.

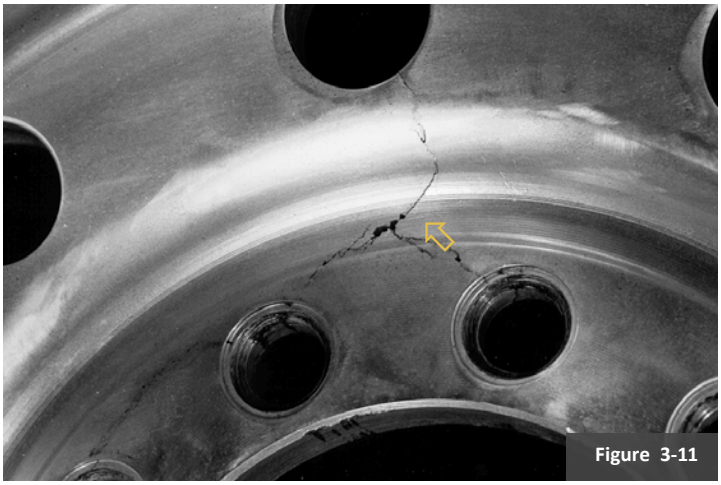


Figure 3-11

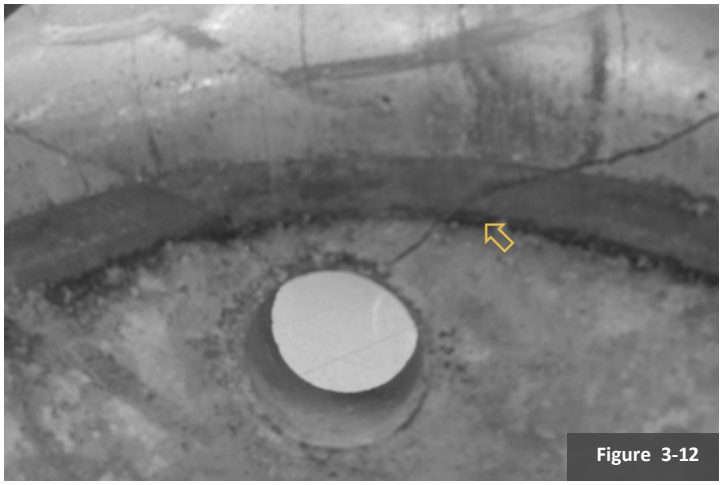


Figure 3-12

Inspect the hub/drum contact area thoroughly for cracks or other damage.

Support surface diameters

Support surface should be flat and match the diameter recommended in Chart 3-1 or 3-2.

Chart 3-1: ISO 4107

STUDS	BOLT CIRCLE	MOUNTING TYPE	MIN. DISC FLAT CLEARANCE DIAMETER	STUD SIZE
6	205 mm	HUB	255 mm	18 mm
8	222.25 mm	HUB	280 mm	20 mm
8	275 mm	HUB	325 mm	20 mm
10	285.75 mm	HUB	345 mm	22 mm
10	335 mm	HUB	390 mm	22 mm

Chart 3-2: SAE J694

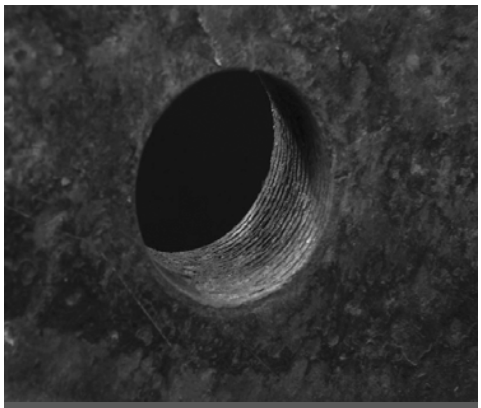
STUDS	BOLT CIRCLE	MOUNTING TYPE	MIN. DISC FLAT CLEARANCE DIAMETER	STUD SIZE
6	205 mm	HUB	255 mm	18 mm
8	6.5"	HUB	8.30"	.563"
8	275 mm	HUB	345 mm	22 mm
8	225.25 mm	HUB	280 mm	20 mm
8	275 mm	HUB	325 mm	20 mm
10	8.75"	STUD	11.32"	.750" / 1.125"
10	285.75 mm	HUB	345 mm	22 mm
10	11.25"	HUB	13.56"	.875"
10	11.25"	STUD	13.56"	.750" / 1.125"
10	335 mm	HUB	390 mm	22 mm

3-8 Bolt Holes

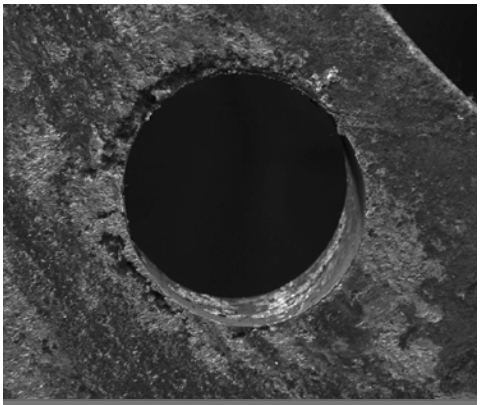
Check bolt holes for enlargement, and elongation, and any damage which can occur if the wheel nuts are not kept tight. Dirt streaks or rust radiating from stud holes may indicate loose wheel nuts.

If wheels are run loose, both stud piloted wheels and hub piloted wheels can be damaged. Look for wallowed out or elongated ball seats on stud piloted wheels. On hub piloted wheels look for elongated stud holes. Over torquing can lead to damaged ball seats on stud piloted wheels and can damage the disc surface of hub piloted wheels. Remove damaged wheels from service and scrap.

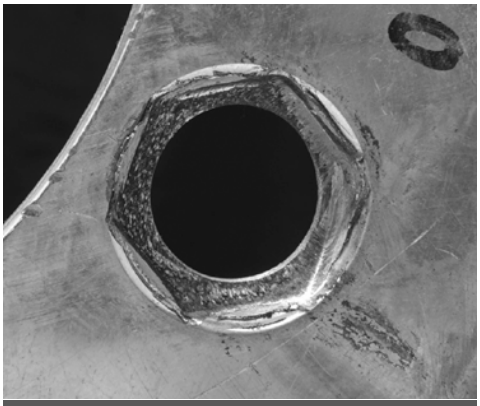
Machines designed to re-polish aluminum wheels are available at local facilities such as re-treaders, tire service providers, and truck dealerships. During polishing a wheel may experience bolt hole washout. This condition can be seen on the polished side of wheel. Check the wheel's non-polished side to see if bolt holes or hand holes are washed out or wallowed out. Bolt hole washout is not an out-of-service condition. Wheels with bolt hole washout are not pretty but are still serviceable.



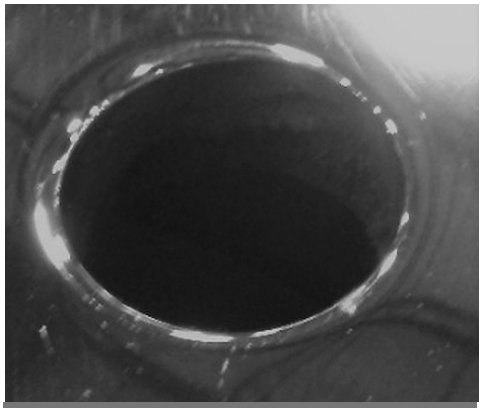
UNACCEPTABLE
Figure 3-13: For hub piloted wheels, visible thread marks on the inside of the stud holes indicate the wheel ran loose.



UNACCEPTABLE
Figure 3-14: For hub piloted wheels, a wallowed out stud hole indicates the wheel ran loose.



UNACCEPTABLE
Figure 3-15: For stud piloted wheels, a damaged ball seat contact area indicates the wheel ran loose.



ACCEPTABLE
Figure 3-16 For hub piloted wheels, a washed-out stud hole indicates the wheel ran loose.

3-9 Hand Hole

Inspect both sides of disc area for hand hole cracks. Remove damaged wheels from service and scrap.

Hand Hole Crack/Hand Hole to Disc

Exceeding wheel load capacity or damage to the Hand Hole can lead to cracks in the disc area. Remove wheel from service and scrap.

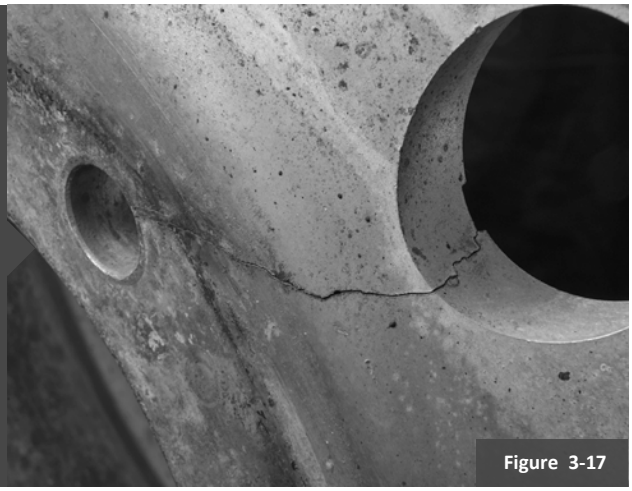


Figure 3-17

3-10 Rim Area (Drop Center, Valve Hole and Bead Seat)

Check the entire rim area for nicks, gouges and cracks. Loss of air may be caused by cracks in areas throughout the drop center, around the valve hole, and in the bead seat area. Remove the damaged wheel from service and scrap.

Drop Center crack

Drop center cracks are normally caused by exceeding load or inflation capacity, or corrosion from excessive air line moisture or improper tire mounting lubricants. The Company recommends Severe Service® wheels if the issue is overload or significant travel on unimproved roads. Please see the Product Spec Guide for Alcoa Wheels for part numbers and wheel descriptions of the Severe Service® wheels. Permanently remove damaged wheel from service and scrap.

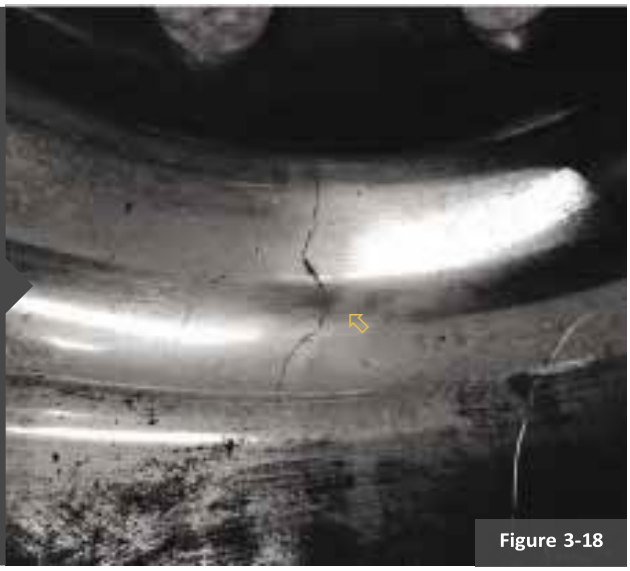


Figure 3-18

Valve Hole crack

Valve hole cracks are normally caused by exceeding load or inflation capacity, rough finish on the valve hole surface, over-torquing of the valve nut, or corrosion. Permanently remove damaged wheel from service and scrap.

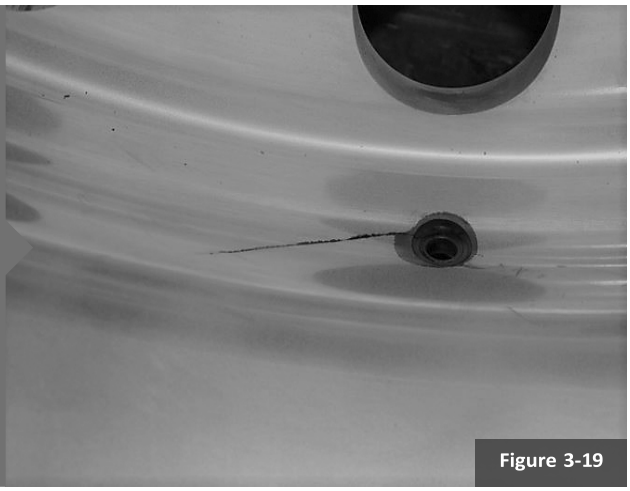


Figure 3-19

Bead Seat crack

Bead seat cracks may be caused by exceeding load or inflation capacity, improper manufacturing, tire tool damage, damage by hammer, impact damage, or rim is too narrow for the tire. Immediately and permanently remove damaged wheel from service and scrap.

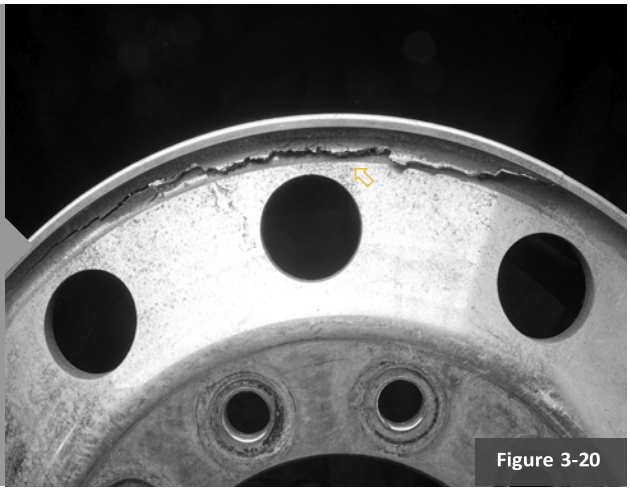


Figure 3-20

3-11 Valves

It is recommended that valve stems be replaced at every tire change.

Replacement valves may be obtained from your authorized Distributor of Alcoa Wheels. Metal valve stem caps are required per DOT instead of plastic. **Do not use rubber grommets or O-rings. Do not use unplated brass valves.**

When replacing valve stems, it is recommended that the threads and O-ring or grommet be lubricated with an approved rubber lubricant.

Clean the valve seat and valve hole thoroughly after removal of the valve. Remove all dirt, grease and oxidation. Make sure all contact areas are dry. Check for sharp edges or burrs. Remove with fine emery cloth if found.

Figure 3-21

Apply a layer of non-water based tire lubricant in the valve hole and the outer and inner side wheel surface, up to 1 inch or 2 centimeters in diameter around the valve hole.

Figure 3-22

Before installing the valve, apply a thin coat of non-water based tire lubricant on the shaft and base of the valve stem where the O-ring or grommet is located. Do not use any other lubricants that are water-based or contain metals.

The Company recommends valve stem torque 9 to 11 ft-lbs, (12 to 15 Nm).

Refer to OEM Specifications for TPMS valves.

Figure 3-23

Valve Extensions

Distributors of Alcoa Wheels offer different valve extensions. A quality extension of 150 mm (6 inches) will enable tire pressure checks and adjustment of the inner tire of a regular dual fitment (Figure 3-24).

A valve stem stabilizer must be used if metal valve extensions are used. The mass of metal valve extensions and rotation may cause forces that can lead to cracks in the valve hole area of the wheel or the valve stem.

Only use metal valve extensions obtained from your authorized Distributors of Alcoa Wheels.

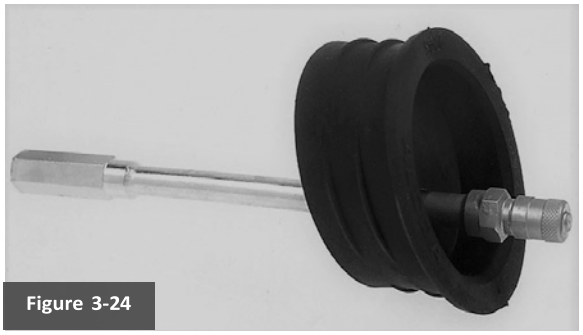


Figure 3-24

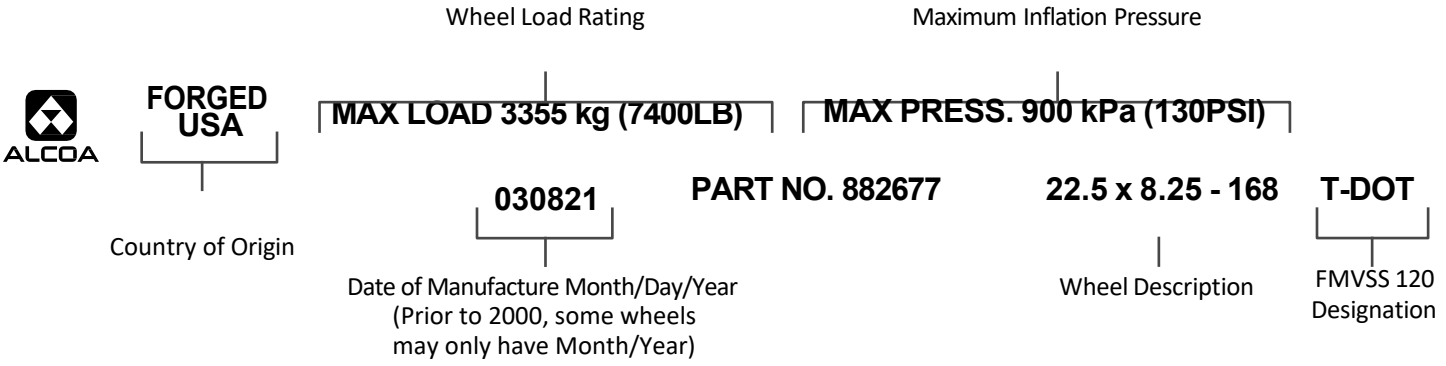
3-12 Identification

Since 1977, all Alcoa Wheels have been identified with a stamping that shows the wheel load rating, maximum inflation pressure, date of manufacture, part number, wheel description and DOT marking designation. See Chart 3-3 and Figure 3-25.

Prior to June 1996, all Alcoa Wheels had the Alcoa identification symbol ⧖ on the outside of the disc near the hand hole in line with the valve location. This marking was phased out on heavy duty truck wheels manufactured after June 1996.

Alcoa Wheel identification is usually located 180 degrees from the valve stem on the open side of the wheel. Wheel identification required by the DOT must be legible. Wheels should be taken out of service if this identification is not legible and scrapped.

Chart 3-3



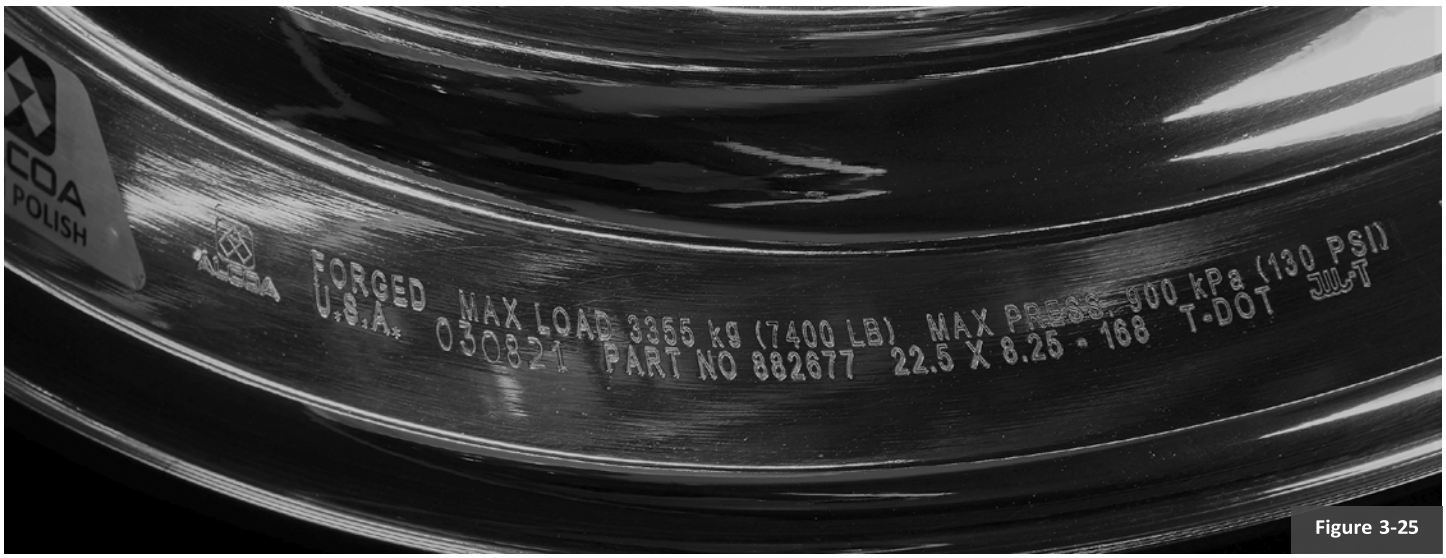


Figure 3-25

Alcoa Wheels may have markings in the rollstamp to designate certification in other regions as follows:

Wheels approved by INMETRO, the Instituto Nacional de Metrologia, are designated with the symbol.

Wheels approved by the Japanese Ministry of Transportation, are designated with the symbol.

All Dura-Bright® surface treated wheels are designated by the letters “DB” following the part number such as 882671DB.

Note: Dura-Bright® wheels produced after November 2002 have Alcoa Wheel part numbers ending with “DB” (earlier wheels have part numbers ending in a 4 or 7). Not all Alcoa Wheels are available with the Dura-Bright® surface treatment.

All Dura-Flange® wheels are designated by the letters “DF” following the part number such as 882677DF.

All Dura-Bright® / Dura-Flange® wheels are designated by the letters “DD” following the part number such as 882673DD.

A new logo label was introduced in January 2009.

Owner/in-service identification

Some fleets mark their names and/or in-service date. When marking wheels use the following guide lines.

1. Use “Lo-Stress” stamps or equivalent.
2. Stamp on outside disc should be placed near the center bore.
3. Stamps on rim should be as close to the roll stamp as possible.

Note: Use of an impression stamp on Dura-Bright® surface treated wheels may affect the appearance and performance of the Dura-Bright® surface treatment in the area around the stamp.

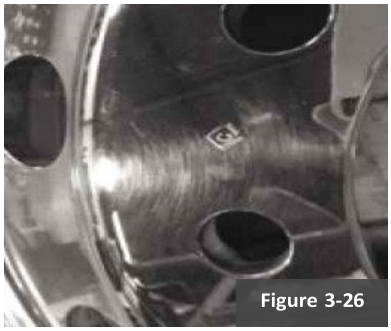


Figure 3-26

3-13 Rim Flange Wear

Rim flange wear is not a warrantable condition. Only Dura-Flange® wheels have a 24 month warranty on rim flange wear.

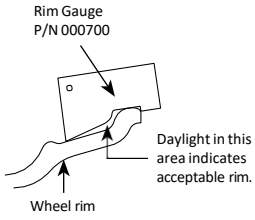
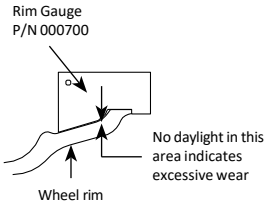
Irregular wear on the surface of the rim flange is caused by abrasion from the tire and/or debris. Rim flange wear occurs most often in applications with heavy or shifting loads. If your wheels are experiencing excessive rim flange wear, consider using an Alcoa Dura-Flange® aluminum wheel. These wheels have been specially treated to significantly reduce rim flange wear. Remove wheels from service when rim flange wear is excessive. Excessive wear can be determined using a Company approved wear gauge and the procedures detailed below. If rim flange wear becomes sharp and/or cuts the tire, contact the Compnay for recommended maintenance procedures at (800) 242-9898 or at www.alcoawheels.com.

Figure 3-27

Rim Flange Wear Gauge Instructions

These gauges are to be used for rim flange wear only. They are not a bead seat angle or diameter tool.

Chart 3-4

Rim Acceptable		**Rim NOT Acceptable**	 Remove from service immediately.

To obtain a gauge(s) (P/N 000700) at no charge and information about free training on installation and maintenance procedures, contact the Company at (800) 242-9898 or on the web at www.alcoawheels.com/contactus.

Determining Rim Flange Wear

STEP 1. Remove the wheel/tire assembly from the vehicle. Remove the valve core per section 2-1 to deflate the tire completely, demount the tire from the wheel according to OSHA regulations, TMC Recommended Practices (RP 209) for tire and rim safety procedures and/or the Service Manual for Alcoa Wheels.

STEP 2. After the tire is demounted, verify that circumference of the bead seat on the open side is acceptable (see Section 3-4). Check the wheel flange with the Rim Flange Wear Gauge for Alcoa Wheels to determine if the wheels must be removed from service for excessive rim flange wear (Figures 3-27 and 3-28).

Figure 3-28: Serviceable

Figure 3-29: Not serviceable (scrap wheel)

NOTICE

Examine the tire for cuts in the bead area and side wall. If no damage occurred to these areas, return the tire to service. Cut tires should be removed from service. The tire should be inspected at this time for any other damage.

NOTICE

Check the wheel at every tire change for rim flange wear and any sharp edges. Following this practice will significantly reduce the possibility of a rim flange cutting into the tire.

STEP 3. If the wheel is serviceable by the rim flange gauge, examine the wheel flange edge for sharpness by using a rubber sharpness gauge. These gauges are constructed with a section of tire or a suitable piece of rubber attached to a block of wood (Figure 3-30). By running the sharpness indicator gauge along the wheel in the area of the wear, determine if the wear is sharp enough to cut or damage the rubber on the sharpness indicator (Figure 3-31). If the rubber is cut, then follow the edge removal instructions below.

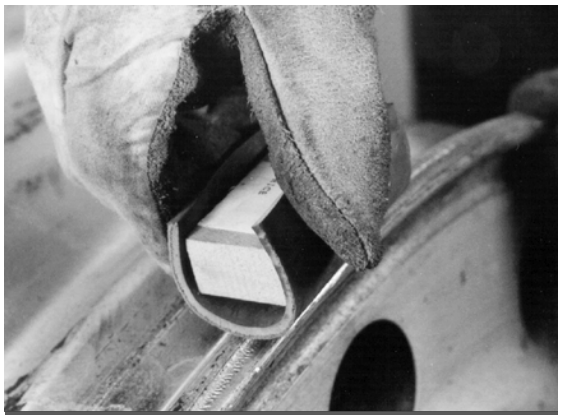


Figure 3-30: A rubber sharpness gauge or a suitable piece of rubber attached to a block of wood.

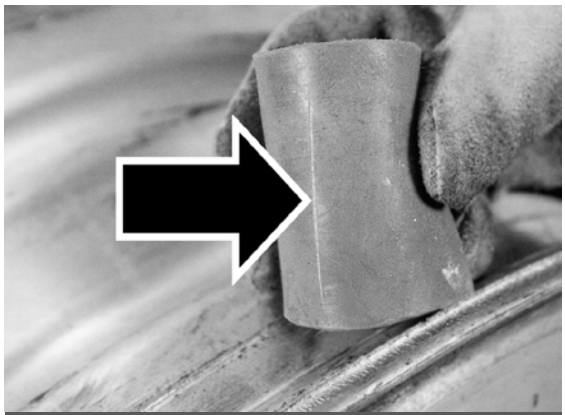


Figure 3-31: Run the sharpness indicator gauge along the wheel in the area of the wear to determine if the wear is sharp enough to cut or damage the rubber on the sharpness indicator.

If the flange cuts or appears close to being sharp enough to cut the rubber on the sharpness indicator gauge, the edge can be removed by following the edge removal procedures on the following page. If the rubber is not cut, then the wheel can be returned to service without further work to the rim flange.

CAUTION

CAUTION Do not run unprotected hands or fingers across worn rim flange areas of used wheels.

Worn rim flange areas are sharp and can cut hands or fingers.

Always wear gloves when handling used wheels or when testing for edge sharpness.

Rim Flange Wear (Continued)

CAUTION

CAUTION Removing sharp edges with hand or power tools produces metal filings and sparks. Many power tools have edges that are sharp or may become hot during use. Some power tools produce excessive noise when used.

Metal filings can be sharp and, when projected by the action of power tools, can cause serious skin or eye damage. Excessive noise from power tools can harm hearing. Sharp edges can produce cuts and hot surfaces can cause burns.

Always wear appropriate safety gear such as protective eye wear, gloves, protective clothing and hearing protection when using hand or power tools.

Edge Removal Procedures

There are many tools available to remove the sharp edge on the wheel caused by rim flange wear. Here are some examples of commonly used tools below:

File: A file can be used very effectively to remove the edge (Figure 3-32).

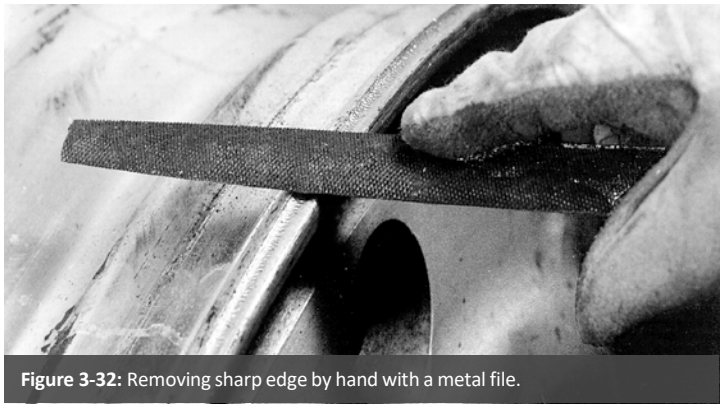


Figure 3-32: Removing sharp edge by hand with a metal file.

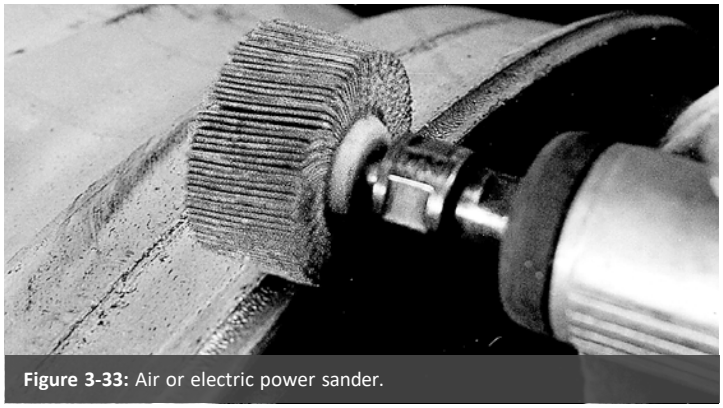


Figure 3-33: Air or electric power sander.

Air or Electric Powered Sander: This tool provides a very quick and effective method of removing the sharp edge. Technicians should use care to keep a uniform edge when using these tools (Figure 3-33).

Air or Electric Grinder: This tool is another quick and effective method of removing the sharp edge caused by rim flange wear. The grinding pads may "gum up" from the aluminum that is removed (Figure 3-34, 3-35). Care must be used to avoid gouging the wheel.

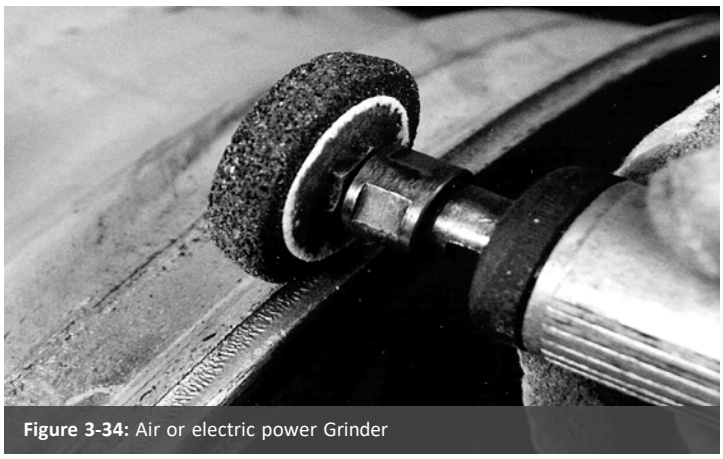


Figure 3-34: Air or electric power Grinder

Figure 3-35: Die Grinder.

Die Grinder: Used with a sanding wheel, cutting stone or grinding tool, this is a version of an electric grinder. This tool is very quick and effective as well, but care must be taken to remove metal as uniformly as possible and not to gouge the wheel (Figure 3-35).

Always wear PPE at all times.

Rim Flange Wear (Continued)

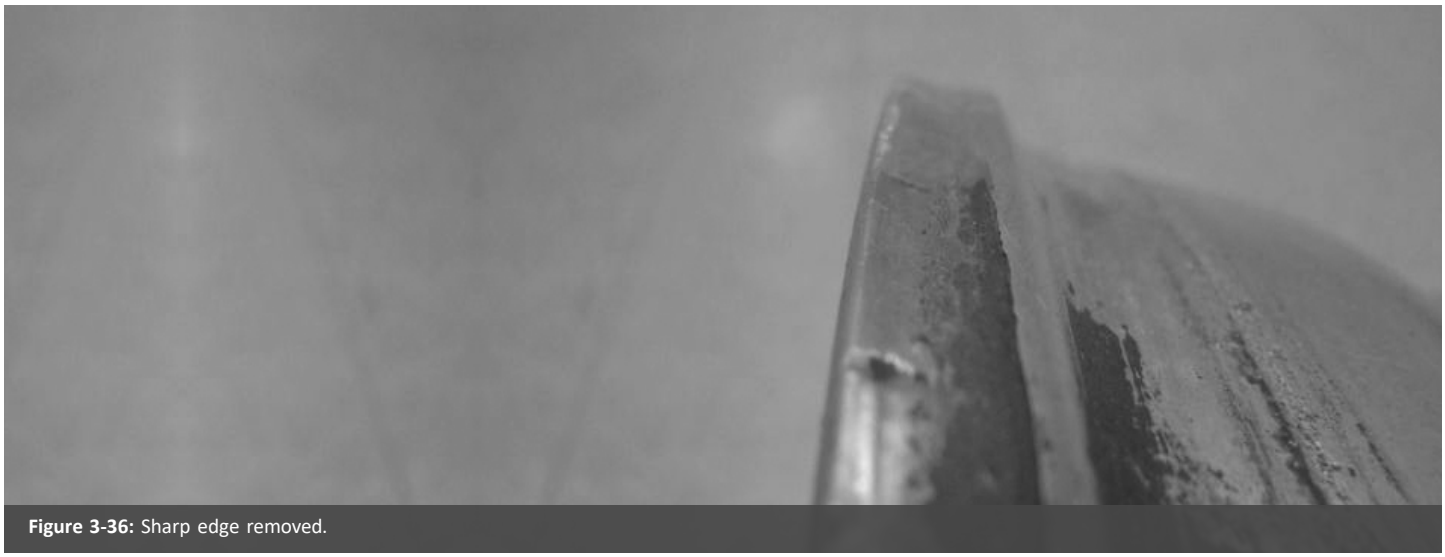


Figure 3-36: Sharp edge removed.

STEP 4. Figure 3-36 shows the result of removing the sharp edge on the rim flange. With whatever tool is selected, work the tool around the wheel's circumference removing only enough material to eliminate the sharp edge. This should only be a small amount of metal. Perform this work on both flanges if there is evidence of sharpness. Take care to make sure the edge removal is as uniform as possible and avoid gouging the wheel.

STEP 5. After the edge is removed, run the sharpness indicator gauge (Figure 3-29) along the flange where the sharp edge was removed to check for any remaining sharpness. If the rubber is still cut, perform the steps again to remove the sharp edge. Always remove the minimum amount of material necessary to eliminate the sharp edge.

STEP 6. Check the rim flange height with the Rim Flange Wear gauge to make sure there is adequate height remaining to safely support the tire. Chart 3-4 shows how this gauge is used. Be sure to move the gauge all around the wheel's circumference and make sure that no area of the flange is below what the gauge indicates is acceptable. If the entire wheel flange is within the limits of the rim flange wear gauge, the wheel may be returned to service.

STEP 7. Always inspect the wheel for any other conditions that would warrant removal from service. Consult the Service Manual for Alcoa Wheels or the TMC User's Guide to Wheels and Rims for information on Out of Service Conditions.

WARNING

WARNING Welding or brazing the rim flange or any area of an Alcoa Wheel will weaken the wheel. Weakened or damaged wheels can result to an explosive separation of tire from wheels.

Explosive separations of tires from wheels or wheel failure on the vehicle could cause serious injury or death.

Never attempt to weld or braze any surface of an Alcoa Wheel.

WARNING

WARNING Returning wheels to service with inadequate flange height as determined by the Rim Flange Wear Gauge can lead to an explosive separation of tires and wheels.

Explosive separations of tires and wheels on the vehicle could cause serious injury or death.

Flange heights that fall below the gauge for Alcoa Wheels have inadequate rim flange height to support the tire on the rim. Immediately and permanently remove any wheel from service that has inadequate rim flange height.

NOTE: Always follow safe mounting procedures and inflation procedures using OSHA approved tire restraining device. See the Service Manual for Alcoa Wheels or OSHA safety wall charts and procedures.

3-14 Corrosion

Certain service environments can lead to corrosion. Some of the more common corrosive materials (salt, magnesium chloride, calcium chloride compounds and brine water) are used for snow removal and highly alkaline materials. If the inflation media to fill the tire is not dry, the areas of the wheel under the tire can corrode severely.

Mounting surfaces (Aluminum Wheels) – If corrosion or pitting is deeper than the DOT stamp (0.020" deep), or the DOT stamp is not clearly legible, remove the wheel from service. Surface pitting on the wheel mounting area is acceptable if the mounting surface remains flat. Flatness can be checked by using a straight edge and a 0.020" feeler gauge.

Do not grind metal off of the mounting flange surface as flat mounting surfaces must be maintained. It is recommended that a wire brush or light sand paper be used to remove corrosion. If material is removed from the mounting flange surface the wheel should be removed from service. Non-flat surfaces may result in edge of bolt hole cracks.

CAUTION

CAUTION The use of liquid tire balancers or sealants on Alcoa Wheels may cause extremely rapid corrosion of the wheel rim surface. Alcoa Wheels corroded by the use of liquid tire balancers or sealants will not be replaced under the Company's limited warranty for Alcoa Wheels.

Severely corroded wheels are unsuitable for service.

Figure 3-37: Drop Center Corrosion

Bead seat and valve stem corrosion often are caused by trapped moisture. Mild corrosion as shown in Figure 3-37 should be removed until thoroughly cleaned. Remove any severely corroded wheel from service immediately and scrap.

Figure 3-38: Valve Hole Corrosion

3-15 Dura-Flange® Maintenance

Dura-Flange® has a **24 month warranty** against wear which creates a sharp edge that requires maintenance per Section 3-13.

Minor wear or minor pitting is not a warrantable condition.

Edge re-conditioning of any kind **cannot** be performed on Dura-Flange® wheels including those methods as described in Section 3-13.

Figure 3-39: ACCEPTABLE PITTING

3-16 Corrosion Prevention
(non-Dura-Bright® and non-Dura-Black™ surface treated wheels)

The following information is for standard forged aluminum Alcoa Wheels without the Dura-Bright® or Dura-Black™ surface treatments. For specific instructions on the care and cleaning of Alcoa Wheels featuring those surface treatments, see sections 3-17 and 3-18, respectively.

1. Clean frequently with high pressure water. The use of a mild detergent will speed the cleaning process. Do not use harsh alkaline cleaners.

2. When tires are removed the entire wheel must be cleaned and inspected, see Section 3. With a wire brush, remove any foreign materials from the tire side of the rim. **Do not** use a wire brush to remove dirt and corrosion materials from the appearance surface of the wheel. Generously coat the entire air chamber surface with an approved surface protectant and lubricant each time the tire is removed (see Section 4-1).

3. To maintain the original appearance of Alcoa Wheels, the following procedures are recommended:
   a. After installing new wheels and prior to operating the vehicle, use a sponge, cloth or soft fiber brush to wash exposed wheel surfaces with a mild detergent and warm water solution.
   b. Rinse thoroughly with clean water.
   c. Wipe dry to avoid water spots.
   d. Apply polish to the cleaned surface.
   e. Clean truck wheels as frequently as required to maintain their appearance.

3-17 Dura-Bright® Surface Treated Wheels Cleaning & Maintenance

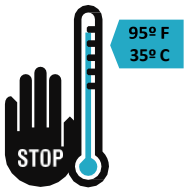
Dura-Bright® Wheels are the easy maintenance way to bright, shiny wheels that stay that way when properly maintained. Dura-Bright® wheels clean easily with mild soap and water, and eliminate the need for harsh cleaning products.

Dura-Bright® Wheels are maintained best with an off-the-shelf car wash, a mild (near neutral) detergent or a cleaning solution that has been diluted to a pH between 3-11 for Dura-Bright® EVO or 5-9 for Dura-Bright® XBR and prior generations.

Do not use Hydrofluoric Acid (HF), Hydrochloric Acid (HCl) or Sulfuric Acid (H_2SO_4) on Dura-Bright® Wheels.

Step 1: Cool down

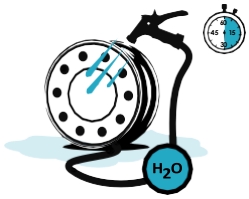
Before cleaning, allow the wheels to cool down to a temperature below 95˚ F (35˚ C).



Step 2: Pre-rinse

Rinse wheels thoroughly to remove any loose and visible dirt/debris.

- Rinsing the wheel with water helps to prevent scratching and abrasion.
- Use a water hose or power washer to remove soil, sand, etc.



Step 3: Prepare cleaning solution

- Add a **mild** detergent (e.g. common dish soap liquid) to the water at the specified dilution ratio before applying to vehicle.
- The pH level should be 3-11 for Dura-Bright® EVO (5-9 for Dura-Bright® XBR) in diluted/ready-to-use state.
- If using multiple solutions, each solution must fall within the pH range of 3-11 for Dura-Bright® EVO (5-9 for Dura-Bright® XBR). Do not use Hydrofluoric Acid (HF), Hydrochloric Acid (HCl) or Sulfuric Acid (H_2SO_4) on Dura-Bright® Wheels.

Step 4: Clean the wheel

- Apply soap or detergent generously on wheel surface with either a spray applicator, a clean, soft bristled brush or soft sponge.
- Abrasive tools and scouring pads (e.g. 3M Scotch-Brite®) **should not be used.**

Step 5: Rinse the wheel

- Rinse the wheel thoroughly with clean water to remove all remaining soap and dirt.
- If you intend to dry your wheels, be sure to use a soft cloth free of debris.

This is an example of how to test pH.

Look for the black Alcoa sticker to identify Dura-Bright® Surface Treatment.

If soils attached to the surface do not come off with cold water, try warm water and wipe with a soft towel or chamois cloth. Use warm water and a mild detergent (with assistance of a commercial high pressure power washer, if available). Always dilute the detergent according to the manufacturer's recommendation; never use the detergent straight without diluting with water. Once in service, Dura-Bright® wheels can become nicked or scratched by road debris and/or mechanical damage. If this occurs, continue to follow the normal washing and cleaning instructions provided above.

The mounting area on Dura-Bright® wheels can become scratched, marred or discolored when mounted against another wheel, hub or drum. Components such as high temperature nylon protection gaskets can prevent scratches. Contact the Field Service team for Alcoa Wheels if you have any questions.

Note: pH value can be found in chemical MSDS (Material Safety Data Sheet) from the product manufacturer. If the cleaner is in concentrated form, contact your cleaning chemical supplier to determine pH levels and follow all manufacturer cleaning instructions.

The full Dura-Bright® cleaning procedure can be reviewed in the Dura-Bright® Cleaning Guide available in print and online at www.alcoawheels.com. Only the Warranty Center for Alcoa Wheels can authorize warranty claims and justify warranty returns. Dura-Bright® and Dura-Flange® claims can only be authorized and determined by the Warranty Center for Alcoa Wheels.

3-18 Dura-Black™ Advanced Surface Treated Wheels Cleaning & Maintenance

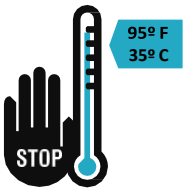
Dura-Black™ Wheels with a matte black finish are easy to maintain. Surface treatment performance is not compromised if properly maintained. Dura-Black™ Wheels clean easily with mild soap and water while eliminating the need for harsh cleaning products.

Dura-Black™ Wheels are maintained best with an off-the-shelf car wash, a mild (near neutral) detergent or a cleaning solution that has been diluted to a pH between 3 and 11.

Do not use Hydrofluoric Acid (HF), Hydrochloric Acid (HCl) or Sulfuric Acid (H_2SO_4) on Dura-Black™ Wheels.

Step 1: Cool down

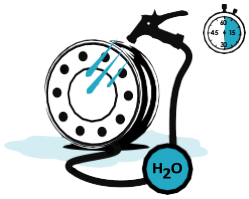
Before cleaning, allow the wheels to cool down to a temperature below 95˚ F (35˚ C).



Step 2: Pre-rinse

Rinse wheels thoroughly to remove any loose and visible dirt/debris.

- Rinsing the wheel with water helps to prevent scratching and abrasion.
- Use a water hose or power washer to remove soil, sand, etc.



Step 3: Prepare cleaning solution

- Add a **mild** detergent (e.g. common dish soap liquid) to the water at the specified dilution ratio before applying to vehicle.
- The pH level should be 3-11 for Dura-Black™ in a diluted ready-to-use state.
- If using multiple solutions, each solution must fall within the pH range of 3-11. Do not use Hydrofluoric Acid (HF) or Sulfuric Acid (H2SO4) on Dura-Black™ Wheels.

Step 4: Clean the wheel

- Apply soap or detergent generously on wheel surface with either a spray applicator, a clean, soft bristled brush or soft sponge.
- Abrasive tools and scouring pads (e.g. 3M Scotch-Brite®) **should not be used.**

Step 5: Rinse the wheel

- Rinse the wheel thoroughly with clean water to remove all remaining soap and dirt.
- If you intend to dry your wheels, be sure to use a soft cloth free of debris.

This is an example of how to test pH.

Look for the white laser etched Alcoa logo to identify Dura-Black™ surface treatment

If soils attached to the surface do not come off with cold water, try warm water and wipe with a soft towel or chamois cloth. Use warm water and a mild detergent (with assistance of a commercial high pressure power washer, if available). Always dilute the detergent according to the manufacturer's recommendation; never use the detergent straight without diluting with water. Once in service, Dura-Black™ wheels can become nicked or scratched by road debris and/or mechanical damage. If this occurs, continue to follow the normal washing and cleaning instructions provided above.

The mounting area on Dura-Black™ wheels can become scratched, marred or discolored when mounted against another wheel, hub or drum. Components such as high temperature nylon spacers, can prevent scratches. Contact Field Service team for Alcoa Wheels if you have any questions.

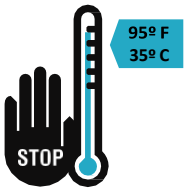
Note: pH value can be found in chemical MSDS (Material Safety Data Sheet) from the product manufacturer. If the cleaner is in concentrated form, contact your cleaning chemical supplier to determine pH levels and follow all manufacturer cleaning instructions.

The full Dura-Black™ cleaning procedure can be reviewed in the Dura-Black™ Cleaning Guide available in print and online at www.alcoawheels.com. Only the Warranty Center for Alcoa Wheels can authorize warranty claims and justify warranty returns. Dura-Black™ claims can only be authorized and determined by the Warranty Center for Alcoa Wheels.

3-19 Polished Wheels Cleaning & Maintenance

Step 1: Cool down

Before cleaning, allow the wheels to cool down to a temperature below 95˚ F (35˚ C).



Step 2: Pre-Wash

Rinse wheels and the surrounding area using a hose to spray the surface of the wheels and around the stud holes. This will loosen up the grime and brake dust that has collected on the wheels and prepares them for treatment.

If a pressure washer is available, use a fan tip to provide a strong stream of water. If the tire is still mounted on the wheel, exercise caution to prevent tire damage from an excessively strong stream of water.

Any existing dirt, grease or debris should be removed prior to polishing. There are many aluminum wheel cleaners on the market that help loosen dirt, grease or grime. Failure to perform this cleaning step may have a negative effect on polishing performance and appearance.

Step 3: Wash

Apply an approved aluminum wheel cleaner intended for aluminum wheels over the surface of the wheels, inside the hand holes, and around the stud holes.

Agitate the cleaner with a soft-bristle brush, periodically while applying water. Scrub the surface of the wheels, inside the hand holes and stud holes.

If the tire is removed scrub the wheel drop center with all-purpose cleaner and a stiff bristle brush.

Step 4: Rinse

Rinse the wheel thoroughly with clean water to remove all remaining cleaner and dirt. Repeat step as necessary.

If you intend to dry your wheels, be sure to use a soft cloth free of debris.

Refer to TMC-RP 267

Polishing

There are three primary ways to polish a non-coated Alcoa Wheels.

- **Hand Polishing** – After rinse (Step 4), use a non-abrasive aluminum polish on the wheel. This is applied by hand and requires a lot of rubbing with a soft, clean, microfiber towel (Figure 3-40).
- **Power Tools** – After rinse (Step 4), use a non-abrasive aluminum polish on the wheel and a soft-bristle wheel pad for polishing (Figure 3-41).
- **Machine Polish** –Machines designed to re-polish aluminum wheels are available at local facilities such as retreaders and tire service providers and truck dealerships (Figure 3-42).

Figure 3-40: Hand Polishing

Figure 3-41: Power Tools

Figure 3-42: Machine Polish

4 MOUNTING ALCOA WHEELS WITH TUBELESS TIRES

4.1 Mounting Tubeless Tires on Alcoa Wheels

NOTICE

For information on tube type Alcoa Wheels, contact the Company at (800) 242-9898 Option 1.

NOTICE

Aluminum non-symmetrical Alcoa Wheels require special tire mounting techniques.

WARNING

WARNING Mounting damaged tires or wheels can lead to an explosive separation of tires and wheels.

Explosive separations of tires from wheels can cause serious injury or death.

Inspect tires and wheels for damage before removing from vehicle. If damage is found, the tire must be completely deflated before loosening cap nuts. Immediately and permanently remove damaged tires or wheels from service.

WARNING

WARNING Use of inner tubes in tubeless wheels will hide slow leaks. Slow leaks may indicate cracked or damaged wheels which lead to wheel failures. See Section 3-10.

Wheel failures can cause accidents which may result in serious injury or death.

(Never use an inner tube on an Alcoa tubeless wheel.) Immediately and permanently remove cracked or damaged wheels from service and scrap.

Before mounting the tire, perform a wheel fitment check to ensure proper clearance from any obstructions. Instructions for performing a fitment check can be found online at https://www.alcoawheels.com/wheelservicemanual.

Only properly trained technicians should service tire/wheel assemblies.

Before mounting, be sure that the tire is properly matched to the rim.

1. Do not gouge or nick the wheel. If changing by hand, place aluminum wheels on a clean floor and use a protective mat when mounting tires. Additional care should be used when mounting Alcoa Dura-Bright® surface treated wheels since minor nicks and scratches cannot be polished out (see Section 3-17, page 20 for specific cautions, care and maintenance procedures). If using a tire changing machine, care should be taken to prevent gouging the aluminum wheel.

2. Always use a rubber, leather-faced or plastic mallet.

3. Inspect the tire/wheel for damage. Do not use a damaged or severely corroded wheel (Section 3-14).

4. Clean the wheel disc face and the tire bead seat areas. Be sure the wheel is dry before applying tire lubricant.

5. Identify the short side of the drop center well. Single-piece tubeless rims and wheels must be mounted from the short side of the drop center well. Aluminum wheels typically have symmetrical drop centers so tires can be mounted from either side. However, on certain aluminum wheels, the short side of the drop center well is located on the disc side. See Figure 4-2.

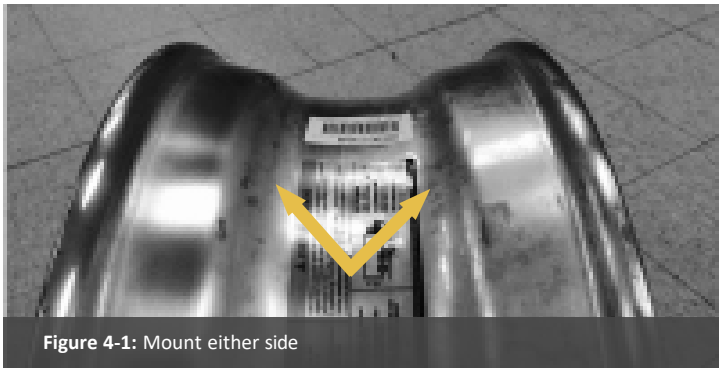


Figure 4-1: Mount either side

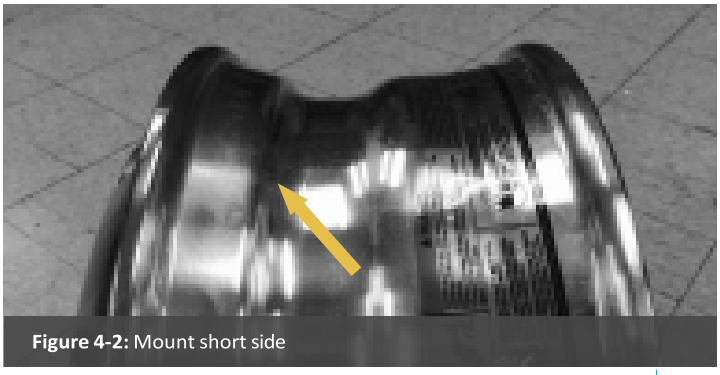


Figure 4-2: Mount short side

Mounting tubeless tires

NOTICE

Not all tire changing machines work alike. Be sure to read the operating or instruction manual for your particular machine before attempting to mount or demount tires.

NOTICE

Do not exceed inflation pressure stamped on wheel.

NOTICE

When match mounting tires to Alcoa® Wheels refer to TMC RP 243.

6. Generously lubricate wheel rim flanges, drop well, and tire beads using non-water based lubricant. A non-water based commercial bead lubricant should be used since water can cause corrosion. However, thin vegetable oil soap solutions with a water base are approved.

Tire beads should be mounted over the rim flange closest to the wheel well. Push bead over flange as far as possible.

Never lubricate the rim or tire bead with a flammable solution. This can lead to an explosion during tire inflation.

Figure 4-3

7. Push the tire bead onto the rim as far as possible. Using the curved end of the tire iron (with the stop resting on the rim flange) take small bites to work the remaining section of the bead onto the rim/wheel.

Start the second tire bead into the well, holding it in position with foot or self-locking pliers clamped to the rim of the flange. Insert the curved end of the tire iron with the stop towards the rim and push the iron outwards to work the bead over the flange.

Figure 4-4

8. Take small bites, repeat the operation progressively around the rim. Keep the tire bead in the well with your foot or with self-locking pliers. Continue until the second tire bead is full mounted over the flange.

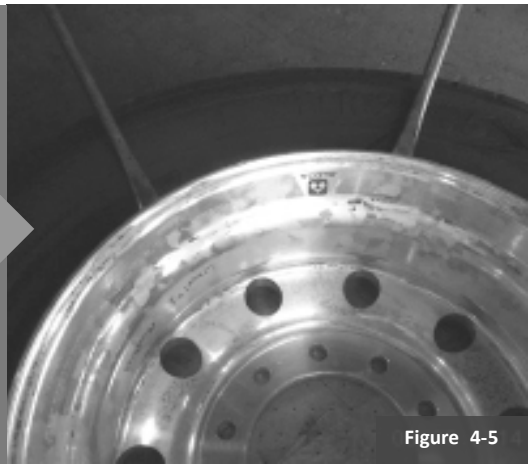


Figure 4-5

4-2 Inflating Tire/Wheel Assembly

WARNING

WARNING Never use a volatile or flammable material, such as ether or gasoline, as an aid to seating the tire beads on the wheel. The use of these materials lead to an uncontrolled pressure build-up in the tire and may result in an explosion with damage to the wheel and cause personal injury.

Explosive separation of the tire from the wheel can occur while seating beads in this manner, while adding pressure to the tire on or off the vehicle, or later on the road. Loss of vehicle control can result, which can cause serious injury or death.

Only use approved mechanical or pneumatic bead seating devices.

WARNING

WARNING A pressurized tire/wheel assembly can explode and separate violently.

This violent separation can cause serious injury or death.

Always contain the tire/wheel assembly in an OSHA compliant restraining device during inflation.

1. Before inflating any tire rim/wheel assembly, be sure to read, understand and comply with ALL WARNINGS. Use only dry air for tire inflation. Water in the chamber can cause corrosion. Be sure that in-line air dryer is maintained properly.

2. After mounting the tire on the rim, seat the bead using compressed air (bead blaster). If needed use a bead blaster. Do not exceed 5 psi before placing the assembly in a OSHA compliant restraining device.

3. Place the assembly in an OSHA compliant restraining device, such as a tire safety cage. Figure 4-6 is an example of one type of a restraining device. Manufacturers recommend that OSHA compliant restraining devices be freestanding and located at least one foot away from any flat or solid surface.

4. Inflate the tire, with the valve core removed, using a clip-on air chuck with an in-line valve or pressure regulator and a sufficient length of hose. Inflate to 20 psi in OSHA compliant restraining device. IMPORTANT! Look for distortions, undulations, or other irregularities in the tire sidewall. Listen for any popping or snapping sounds. See Figure 4-7. The OSHA compliant restraining device should not be bolted to the floor.

If ANY of these conditions are present — STOP! DO NOT approach tire. Before removing from OSHA compliant restraining device, completely deflate tire remotely. Remove clip-on air chuck. Mark tire as damaged for a potential "zipper rupture" (render tire immediately unservicable, non-repairable and scrap).

5. Visually inspect tire rim/wheel assemblies throughout the inflation process for improper seating. When inflating a tire, stay out of the trajectory. See "Trajectory" WARNING in OSHA Regulations (Section 6 - Appendix A). DO NOT stand or lean any part of your body against, or reach over, the OSHA compliant restraining device during inflation.

Place tire/wheel assembly inside a OSHA compliant restraining device. See Section 6. Refer to tire manufacturer's recommendation for proper tire pressure. Using a clip-on air chuck or a self-locking straight chuck with remote valve and pressure gauge, inflate the tire/wheel assembly to proper pressure. Be sure to stay out of the trajectory of potential exploding parts or air blasts.

Figure 4-6

Inflating Tire/Wheel Assembly (continued)

6. Continue to inflate until the beads are seated on the wheel. Inspect both sides of the tire to be sure that the beads are evenly seated. NEVER inflate beyond 40 psi to seat any tire beads.

   If the beads are not seated at 40 psi — STOP! Completely deflate, remove from the restraining device, and demount the tire to determine the problem. Reposition the tire on the rim, **relubricate**, and reinflate.

7. After the tire beads are seated, continue to inflate the tire to its recommended inflation pressure. IMPORTANT! Look for distortions, undulations, or other irregularities in the tire sidewall, such as in Figure 4-7. Listen for any popping or snapping sounds.

   If ANY of these conditions are present — STOP! DO NOT approach tire. Before removing from restraining device, completely deflate tire remotely. Remove clip-on air chuck. Mark tire as damaged and potential "zipper rupture". Render tire unservicable, non-repairable and scrap.

   Refer to TIA or TMC-RP 232.

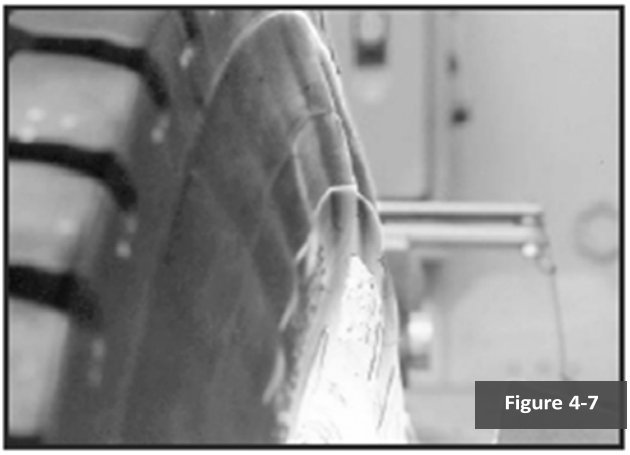


Figure 4-7

8. Do not overinflate. Use the tire manufacturer's recommended pressure, but under no circumstances exceed cold tire pressures roll stamped on the wheel. If none of these "zipper" conditions are present, remove clip-on air chuck, install the valve core, and adjust the inflation pressure to the recommended operating inflation pressure.

9. Before removing the tire/wheel assembly from the restraining device, always visually inspect for proper & concentric seating of the beads and all parts.

10. Conduct a final inspection. Heavy duty truck tires have a "guide rib" or "mounting ring" molded into the sidewall next to the tire bead. When the tire is inflated this molded ring should be evenly spaced from the rim flange all the way around the wheel. Check the position of the mounting ring before removing the assembly from the inflation cage. If the ring and wheel are not concentric, deflate the assembly in the cage, **relubricate** and remount the tire. Check for air leaks. Install a suitable valve cap.

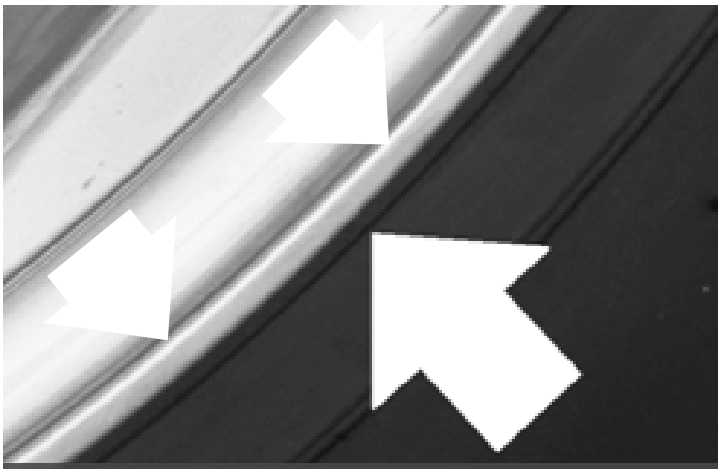


Figure 4-8: Rib evenly between arrows

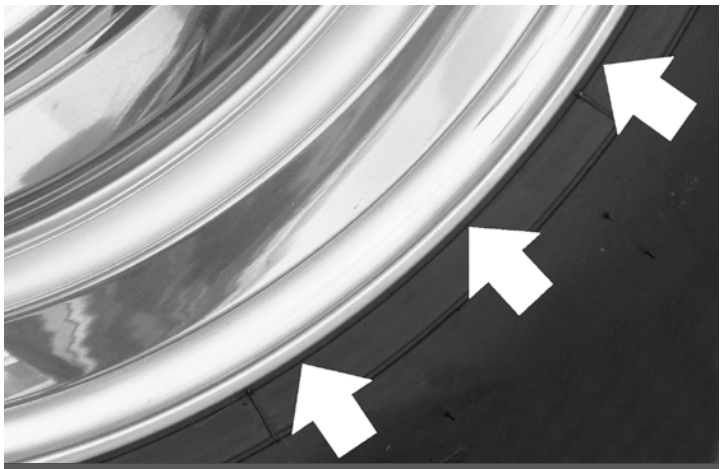


Figure 4-9

4-3 Rim Width to Tire Matching

Rim to tire matching chart for medium and heavy trucks.

WHEEL SIZE	TIRE SIZE (for both radial and bias tires)	APPROVED RIM WIDTHS T&RA (ETRTO)
17.5	8R17.5	(5.25), 6.00, (6.75)
17.5	9R17.5	(6.00), 6.75
17.5	10R17.5	6.75, 7.50
17.5	11R17.5	(7.50), 8.25
19.5	8R19.5	5.25, 6.00, 6.75
19.5	225/70R19.5	6.00, 6.75
19.5	245/70R19.5	6.75, 7.50
19.5	265/70R19.5	(6.75), 7.50, 8.25
19.5	445/65R19.5	13.00, 14.00
22.5	8R22.5	5.25, 6.00, 6.75
22.5	9R22.5	6.00, 6.75, 7.50
22.5	235/80R22.5	6.75, 7.50
22.5	245/75R22.5	6.75, 7.50
22.5	10R22.5	6.75, 7.50, 8.25
22.5	255/70R22.5	6.75, 7.50, 8.25
22.5	255/80R22.5	6.75, 7.50, 8.25
22.5	275/80R22.5	7.50, 8.25, 9.00
22.5	11R22.5	7.50, 8.25
22.5	265/75R22.5	(6.75), 7.50, 8.25
22.5	12R22.5	8.25, 9.00
22.5	295/60R22.5	9.00, 9.75
22.5	295/75R22.5	8.25, 9.00
22.5	305/75R22.5	8.25, 9.00, 9.75
22.5	305/85R22.5	8.25, 9.00, 9.75
22.5	315/80R22.5	9.00, 9.75
22.5	335/65R22.5	9.00, 9.75, 10.50
22.5	15R22.5	11.75, 12.25
22.5	385/65R22.5	11.75, 12.25
22.5	425/65R22.5	12.25, 13.00, 14.00
22.5	16.5R22.5	12.25, 13.00
22.5	18R22.5	13.00, 14.00
22.5	445/50R22.5	14.00, 15.00
22.5	445/55R22.5	(14.00)
22.5	445/65R22.5	13.00, 14.00
24.5	11R24.5	7.50, 8.25
24.5	275/80R24.5	7.50, 8.25, 9.00
24.5	285/75R24.5	7.50, 8.25, 9.00
24.5	12R24.5	8.25, 9.00

CHART 4-1

Reference only. Refer to tire manufacture documentation for tire fitment information

* Source: 2021 TRA Yearbook and ETRTO Standards Manual

4-4 Balance Weights

Alcoa Wheels are fully machined and do not require balancing. However, the tire/wheel combination may need to be balanced. Internal balancing compounds are not recommended. Use of coated balancing weights is recommended to avoid staining and corrosion of wheel surface.

Always follow the recommended procedures of the balancing weight manufacturer. It may be necessary to reduce the tire pressure when installing clip-on weights to allow clearance of the weight clamp between the tire and rim flange.

Adhesive weights should only be applied to a clean surface on the brake side of the rim flange. Balance weights should be installed in a location where they will not contact the brake components during vehicle operation. Proper pre-cleaning is an essential factor for adhesive balance weights. It is recommended to review the surface cleaning techniques & products with the manufacturer or supplier of balancing weights. Relocating wheels from a cold place to a warmer place may cause condensation on wheel surfaces which can negatively affect the adhesion.

Improperly installed weights could dislodge during use and damage the vehicle and/or surrounding objects and cause personal injury.

Excessive rim flange wear (see Service Manual for Alcoa Wheels Section 3-13) could dictate the use of 'stick-on' or adhesive balancing weights if there is inadequate rim flange to properly hold a clip on (knock on) style weight.

Powder, Granulate, Liquid Balancers or Liquid Sealants

Balancing with powder, granulates or liquids is not recommended, nor is sealing tire punctures with liquid sealants. Powder, granulates or liquid balancers as well as liquid sealants may harm tubeless tires. Consult the tire manufacturer's recommendation for information about tire compatibility.

The Company's policies do not endorse any specific brand or type of balancing powder or granulates. The use of these balancers on Alcoa Wheels may clog valves. A filtered valve core is recommended when using balancing powder or granules. The use of these materials will not void the limited warranty, unless inspection of the wheel shows anomalies related to its use (ex. shows excessive corrosion) (Figure 3-37).

Caution: The use of liquid tire balancers or sealants in Alcoa Wheels may cause galvanic corrosion at the valve hole area as well as corrosion to the valve itself and/or may cause extremely rapid corrosion of the wheel rim surface. Corrosion at the bead seat areas can allow loss of inflation pressure. Corrosion at the valve hole will also result in a loss of inflation pressure (Figure 3-37 and 3-38).

Severely corroded wheels are unsuitable and should be permanently removed from service and scrap.

Alcoa Wheels corroded by the use of liquid tire balancers or sealants will not be replaced under the Company's limited warranty for Alcoa Wheels.

CAUTION Clip-on balance weights are not recommended for Dura-Flange® wheels.

The usage of clip-on style balance weights will not adequately engage the hardened Dura-Flange® coating. The Company recommends adhesive style balance weights for this application.

CAUTION The use of liquid tire balancers or sealants in Alcoa Wheels may cause extremely rapid corrosion of the wheel/rim surface. Alcoa Wheels corroded by the use of liquid tire balancers of sealants will not be replaced under the Company's limited warranty for Alcoa Wheels.

Severely corroded wheels are unsuitable for service.

5 Wheel Installation

5-1 Recommendations for proper installation of wheels

1. Make sure all wheel nuts are properly torqued. Dirt/rust streaks radiating from the bolt/stud holes can indicate loose wheel nuts. (See Section 3) If the wheel becomes loose the wheels bolt/stud holes can become elongated (egg-shaped) or damaged as shown in Section 3-8. If wheel nuts are loose you may break studs and/or develop cracks at the wheel bolt/stud holes. This condition may cause the wheel to loosen and disengage from the vehicle.

2. On ball-seat wheels be sure the end of the socket is smooth or cover the wheel mounting surface with a protective shield prior to tightening the cap nuts. The end of the socket will mar the wheel around the cap nuts if it is not smooth.

3. Keep all component contact surfaces smooth and clean. Dirt or projections on mounting surfaces may lead to loose wheels. Remove all projections resulting from burrs, nicks, etc. Be sure that loose dirt does not fall onto mounting surface during assembly.

4. Do not introduce any foreign objects such as top hats into the contact surface areas of the mounting system unless approved by the Company. Do not paint Alcoa Wheels (see Section 3-2).

5. Additional care should be used when mounting Dura-Bright® surface treated Alcoa Wheels since minor nicks and scratches cannot be polished out (Section 3-17, for specific cautions, care and maintenance procedures).

6. High temperature nylon protection gaskets are designed to be placed between the wheels and also the brake drum/wheel contact surfaces. High temperature nylon protection gaskets can be used to protect the mounting face / coating when the tire/wheel assemblies are removed and reinstalled.

WARNING

WARNING Wheels that are not properly installed or maintained may not be safe.

Failure to follow proper wheel installation or maintenance practices may result in serious injury or death.

Follow the proper wheel installation and maintenance practices as contained in this Service Manual for Alcoa Wheels. For training on proper installation and maintenance, available free of charge from the Company, or for the most recent updates, contact the Company at 1-800-242-9898 or on the web at www.alcoawheels.com/contactus.

NOTICE

Do not exceed maximum wheel load. Customer must compare OEM vehicle load rating to maximum wheel load rating.

Refer to tire manufacturer's recommendation for proper tire pressure. Before mounting the tire perform a wheel fitment check to insure proper clearance from any obstructions.

NOTICE

Check for and replace every bent, broken, cracked, corroded, or damaged studs. When replacing one broken stud, always replace the stud on each side of the broken stud. If two or more studs are broken, replace all the studs for that wheel position. Check with the stud manufacturer for regular maintenance and stud replacement practices.

All wheel fastener hardware should be grade 8 or metric conversion 10.9. Follow the hardware manufacturer's recommendations when replacing studs.

WARNING

WARNING Alcoa Wheels are for steer, inside dual or outside dual applications. Alcoa Wheels are NOT designed, tested, or engineered to be run as a single out wheel, with the open end out.

The Company will void the warranty of Alcoa Wheels configured in this fashion. Wheels put in a single out application must be run with the Disc Face out (like a steer wheel).

There may be applications with lighter loads or lift axles where the OEM can request a deviation but that OEM must have written authorization from The Company.

5-2 Wheel Nuts

NOTICE

One-piece flange nuts are not approved for use on any Alcoa Wheel application.

WARNING

WARNING Use of chrome-plated wheel nuts which have chrome plating on the surfaces that contact the wheel can cause reduced and inconsistent wheel clamping.

This condition can cause wheels to loosen and disengage from the vehicle, causing serious injury or death. Never use wheel nuts with chrome-plated contact surfaces. Use only recommended hardware on Alcoa Wheels.

There are many types of nuts and studs in use, and their design and specifications are not standardized. The “R” and “L” on cap nut part numbers indicate right and left-hand threads respectively. The Company recommends the following wheel nuts for use with Alcoa Wheels:

FLANGE NUTS

2-piece, 26.25 mm height, 33mm hex head flange nut. Mounts single and dual wheels to wheel centering hubs. Right hand threads used on both sides of vehicle. P/N 39874 (supersedes P/Ns 39701 and 39691); M22-1.5 RH threads.

Geomet coated. Two-piece, 46mm height, 33mm hex, M22x1.5mm, RH, sleeved cap nut. Mounts either single or dual aluminum wheels with 32mm bolt holes, to wheel centering hubs with stud standouts less than 2.85” (72mm). Right-hand threads used on boths sides of vehicle. Inserts (INSM22) included. P/N 617736.

Geomet coated. Two-piece, 32.5mm height, 33mm hex, M22x1.5mm, RH thread, sleeved cap nut. Mounts single aluminum wheels with 32mm bolt holes, to wheel centering hubs with stud standouts less 1.71” (43.5mm). Right-hand threads used on both sides of vehicle. Inserts (INSM22) included. P/N 617722.

CAP NUTS

1-1/8" X 16 cap nut. Mounts standard single wheels and wide base wheels to 1-1/8" studs. Also mounts outer dual wheel to 1-1/8" inner cap nut. P/N 5996R, 5996L (replaces P/N 5552R, 5552L).

3/4"x16 cap nut. Mounts standard single wheels and wide base wheels to 3/4" studs. Do not use on steel wheels. P/N 5995R, 5995L (replaces P/N 5554R, 5554L).

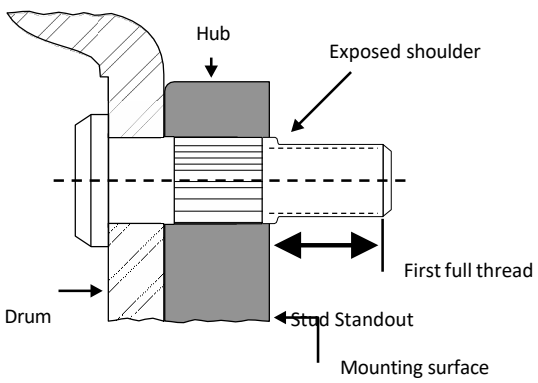
Inner cap nut, inner thread 3/4" x 16, outer thread 1-1/8" x 16. For use with steel inner dual wheel and aluminum outer dual wheel with 1.31" (1-5/16) to 1.44" (1-7/16) stud standout. P/N 7896R, 7896L (Grade 8).

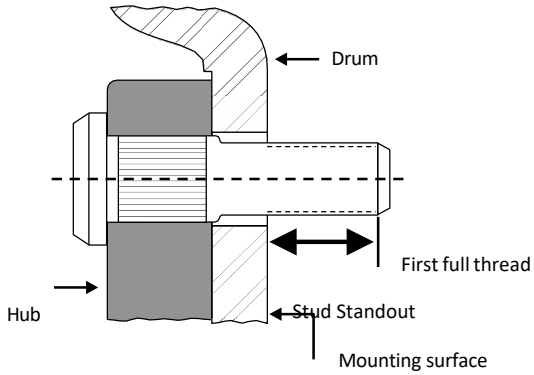
Inner cap nut for use with standard length studs (1.31" [1-5/16] to 1.44" [1-7/16]) stud standout) or longer studs not to exceed 1.88" (1-7/8) stud standout. Full internal and external threads, counter bore 5/16" deep at open end. Prevents stud from bottoming out in cap nut. P/N 5988R, 5988L (Grade 8). For use with studs with exposed shoulders. Do not use with steel inner dual wheel.

FOR MEDIUM DUTY MOUNTING HARDWARE, SEE THE MEDIUM DUTY DATA SHEETS ON WWW.ALCOAWHEELS.COM.

5-3 How to Measure Stud Standout

Stud standout is measured from the axle end mounting surface (the hub, for inboard mounted drums, and the drum, for outboard mounted drums) to the first complete thread at the outside end of the stud.





5-4 Hub Piloted Mounting System. Single Dual & Wide Base Wheels, Mounting Two-Piece Flange Nuts

NOTICE

Do not exceed maximum wheel load. Customer must compare OEM vehicle load rating to maximum wheel load rating.

Refer to tire manufacturer's recommendation for proper tire pressure. Before mounting the tire perform a wheel fitment check to insure proper clearance from any obstructions.

NOTICE

Check for and replace every bent, broken, cracked, corroded, or damaged studs. When replacing one broken stud, always replace the stud on each side of the broken stud. If two or more studs are broken, replace all the studs for that wheel position. Check with the stud manufacturer for regular maintenance and stud replacement practices.

All wheel fastener hardware should be grade 8 or metric conversion 10.9. Follow the hardware manufacturer's recommendations when replacing studs.

Most U.S. manufacturers of highway trucks, tractors and trailers equipped with the hub piloted wheel mounting system requires wheel studs and flange nuts with metric threads. Most frequently these are M22x1.5.

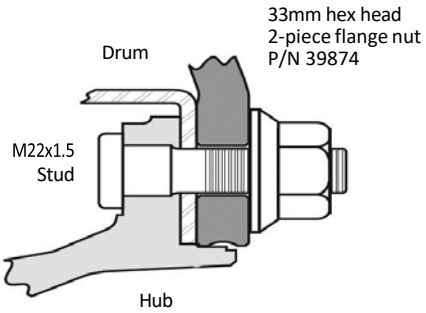
Most areas in North America have laws which dictate full thread engagement or thread engagement past the nut body. Make sure you know the laws for the states/provinces in which you operate and comply with them.

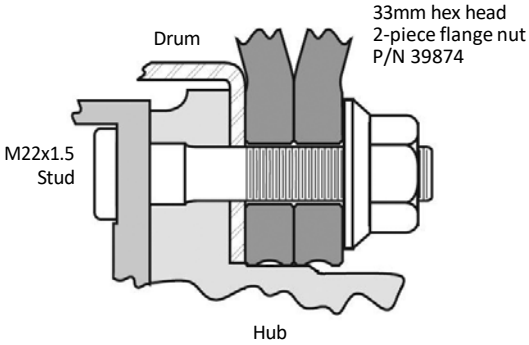
Note: Some stud piloted ball seat wheels have the same number of holes and bolt circle diameter as hub piloted wheels. Never mix hub piloted & stud piloted wheels.

Hubs designed for steel hub piloted wheels may not have enough pilot length to locate dual aluminum wheels. Pay close attention to pilot length, particularly when converting from steel to aluminum duals. Measure the hub pilot tab length to make sure the hub properly centers the wheels. The pilot tab length for sufficient centering must be 5 mm (0.20") or more for mounting single wheel and 1x disc thickness + 5mm (0.20") for mounting dual wheels.

When mounting painted steel inner dual wheels with outer aluminum wheels, be cautious of excessive paint build-up and flaking on the inner steel wheel. Excessive paint can reduce the clamping force and allow the wheels to become loose (excessive paint is defined as anything greater than 3.5 mil).

Typical assembly of hub piloted single and dual wheels use 33mm hex head two-piece flanged nuts, Part No. 39874. If hex nuts with greater overall height are used, more stud length is required.





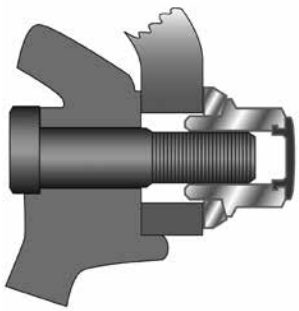
Two-Piece Sleeved Flange Nuts

Sleeved flange nuts serve two purposes::

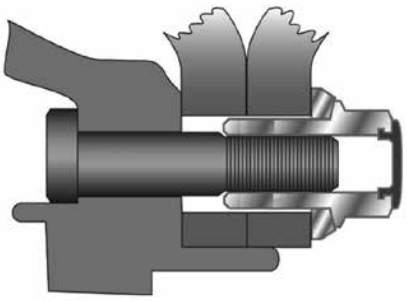
1. May increase thread engagement.
2. Reduce stud hole misalignment.

When using sleeved flange nuts:

- There are two kinds of sleeved flange nuts, single mount and dual mount as shown. One that aligns outer wheels only. One that goes into the inner dual wheel. Either sleeve cap nut is acceptable for Alcoa wheels.
- All threads in the sleeve do not need to be engaged with the wheel bolt for proper installation.
- Always use wheels and hardware that are designed for use with sleeved flange nuts.



Single mounted wheels require sleeved flange nuts with a short sleeve.



Dual mounted wheels require sleeved flange nuts with a long sleeve.

5-5 Tightening Hub Piloted, Two-Piece Flange Nuts

Two-piece flange nuts must be properly tightened.
Refer to the chart below for industry standard torque of two-piece flange nuts.

NUT THREAD	TORQUE LEVEL FT-LB LUBRICATED
11/16" - 16	300 - 400
7/8" - 14	350 - 400
M20 X 1.5	280 - 330
M22 X 1.5	450 - 500

CHART 5-1

Source: TMC. Refer to truck manufacturer guidelines for specific recommendations.

Calibrated torque runners (i.e. pneumatic or electronic), if used, should be carefully adjusted to apply torques within the limits recommended. Nuts should be tightened in recommended criss-cross torque sequence (see next page).

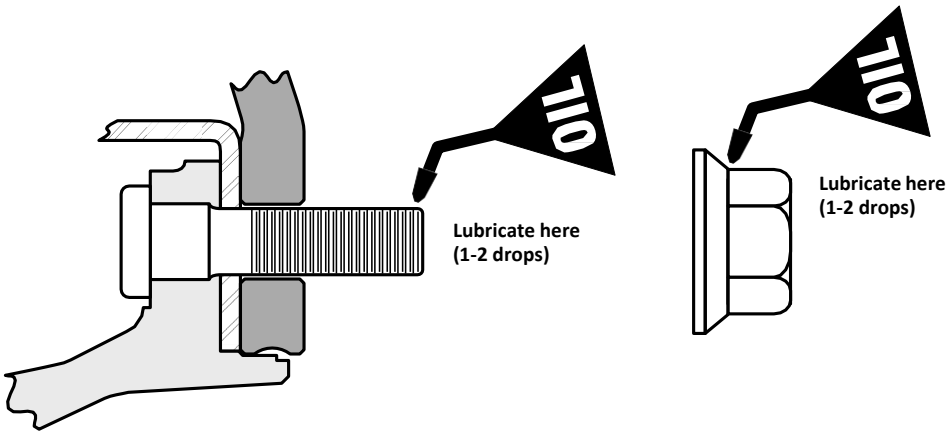
WARNING

WARNING Undertorqued flange nuts allow wheels to run loose and fatigue studs or lose nuts. Overtorquing can yield studs causing them to fail.

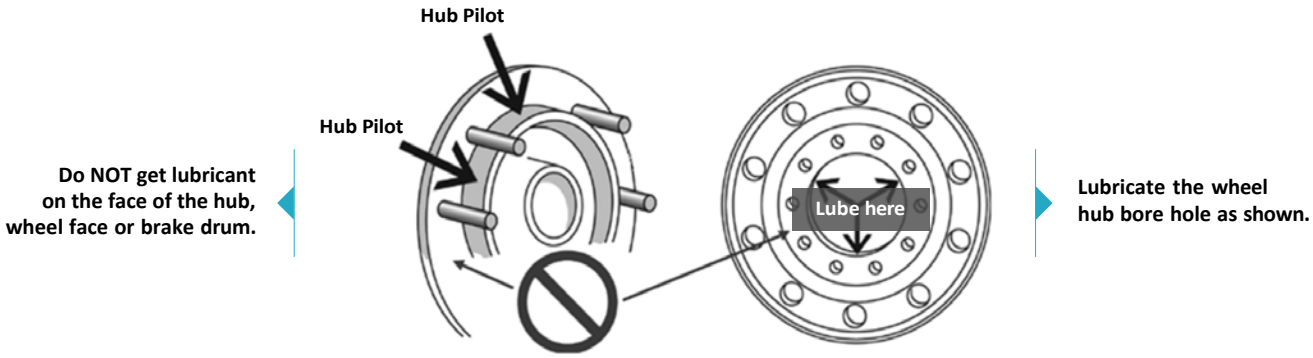
Both under and overtorquing can lead to wheel detachment which can result in serious injury or death.

Check all parts including wheels, studs and flange nuts. Check mounting faces of wheels, hubs and drums. Check for dirt, corrosion or damage. Remove dirt and rust; replace damaged parts. Follow correct tightening sequences and torque levels.

Before installing two-piece flange nuts, use only 1 to 2 drops of motor oil to lightly lubricate the first two or three threads at the tip of each stud, and the contact surfaces between the flange nut and the washer as illustrated below. This will minimize corrosion between the mating surfaces. Lubrication is not necessary with new hardware.



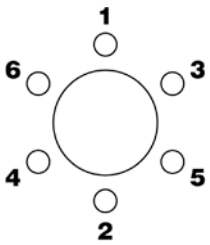
Prior to mounting hub piloted wheels, coat the wheel hub bore only (do not lubricate the face of the wheel, hub or brake drum – see illustration below). Then push wheels onto the hub so that excess lube will scrape off and not be pushed between the mounting surfaces. Use a non-water-based lubricant to minimize corrosion and build-up between the wheel and hub pilot. Excessive corrosion build-up between the wheel and hub pilots can make wheel removal difficult.



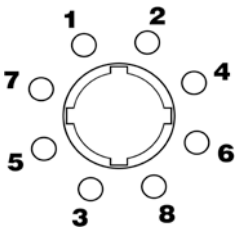
Position one of the hub's pilot pads at the twelve o'clock position. After positioning wheels on the pilot pads, hand tighten all two-piece flange nuts, then tighten to the recommended torque following the proper sequence shown below for your type wheel. After a wheel assembly has been installed and torqued, check the fastener torque again within 5 - 100 miles. Individual fleet conditions will influence the mileage interval. Refer to TMC RP 237 - Retorquing Guidelines for Disc Wheels which establishes guidelines for determining the fleet torque check interval.

NOTICE

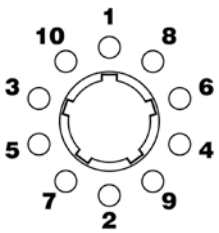
In service, stud dimensions and condition may change over time due to environmental conditions, multiple re-installations, improper torquing and other factors. Consult your hub and stud manufacturer for maintenance and replacement recommendations.



Six Stud



Eight Stud



Ten Stud

5-6 Keep Wheel Nuts Tight (Hub Piloted)

Flange nuts must be kept tight, the torque, studs and nuts should be checked at regular service intervals. Nuts and studs should be inspected at tire changes to ensure they are in serviceable working condition. If nuts require frequent tightening or studs break frequently, hardware and mounting practices should be reviewed (TMC-RP 222).

NOTE:

1. Tightening wheel nuts to their specified torque is extremely important. Undertightening results in loose wheels which can damage wheels, studs and hubs, and can result in wheel loss. Overtightening can damage studs, nuts and wheels and results in loose wheels as well.

2. All torque wrenches, calibrated torgue runners and any other tools used for tightening flange nuts should be calibrated periodically to ensure the proper torque is applied.

3. Refer to OEM for torque ranges of hardware that is not noted in this manual.

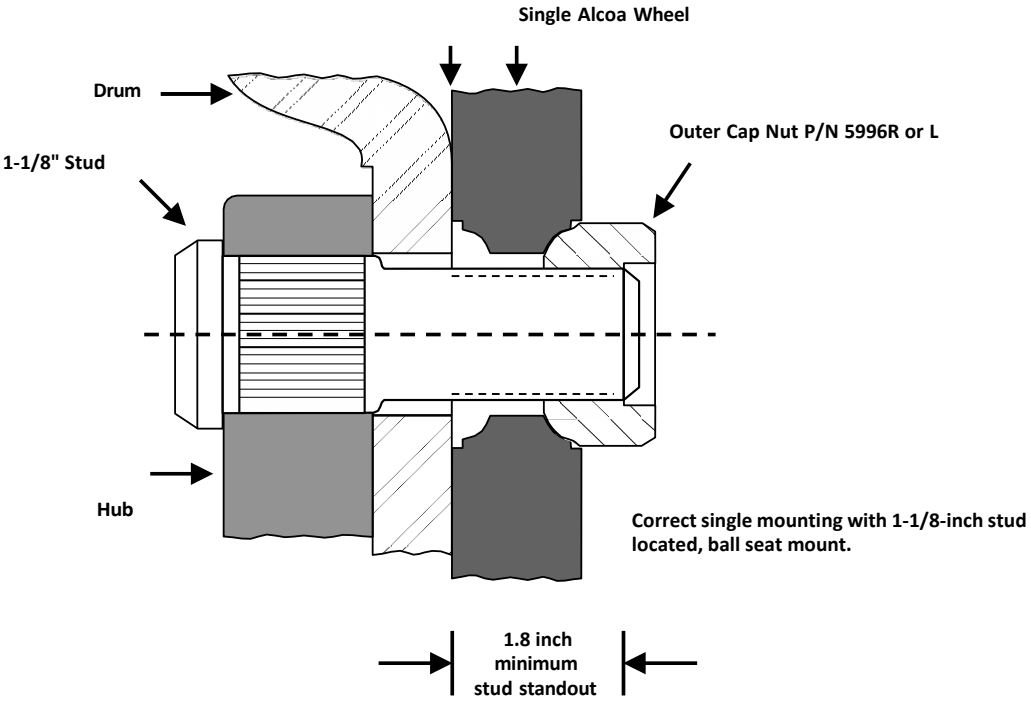
5-7 Stud Piloted Mounting System Single & Widebase

The cap nut seat for the stud piloted system is a precision-machined spherical surface. Cap nuts must be properly manufactured to assure correct seating. Never use one or two-piece flange nuts on a wheel designed with ball seats (Section 5-10).

Ball seat cap nuts may be obtained from your Distributor for Alcoa Wheels.

Front wheels are mounted as singles and require 1.8" (45.7mm) minimum stud standout. Most vehicles have 1-1/8-inch studs on the front hubs. Alcoa single cap nuts, Part Nos. 5996R and 5996L, or equivalents, should be used. Some front hubs have 3/4-inch studs. On these hubs, use Alcoa single cap nuts, Part Nos. 5995R and 5995L or equivalents.

High temperature nylon protection gaskets can be used with Alcoa Dura-Bright® surface treated wheels to protect the wheel contact surfaces from marring. High temperature nylon protection gaskets can be placed between the contact surfaces of the Dura-Bright® wheels and the brake drum.



NOTICE

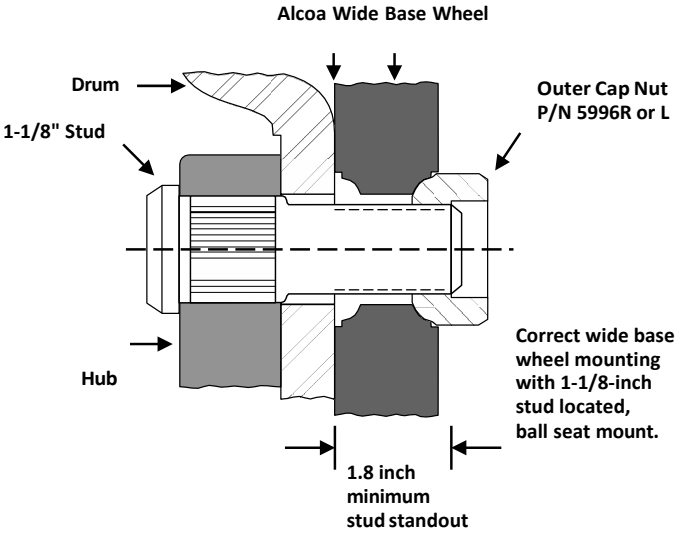
Do not exceed maximum wheel load. Customer must compare OEM vehicle load rating to maximum wheel load rating.

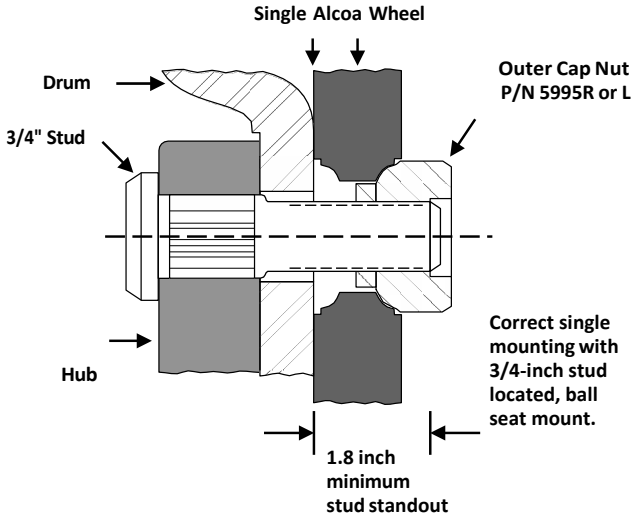
Refer to tire manufacturer's recommendation for proper tire pressure. Before mounting the tire perform a wheel fitment check to insure proper clearance from any obstructions.

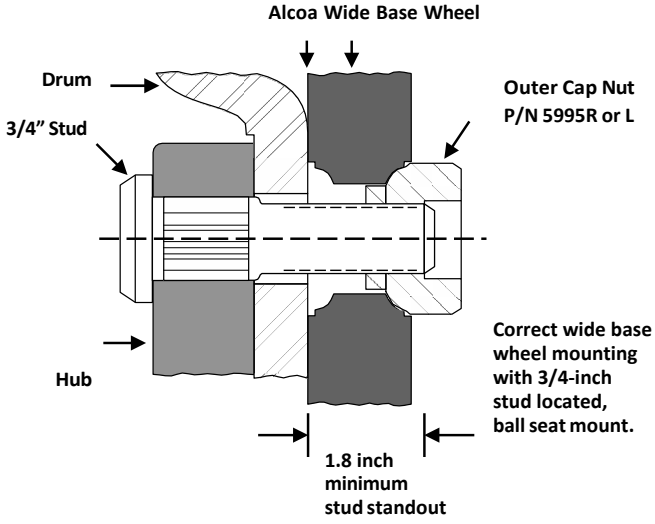
NOTICE

Check for and replace every bent, broken, cracked, corroded, or damaged studs. When replacing one broken stud, always replace the stud on each side of the broken stud. If two or more studs are broken, replace all the studs for that wheel position. Check with the stud manufacturer for regular maintenance and stud replacement practices.

All wheel fastener hardware should be grade 8 or metric conversion 10.9. Follow the hardware manufacturer's recommendations when replacing studs.







5-8 Stud Piloted Mounting System Dual Wheels

NOTICE

Do not exceed maximum wheel load. Customer must compare OEM vehicle load rating to maximum wheel load rating.

Refer to tire manufacturer's recommendation for proper tire pressure. Before mounting the tire perform a wheel fitment check to insure proper clearance from any obstructions.

NOTICE

Check for and replace every bent, broken, cracked, corroded, or damaged studs. When replacing one broken stud, always replace the stud on each side of the broken stud. If two or more studs are broken, replace all the studs for that wheel position. Check with the stud manufacturer for regular maintenance and stud replacement practices.

All wheel fastener hardware should be grade 8 or metric conversion 10.9. Follow the hardware manufacturer's recommendations when replacing studs.

Rear wheels are most frequently mounted as duals. Each inner aluminum wheel is attached by 10 inner cap nuts. The Company recommends use of inner cap nuts 5978R, 5978L, or 5988R, 5988L.

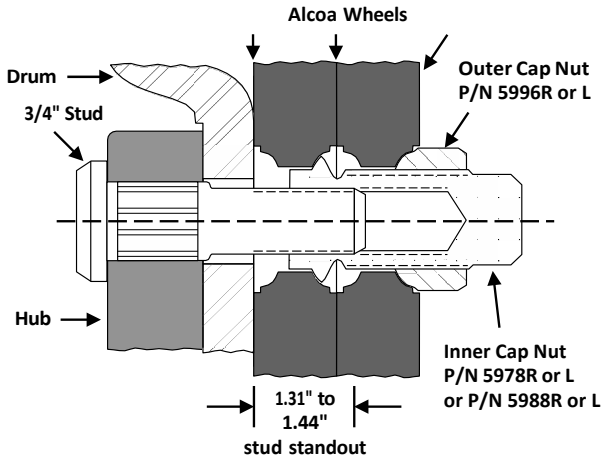
Cap nuts recommended by the Company are compatible with Alcoa Wheels. Hardware of equal dimensions and strength may be used.

Most vehicles have standard length studs (1.31" [1-5/16"] to 1.44" [1-7/16"] stud standout). Some vehicles use studs longer than standard (up to 1.88" [1-7/8"] standout).

When changing types of brake drums be sure to check for excessive stud standout (greater than 1.88" [1-7/8"]). Most states and provinces have their own standards for fastener engagement. Most of these consist of at least 1 to 2 threads past full thread engagement. Excessive stud standout may cause the inner cap nut to bottom out on the longer stud preventing proper seating of the wheel.

Each outer dual wheel is attached by 10 single cap nuts which thread on the inner cap nuts. Use Alcoa outer cap nuts, Part Nos. 5996R, 5996L or

equivalents. Dual wheels should be put on the vehicles with the valve stems 180° apart in order to access the inner wheel valve stem.



Correct mounting for dual aluminum, stud piloted / ball seat mount wheels.

5-9 Stud Piloted Mounting System Steel Inner/Aluminum Outer Dual Wheels

WARNING

WARNING Incorrect inner cap nuts used with dual aluminum wheels can bottom out on the unthreaded portion of the stud before the wheels are properly seated.

Improperly seated wheels can run loose, cause stud breakage and detach from the vehicle which can cause serious injury or death. Loose running wheels can lead to stud breakage.

Use only cap nut 5978R or L, 5988R or L, or their equivalent when mounting dual aluminum wheels.

On occasion Alcoa Wheels are dualed with a steel inner wheel. When this application occurs it is recommended that a high temperature nylon protection gasket be used because of corrosion issues. In the event a steel inner wheel is used, extreme care must be exercised to properly seat it to the hub or drum before mounting the outer aluminum wheel. Selection of an inner cap nut capable of fixing the steel inner wheel and providing adequate external thread length to secure the outer aluminum dual wheel is critical to a safe assembly. The Company recommends the use of inner cap nuts 7896R and L (Grade 8), or equivalent, for this purpose.

NOTICE

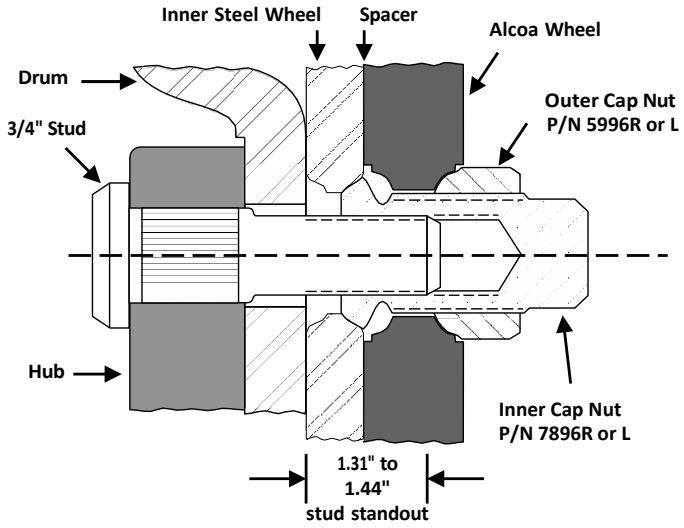
Do not exceed maximum wheel load. Customer must compare OEM vehicle load rating to maximum wheel load rating.

Refer to tire manufacturer's recommendation for proper tire pressure. Before mounting the tire perform a wheel fitment check to insure proper clearance from any obstructions.

NOTICE

Check for and replace every bent, broken, cracked, corroded, or damaged studs. When replacing one broken stud, always replace the stud on each side of the broken stud. If two or more studs are broken, replace all the studs for that wheel position. Check with the stud manufacturer for regular maintenance and stud replacement practices.

All wheel fastener hardware should be grade 8 or metric conversion 10.9. Follow the hardware manufacturer's recommendations when replacing studs.



Correct dual mounting for steel inner/aluminum outer stud piloted ball seat mount.

WARNING

WARNING Incorrect inner cap nuts used with steel wheels can bottom out on the unthreaded portion of the stud before the wheels are properly seated.

Improperly seated wheels can run loose, cause stud breakage and detach from the vehicle which can lead to serious injury or death. Loose running wheels can lead to stud breakage.

Use only cap nut 7896R or L or its equivalent when mounting steel inner duals.

WARNING

WARNING Inadequate wheel support surface can lead to stud hole-to-stud hole fracture resulting in separation of the outer disc and rim from the vehicle.

Separation of the wheel from the vehicle can cause serious injury or death.

Alcoa Wheels with 11-1/4" diameter bolt circle require a support surface at least 13-3/16" in diameter. Check the outer support surface of the inner steel wheel for flatness and adequate diameter before installing the outer wheel. When the wheels are serviced, check the mounting surfaces of both wheels for stud hole-to-stud hole cracks. If cracks are found, immediately and permanently remove the wheel from service and scrap. For the support surface diameter required by other bolt circle sizes, ask your Company representative.

WARNING

WARNING Use of two-piece flange nuts on stud piloted wheels or ball seat cap nuts on hub piloted wheels is dangerous.

Using the wrong cap nuts can cause loss of torque, broken studs, and cracked wheels, wheel loss which can lead to serious injury or death.

Use only hardware designed specifically for each wheel type. See Section 5-2 for proper hardware assemblies.

5-10 Tightening Stud Piloted Cap Nuts

Wheel cap nuts must be properly tightened.

Refer to the chart below for the proper nut torque of stud piloted, double cap nuts:

BALL SEAT RADIUS	NUT THREAD	TORQUE LEVEL FT-LB DRY
7/8"	3/4" - 16	450 - 500
7/8"	1-1/18" - 16	450 - 500
1 - 3/16"	15/16" - 12	750 - 900
1 - 3/16"	1-1/18" - 16	750 - 900
1 - 3/16"	1-5/16" - 12	750 - 900

CHART 5-2
Source: TMC. Refer to truck manufacturer guidelines for specific recommendations.

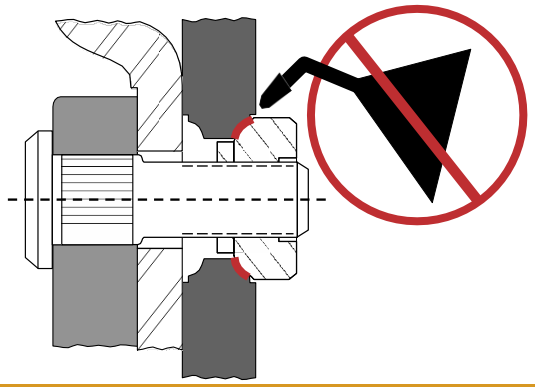
WARNING

WARNING Undertorqued cap nuts allow wheels to run loose, pounding out (deforming) the ball seats, fatiguing studs or losing nuts. Overtorquing can stretch studs causing them to fail.

Both under and overtorquing can lead to wheels coming off, causing serious injury or death.

Check all parts, including wheels, studs and cap nuts. Check mounting faces of wheels, hubs and drums. Check for dirt, corrosion or damage. Remove dirt and rust; replace damaged parts. Follow correct tightening sequences and torque levels.

Note: Never get lubricant on the wheel, cap nut seat, or mounting faces.



WARNING

WARNING Lubricants should not be applied to the cap nut seat or to the cap nut-to-wheel contact surface. If a lubricant is used you must drop the torque down 100 ft-lbs.

Oiled seats can lead to over-torquing which can yield studs causing failure. Failed studs can cause the wheel to detach from the vehicle, causing serious injury or death.

Lubricants must be completely removed from the cap nut seats and contact surfaces if applied accidentally.

On vehicles equipped with the stud piloted, ball seat, mounting systems, wheel studs on the right side of the vehicle have right-hand threads and those on the left have left-hand threads. The “R” and “L” on the studs and nuts indicate right and left-hand threads respectively.

Note: The top of the inner cap nut will have thread direction identified on the end of the nut.

INNER CAP NUT.

This should be used for dual wheel.

NOTE: There are two different inner cap nuts for aluminum and steel wheels. The inner cap nut in Figure 5-1 is for use with dual aluminum wheels.

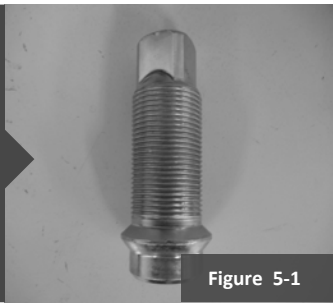


Figure 5-1

INNER CAP NUT LEFT HAND THREADS.

The letter L should appear on the end of the cap nut.

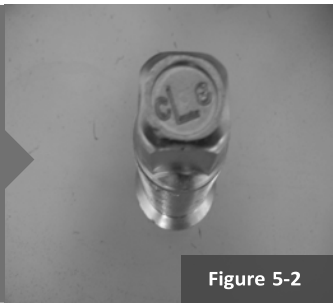


Figure 5-2

INNER CAP NUT RIGHT HAND THREADS.

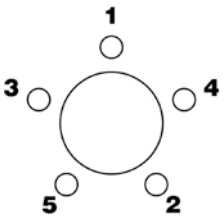
The letter R should appear on the end of the cap nut.

Figure 5-3

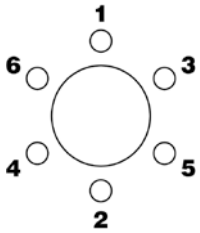
After mounting a wheel over the studs, snug up the cap nuts in the order shown in the illustrations that follow. After all the cap nuts have been snugged, tighten the cap nuts to the recommended torques, following the same tightening sequence.

NOTICE

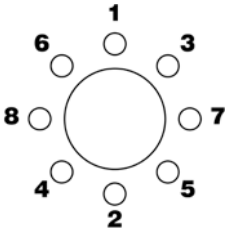
In service, stud dimensions and condition may change over time due to environmental conditions, multiple re-installations, improper torquing and other factors. Consult your hub and stud manufacturer for maintenance and replacement recommendations.



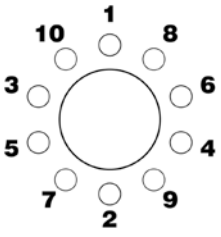
Five Stud



Six Stud



Eight Stud



Ten Stud

After a wheel assembly has been installed and torqued, check the fastener torque again within 5 - 100 miles of operation and retighten the nuts if necessary the recommended torque using the proper sequence. Individual fleet conditions will influence the mileage interval. Refer to TMC RP 237 - Retorquing Guidelines for Disc Wheels which establishes guidelines for determining the fleet torque check interval. To check and retorque an inner nut, it is necessary to loosened the outer nut first, and then tighten the inner nut. Finally, the outer nuts must be retightened to the proper level.

5-11 Keep Stud Piloted Wheel Nuts Tight

Cap nuts must be kept tight, and studs and nuts should be checked frequently. Nuts should be properly retorqued if necessary. At tire changes, nuts and studs should be inspected for cracks and stripped or damaged threads. After each wheel mounting, cap nut torque should be checked with a properly calibrated torque wrench.

Calibrated torque runners, if used, should be carefully adjusted to apply torque within the limits recommended. Torquing of cap nuts should be tightened in recommended sequences.

Some states/provinces have laws which dictate full thread engagement or thread engagement past the nut body. Make sure you know the laws for the states/provinces in which you operate and comply with them.

When checking the cap nuts on dual disc wheels utilizing the stud piloted ball seat mounting system, loosen every other cap nut and then check the torque of the inner cap nuts. Retorque the loosened outer cap nuts. Repeat procedure with the rest of the nuts. Check all cap nuts for the proper torque after the first use or any removal. Inspect wheels (see Section 3) and check wheel nuts during service stops. Dirt and rust streaks from cap nuts may indicate looseness.

NOTE:

1. If using specialty fasteners (cap nuts) or any hardware not noted above, consult the manufacturer for recommended torque values.

2. Tightening wheel nuts to their specified torque is extremely important. Undertightening results in loose wheels which can damage wheels, studs and hubs, and can result in wheel loss. Overtightening can damage studs, nuts and wheels and result in wheel loss as well.

5-12 Incorrect Assemblies

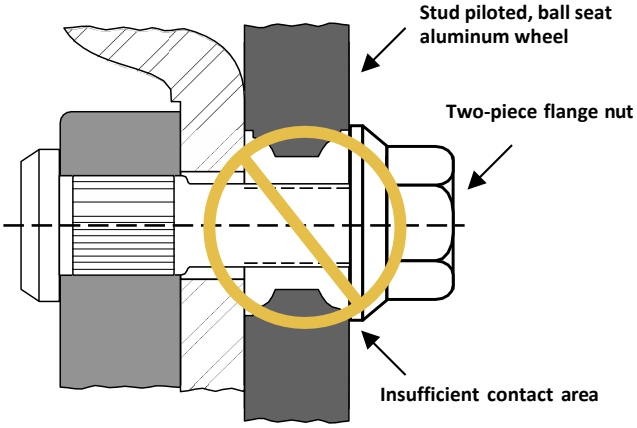
WARNING

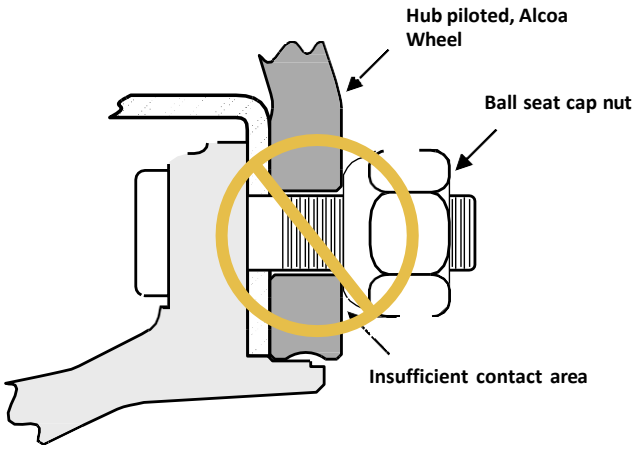
WARNING Use of two-piece flange nuts on ball seat wheels, ball seat cap nuts on hub piloted wheels or single-piece flange nuts in place of 2-piece flange nuts is dangerous.

Using the wrong wheel nuts can cause loss of torque, broken studs and cracked wheels, conditions which can lead to serious injury or death.

Use only hardware designed specifically for each wheel type. See Section 5-2 for proper hardware assemblies.

The following are examples of incorrect wheel assemblies.

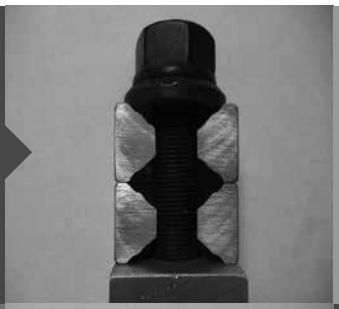




Incorrect use of a ball seat cap nut on a hub piloted system. Do not use ball seat cap nuts with hub piloted wheels.

NOTE: Notice all the different variations of mounting wheels incorrectly on hubs.

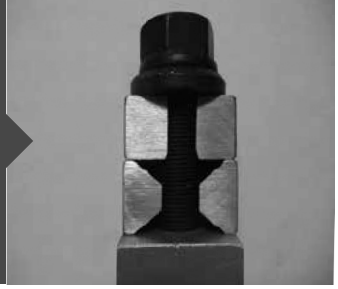
Incorrect use of stud piloted wheels on hub piloted system. Do not use ball seat wheels as inner and outer duals with a hub piloted wheel system.



Incorrect use of a hub-piloted wheel as an inner. Do not use hub-piloted wheels with stud-piloted mounting systems. Note lack of contact between duals on a stud piloted system.

Incorrect use of stud piloted wheel on hub piloted system. Do not use ball seat wheels as outer duals with a hub piloted mounting system.

Incorrect use of ball seat wheel on hub piloted system. Do not use ball seat wheels as inner duals with a hub piloted wheel system.



6 OSHA Regulations

(29 C.F.R. Section 1910.177)

(a) Scope.

(1) This section applies to the servicing of multi-piece and single piece rim wheels used on large vehicles such as trucks, tractors, trailers, buses and off-road machines. It does not apply to the servicing of rim wheels used on automobiles, or on pickup trucks and vans utilizing automobile tires or truck tires designated "LT".

(2) This section does not apply to employers and places of employment regulated under the Longshoring Standards, 29 CFR part 1918; Construction Safety Standards, 29 CFR part 1926; or Agriculture Standards, 29 CFR part 1928.

(3) All provisions of this section apply to the servicing of both single piece rim wheels and multi-piece rim wheels unless designated otherwise.

(b) Definitions.

Barrier means a fence, wall or other structure or object placed between a single piece rim wheel and an employee during tire inflation, to contain the rim wheel components in the event of the sudden release of the contained air of the single piece rim wheel.

Charts means the U. S. Department of Labor, Occupational Safety and Health Administration publications entitled "Demounting and Mounting Procedures for Truck/Bus Tires" and "Multi-Piece Rim Wheel Matching Chart," the National Highway Traffic Safety Administration (NHTSA) publications entitled "Demounting and Mounting Procedures for Truck/Bus Tires" and "Multi-Piece Rim Wheel Matching Chart," or any other poster which contains at least the same instructions, safety precautions and other information contained in the charts that is applicable to the types of wheels being serviced.

Installing a rim wheel means the transfer and attachment of an assembled rim wheel onto a vehicle axle hub. "Removing" means the opposite of installing.

Mounting a tire means the assembly or putting together of the wheel and tire components to form a rim wheel, including inflation. "Demounting" means the opposite of mounting.

Multi-piece rim wheel means the assemblage of a multi-piece wheel with the tire tube and other components.

Multi-piece wheel means a vehicle wheel consisting of two or more parts, one of which is a side or locking ring designed to hold the tire on the wheel by interlocking components when the tire is inflated.

Restraining device means an apparatus such as a cage, rack, assemblage of bars and other components that will constrain all rim wheel components during an explosive separation of a multi-piece rim wheel, or during the sudden release of the contained air of a single piece rim wheel.

Rim manual means a publication containing instructions from the manufacturer or other qualified organization for correct mounting, demounting, maintenance, and safety precautions peculiar to the type of wheel being serviced.

Rim wheel means an assemblage of tire, tube and liner (where appropriate), and wheel components.

Service or servicing means the mounting and demounting of rim wheels, and related activities such as inflating, deflating, installing, removing, and handling.

Service area means that part of an employer's premises used for the servicing of rim wheels, or any other place where an employee services rim wheels.

Single piece rim wheel means the assemblage of single piece rim wheel with the tire and other components.

Single piece wheel means a vehicle wheel consisting of one part, designed to hold the tire on the wheel when the tire is inflated.

Trajectory means any potential path or route that a rim wheel component may travel during an explosive separation, or the sudden release of the pressurized air, or an area at which an airblast from a single piece rim wheel may be released. The trajectory may deviate from paths which are perpendicular to the assembled position of the rim wheel at the time of separation or explosion. (See Appendix A for examples of trajectories.)

Wheel means that portion of a rim wheel which provides the method of attachment of the assembly to the axle of a vehicle and also provides the means to contain the inflated portion of the assembly (i.e., the tire and/or tube).

(c) Employee training.

(1) The employer shall provide a program to train all employees who service rim wheels in the hazards involved in servicing those rim wheels and the safety procedures to be followed.

- **(i)** The employer shall assure that no employee services any rim wheel unless the employee has been trained and instructed in correct procedures of servicing the type of wheel being serviced, and in the safe operating procedures described in paragraphs (f) and (g) of this section.
- **(ii)** Information to be used in the training program shall include, at a minimum, the applicable data contained in the charts (rim manuals) and the contents of this standard.
- **(iii)** Where an employer knows or has reason to believe that any of his employees is unable to read and understand the charts or rim manual, the employer shall assure that the employee is instructed concerning the contents of the charts and rim manual in a manner which the employee is able to understand.

(2) The employer shall assure that each employee demonstrates and maintains the ability to service rim wheels safely, including performance of the following tasks:

- **(i)** Demounting of tires (including deflation);
- **(ii)** Inspection and identification of the rim wheel components;
- **(iii)** Mounting of tires (including inflation with a restraining device or other safeguard required by this section);
- **(iv)** Use of the restraining device or barrier, and other equipment required by this section;
- **(v)** Handling of rim wheels;
- **(vi)** Inflation of the tire when a single piece rim wheel is mounted on a vehicle;
- **(vii)** An understanding of the necessity of standing outside the trajectory both during inflation of the tire and during inspection of the rim wheel following inflation; and
- **(viii)** Installation and removal of rim wheels.

(3) The employer shall evaluate each employee's ability to perform these tasks and to service rim wheels safely, and shall provide additional training as necessary to assure that each employee maintains his or her proficiency.

(d) Tire servicing equipment.

(1) The employer shall furnish a restraining device for inflating tires on multi-piece wheels.

(2) The employer shall provide a restraining device or barrier for inflating tires on single piece wheels unless the rim wheel will be bolted onto a vehicle during inflation.

(3) Restraining devices and barriers shall comply with the following requirements:

- **(i)** Each restraining device or barrier shall have the capacity to withstand the maximum force that would be transferred to it during a rim wheel separation occurring at 150 percent of the maximum tire specification pressure for the type of rim wheel being serviced.
- **(ii)** Restraining devices and barriers shall be capable of preventing the rim wheel components from being thrown outside or beyond the device or barrier for any rim wheel positioned within or behind the device;
- **(iii)** Restraining devices and barriers shall be visually inspected prior to each day's use and after any separation of the rim wheel components or sudden release of contained air. Any restraining device or barrier exhibiting damage such as the following defects shall be immediately removed from service:

(A) Cracks at welds;
(B) Cracked or broken components;
(C) Bent or sprung components caused by mishandling, abuse, tire explosion or rim wheel separation;
(D) Pitting of components due to corrosion; or
(E) Other structural damage which would decrease its effectiveness.

(iv) Restraining devices or barriers removed from service shall not be returned to service until they are repaired and reinspected. Restraining devices or barriers requiring structural repair such as component replacement or rewelding shall not be returned to service until they are certified by either the manufacturer or a Registered Professional Engineer as meeting the strength requirements of paragraph (d)(3)(i) of this section.

(4) The employer shall furnish and assure that an air line assembly consisting of the following components be used for inflating tires:

(i) A clip-on chuck;
(ii) An in-line valve with a pressure gauge or a presettable regulator; and
(iii) A sufficient length of hose between the clip-on chuck and the in-line valve (if one is used) to allow the employee to stand outside the trajectory.

(5) Current charts or rim manuals containing instructions for the type of wheels being serviced shall be available in the service area.

(6) The employer shall furnish and assure that only tools recommended in the rim manual for the type of wheel being serviced are used to service rim wheels.

(e) Wheel component acceptability.

(1) Multi-piece wheel components shall not be interchanged except as provided in the charts or in the applicable rim manual.

(2) Multi-piece wheel components and single piece wheels shall be inspected prior to assembly. Any wheel or wheel component which is bent out of shape, pitted from corrosion, broken, or cracked shall not be used and shall be marked or tagged unserviceable and removed from the service area. Damaged or leaky valves shall be replaced.

(3) Rim flanges, rim gutters, rings, bead seating surfaces and the bead areas of tires shall be free of any dirt, surface rust, scale or loose or flaked rubber build-up prior to mounting and inflation.

(4) The size (bead diameter and tire/wheel widths) and type of both the tire and the wheel shall be checked for compatibility prior to assembly of the rim wheel.

(f) Safe operating procedure - multi-piece rim wheels.

The employer shall establish a safe operating procedure for servicing multi-piece rim wheels and shall assure that employees are instructed in and follow that procedure. The procedure shall include at least the following elements:

(1) Tires shall be completely deflated before demounting by removal of the valve core.

(2) Tires shall be completely deflated by removing the valve core before a rim wheel is removed from the axle in either of the following situations:

(i) When the tire has been driven underinflated at 80% or less of its recommended pressure, or
(ii) When there is obvious or suspected damage to the tire or wheel components.

(3) Rubber lubricant shall be applied to bead and rim mating surfaces during assembly of the wheel and inflation of the tire, unless the tire or wheel manufacturer recommends against it.

(4) If a tire on a vehicle is underinflated but has more than 80% of the recommended pressure, the tire may be inflated while the rim wheel is on the vehicle provided remote control inflation equipment is used, and no employees remain in the trajectory during inflation.

(5) Tires shall be inflated outside a restraining device only to a pressure sufficient to force the tire bead onto the rim ledge and create an airtight seal with the tire and bead.

(6) Whenever a rim wheel is in a restraining device the employee shall not rest or lean any part of his body or equipment on or against the restraining device.

(7) After tire inflation, the tire and wheel components shall be inspected while still within the restraining device to make sure that they are properly seated and locked. If further adjustment to the tire or wheel components is necessary, the tire shall be deflated by removal of the valve core before the adjustment is made.

(8) No attempt shall be made to correct the seating of side and lock rings by hammering, striking or forcing the components while the tire is pressurized.

(9) Cracked, broken, bent or otherwise damaged rim components shall not be reworked, welded, brazed, or otherwise heated.

(10) Whenever multi-piece rim wheels are being handled, employees shall stay out of the trajectory unless the employer can demonstrate that performance of the servicing makes the employee's presence in the trajectory necessary.

(11) No heat shall be applied to a multi-piece wheel or wheel component.

(g) Safe operating procedure-single piece rim wheels.

The employer shall establish a safe operating procedure for servicing single piece rim wheels and shall assure that employees are instructed in and follow that procedure. The procedure shall include at least the following elements:

(1) Tires shall be completely deflated by removal of the valve core before demounting.

(2) Mounting and demounting of the tire shall be done only from the narrow ledge side of the wheel. Care shall be taken to avoid damaging the tire beads while mounting tires on wheels. Tires shall be mounted only on compatible wheels of matching bead diameter and width.

(3) Nonflammable rubber lubricant shall be applied to bead and wheel mating surfaces before assembly of the rim wheel, unless the tire or wheel manufacturer recommends against the use of any rubber lubricant.

(4) If a tire changing machine is used, the tire shall be inflated only to the minimum pressure necessary to force the tire bead onto the rim ledge while on the tire changing machine.

(5) If a bead expander is used, it shall be removed before the valve core is installed and as soon as the rim wheel becomes airtight (the tire bead slips onto the bead seat).

(6) Tires may be inflated only when contained within a restraining device, positioned behind a barrier or bolted on the vehicle with the lug nuts fully tightened.

(7) Tires shall not be inflated when any flat, solid surface is in the trajectory and within one foot of the sidewall.

(8) Employees shall stay out of the trajectory when inflating a tire.

(9) Tires shall not be inflated to more than the inflation pressure stamped in the sidewall unless a higher pressure is recommended by the manufacturer.

(10) Tires shall not be inflated above the maximum pressure recommended by the manufacturer to seat the tire bead firmly against the rim flange.

(11) No heat shall be applied to a single piece wheel.

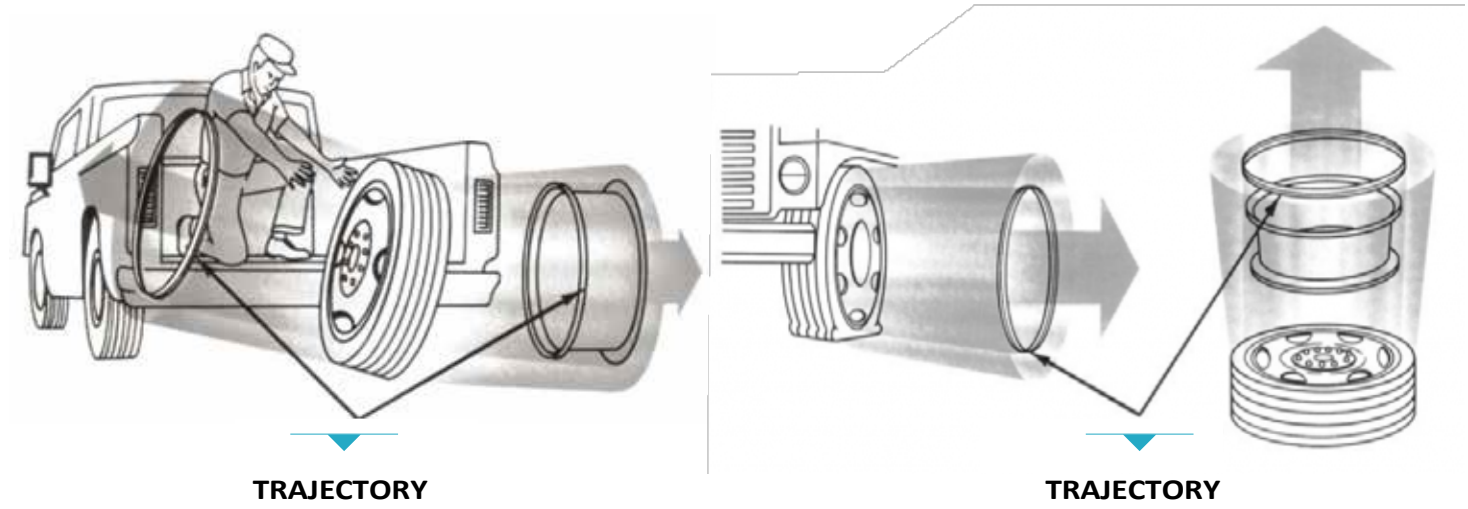
(12) Cracked, broken, bent, or otherwise damaged wheels shall not be reworked, welded, brazed, or otherwise heated.

Appendix A - Trajectory

WARNING

WARNING Stay out of trajectory as indicated by shaded area.

NOTE: Under some circumstances the trajectory may deviate from its expected path.



Appendix B - Ordering Information for OSHA Charts

The information on the OSHA charts is available on three posters, or in a manual containing the three charts, entitled "Demounting and Mounting Procedures for Tubeless Truck and Bus Tires," "Demounting and Mounting Procedures for Tube-Type Truck and Bus Tires," and "Multi-piece Rim Matching Chart." Interested parties can download and print both the manuals and posters from OSHA's Web site at http://www.osha.gov/publications (and type "tire chart" in the search field). However, when used by the employer at a worksite to provide information to employees, the printed posters must be, at a minimum, 2 feet wide and 3 feet long.

Copies of the manual also are available from the Occupational Safety and Health Administration (OSHA Office of Publications, Room N-3101, U.S. Department of Labor, 200 Constitution Avenue NW., Washington, DC 20210; telephone: (202) 693-1888; or fax: (202) 693-2498).

[49 FR 4350, Feb. 3, 1984; as amended at 52 FR 36026, Sept. 25, 1987; 53 FR 34737, Sept. 8, 1988; 61 FR 9227, March 7, 1996; 76 FR 80739, Dec. 27, 2011]

7 Glossary of Terms

7-1 Glossary of Common Terms

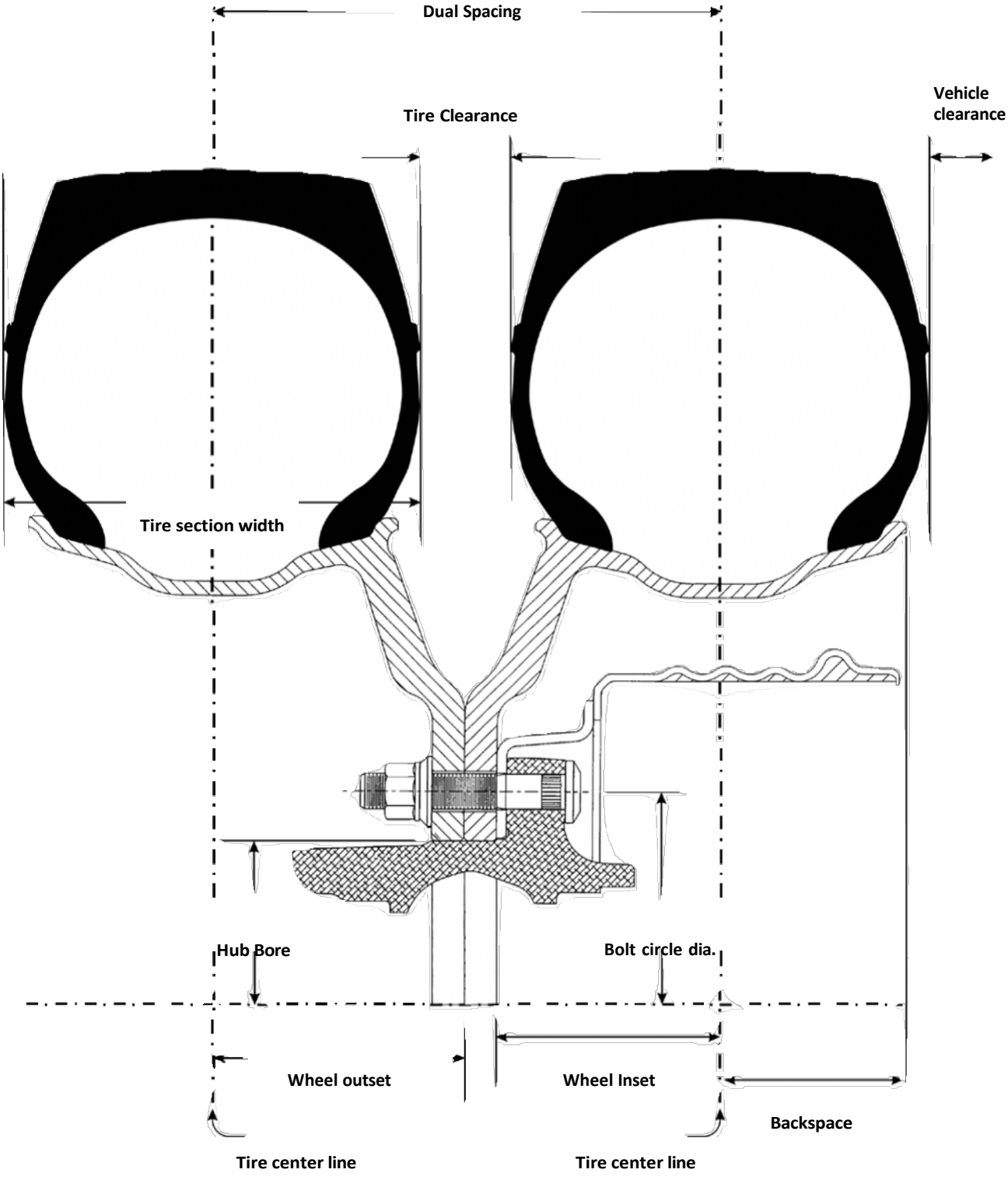
TERM	DEFINITION
AIR CHAMBER	The area in a mounted tire and rim assembly that contains the air.
BACKUP DIAMETER	Hub / drum attachment face diameter that mounts to the wheel.
BEAD SEAT	The tire seating surface of the rim.
BOLT CIRCLE	The circle defined by the centers of the bolt holes (stud holes) of a wheel, dimensions stated in diameter inches or millimeters.
BORE / CENTER HOLE	See "HUB BORE."
DISC	The center member of a disc wheel.
DISC FACE	The flat central portion of a disc wheel in which the bolt holes are located and which contacts the drum, hub or mating wheel.
DISC WHEEL	A rim combined with a center disc which has bolt holes for attaching to a vehicle.
DOUBLE CAP NUTS	Two wheel nuts used in stud-piloted wheel systems. They include inner cap nuts used to fasten inner wheels to a vehicle and outer cap nuts used to fasten single wheels and outer wheels to a vehicle. These nuts have both right and left hand threads and have ball seats that fit into the wheel ball, and ball seat bolt holes to center and clamp the wheels on the hub.
DROP CENTER	The well or center portion of the wheel rim.
DUAL WHEEL / DUALABLE	Any wheel that can be mated disc side to disc side with another wheel resulting in an inner and outer dual wheel assembly.
FLANGE NUT	A nut with a flat face or flange that bears against the wheel; can be one-piece or multi-piece construction. Use on hub piloted wheels.
FOOT-POUNDS	The measure of the amount of torque applied to a cap nut or other part. May be measured with a torque wrench.
HUB BORE	(Bore) The large hole in the middle of a disc wheel.
HALF DUAL SPACING	The distance from the outside disc face (surface between the wheels as a dual assembly) to the center of the rim.
HUB PILOTED MOUNTING	A wheel mounting system in which location of the wheel is accomplished by positioning the wheel center hole on a machined pilot, (continuous or interrupted) on the hub. Fastening is accomplished by flange nuts bearing against the flat face of the wheel disc.
HUB PILOTS	Pads on the hub to locate the center hole of a hub-piloted wheel.
in.	Abbreviation for inches.
INNER CAP NUT	The ball seat nut used to install the inner stud-piloted dual wheel to a vehicle. (see Double cap nut)
INSET	The distance from the wheel mounting surface to the rim centerline when the centerline is placed inboard of the mounting surface.
kg	Abbreviation for kilogram (weight measurement), equal to 1000 grams.
kPa	Abbreviation for kilo Pascals (pressure measurement).
MAXIMUM INFLATION	The highest amount of air pressure allowed, measured at normal ambient temperatures.
mm	Abbreviation for millimeters.

TERM	DEFINITION
N-m	Abbreviation for Newton meters
OFFSET	See “OUTSET.”
OPEN SIDE	The side of the wheel opposite the disc face.
OSHA	Abbreviation for the U.S. Department of Labor, Occupational Safety and Health Administration.
OUTER CAP NUT	The ball seat nut used to install the outer wheel of a stud-piloted dual assembly or a single stud-piloted wheel to a vehicle. The outer nut screws onto the inner cap is a dual assembly. (see Double Cap Nut).
OUTSET	The distance from the mounting surface of the wheel to the rim centerline when the rim centerline is mounted outboard of the hub face. This dimension is the same as the 1/2 DUAL SPACING dimension.
PILOT PAD	See “HUB PILOTS”.
PSI	Abbreviation for pounds per square inch.
REVERSIBLE	Term applied to a disc wheel which can be reversed on the hub without changing the position of the tire centerline.
RIM	That portion of the wheel which supports the tire.
RIM CENTERLINE	A line to the radial axis of the wheel running through the mid point between the rim flanges.
RIM FLANGE	The edge of a rim that has a larger diameter that the tire bead designed to support the tire.
SINGLE CAP NUT	A cap nut used to secure single wheels or outer dual wheels.
STUD	A threaded bolt that is used with wheel nuts to fasten wheels or rims to a vehicle.
STUD-PILOTED MOUNTING	A wheel mounting system in which location and fastening of the wheel are both accomplished by nuts which fit corresponding studs at each wheel bolt hole..
TIRE BEAD	That surface of the tire which contacts the angled surface of the wheel rim.
TPMS (Active)	Tire Pressure Monitoring System where the vehicle’s air system can automatically correct tire inflation.
TPMS (Passive)	Tire Pressure Monitoring System where driver / Maintenance is notified that tire inflation needs to be corrected.
TORQUE	Rotational force to measure nut tightness.
WHEEL MOUNTING FACE	See “DISC FACE”.
wt.	Abbreviation for weight.

7-2 Wheel Measurement

How to measure minimum dual spacing

Minimum dual spacing measurement is determined by the tire manufacturer and may be obtained from the tire manufacturer's handbook. To determine if the Alcoa dual wheel assembly has adequate minimum dual spacing for the selected tires, double the wheel outset measurement of the Alcoa wheel used. If the doubled outset measurement is equal to or greater than the tire manufacturer's recommendation, there will be sufficient minimum dual spacing. Wheel inset and outset is given for each Alcoa wheel in the Product Spec Guide for Alcoa Wheels. Both inset and outset wheels are measured from the mounting surface of the wheel to the center line of the rim. Maintaining proper tire inflation and load ratings are essential to maintaining proper minimum dual spacing.



8 Conversion Tables

8-1 Inch Fraction, Decimal and Millimeter Equivalents Chart (Up to 1 inch)

INCHES	DECIMALS	MILLIMETERS
1/64	0.016	0.40
1/32	0.031	0.79
3/64	0.047	1.19
1/16	0.063	1.59
5/64	0.078	1.98
3/32	0.094	2.38
7/64	0.109	2.78
1/8	**0.125**	**3.18**
9/64	0.141	3.57
5/32	0.156	3.97
11/64	0.172	4.37
3/16	0.188	4.76
13/64	0.203	5.16
7/32	0.219	5.56
15/64	0.234	5.95
1/4	**0.250**	**6.35**
17/64	0.266	6.75
9/32	0.281	7.14
19/64	0.297	7.54
5/16	0.313	7.94
21/64	0.328	8.33
11/32	0.344	8.73
23/64	0.359	9.13
3/8	**0.375**	**9.53**
25/64	0.391	9.92
13/32	0.406	10.32
27/64	0.422	10.72
7/16	0.438	11.11
29/64	0.453	11.51
15/32	0.469	11.91
31/64	0.484	12.30
1/2	**0.500**	**12.70**

INCHES	DECIMALS	MILLIMETERS
33/64	0.516	13.10
17/32	0.531	13.49
35/64	0.547	13.89
9/16	0.563	14.29
37/64	0.578	14.68
19/32	0.594	15.08
39/64	0.609	15.48
5/8	**0.625**	**15.88**
41/64	0.641	16.27
21/32	0.656	16.67
43/64	0.672	17.07
11/16	0.688	17.46
45/64	0.703	17.86
23/32	0.719	18.26
47/64	0.734	18.65
3/4	**0.750**	**19.05**
49/64	0.766	19.45
25/32	0.781	19.84
51/64	0.797	20.24
13/16	0.813	20.64
53/64	0.828	21.03
27/32	0.844	21.43
55/64	0.859	21.83
7/8	**0.875**	**22.23**
57/64	0.891	22.62
29/32	0.906	23.02
59/64	0.922	23.42
15/16	0.938	23.81
61/64	0.953	24.21
31/32	0.969	24.61
63/64	0.984	25.00
1	**1.000**	**25.40**

8-2 Conversion Factors

Inches to Millimeters

Inches x 25.4 = Millimeters

Millimeters to Inches

Millimeters x 0.03937 = Inches

PSI to kPa

PSI x 6.8948 = kPa

kPa to PSI

kPa x 0.145 = PSI

Pounds to Kilograms

Pounds x 0.4536 = kg

Kilograms to Pounds

kg x 2.2046 = Pounds

Foot-pounds to Newton Meters

Ft-lbs x 1.3558 = N-m

Newton Meters to Foot-pounds

N-m x .73756 = Ft-lbs

NOTES

NOTES

Howmet Wheel Systems
1616 Harvard Avenue Cleveland, Ohio 44105
(800) 242-9898
alcoawheels.com

@alcoawheels facebook.com/alcoawheels alcoawheels youtube.com/AlcoaWheelsNorthAmerica

HOWMET AEROSPACE

Form E37-13584
Printed in USA

Coolant System

Value Proposition

Effectiveness and reliability are the hallmarks of a great cooling system. New Flyer achieves this by continually evaluating our current system against new products and industry know-how. This process, along with quality management and designs that consider component tolerances, creates a truly best value cooling system.

System Overview

The coolant system is a multi component network, with the primary goal of regulating the temperature of the engine and transmission. It has a secondary goal of providing a heat source for warming the passenger cabin and other vehicle components, such as the DEF tank and SCR dosing module. Furthermore, many additional features are included to enhance efficiency, enhance maintainability and enhance ease-of-use.

Equipment

Surge Tanks

Coolant in a vehicle expands and contracts under normal operation. A surge tank is a device that absorbs the excess coolant when at peak volume and feeds it back to the system during the coolant contraction phase.

Xcelsior® offers a stainless steel surge tank as a standard feature, located on the streetside of the engine compartment. This surge tank is cylindrical and vertically mounted, a geometric design that has shown to be beneficial in reducing sloshing, reducing false low coolant alarms and reducing aeration of coolant, which box shaped surge tanks can be prone to. Furthermore, the cylindrical design has shown better resistance to warping by the pressures associated with the operation of a surge tank.

Additional standard surge tank features include a site glass, a coolant level sensor and a low coolant level sensor.

Surge Tank

Hose Types	2807, Manuli NOZ2, Venair
Connection/Fittings/Clamps	JIC Crimped fittings (some reusable), drop tube clamps are Ideal Smartseal
Hose and Line Securement	Clamp-P
Thermal Wrap	On select hoses

Radiator & Transmission Cooler

Hose Types	Venair
Hardlines	Stainless Steel
Connection/Fittings/Clamps	Ideal SmartSeal & WaveSeal
Hose and Line Securement	Stauff blocks, U-bolts & brackets

Coolant Recovery Tank

Hose Types	Venair
Connection/Fittings/Clamps	Ideal Flex-Gear
Hose and Line Securement	P-Clamps
Thermal Wrap	On select hoses

DEF Tank & SCR Dosing Module

Hose Types	Venair
Connection/Fittings/Clamps	Ideal Flex-Gear
Hose and Line Securement	Stauff Blocks, cable Ties/Hellerman clamps, P-Clamps
Thermal Wrap	On select hoses

Radiator & Transmission Cooler

A radiator and transmission cooler (heat exchanger) work together to regulate the operating temperature of the engine and transmission. Depending on the type/model of transmission in the bus, the transmission cooler can be either stand alone, or integrated into the transmission.

An upper and lower rad tube provide the main connection between the radiator, transmission cooler, transmission and engine. The lower rad tube features a 5" diameter expansion section directly below the drop tube. This expansion reduces flow velocity, allowing air from the cabin loop to collect and migrate up the drop tube and into the surge tank, instead of entering the engine water pump.

Coolant Recovery Tank

The coolant recovery tank offers a means to perform coolant level maintenance without breaking the pressure seal of the surge tank. Breaking this seal during operation can have negative long term consequences, as coolant system components need pressure to function properly, avoid cavitation and avoid aeration.

The coolant recovery tank also offers a reserve supply of coolant to the system that is siphoned back upon bus shutdown (cooling), thus periodically and automatically maintaining coolant level.

Lastly, the coolant recovery tank protects against coolant overflowing and spilling out on to the road.

DEF Tank & SCR Dosing Module

To function properly, heat must be provided to the DEF and SCR Dosing module to eliminate freezing. DEF fluid can be prone to freezing, thus a thermal management plan has been implemented.

Booster Pump

A booster pump helps push the coolant through the lengthy coolant system.

Main HVAC

Hot coolant is pumped to the main HVAC unit and front windshield defroster via copper lines that run behind the overhead lighting panels. The HVAC and defroster use this coolant as a heat source to warm the passenger compartment.

Booster Pump Lines

Hose Types	Venair
Hardlines	Copper pipe
Connections/Fittings/Clamps	Ideal Flex-Gear
Hose and Line Securement	Stuaff Block Clamps & P-clamps
Thermal Wrap	On select hoses

Floor Heater Coolant Lines
(applicable only to buses with floor heaters)

Hose Types	Venair
Connection/Fittings/Clamps	Ideal WaveSeal
Hardlines	.75" diameter copper wrapped in insulation and a protective nylon sleeve
Hose and Line Securement	Stauff Blocks & P-clamps

Defroster Lines

Hose Types	Venair
Connection/Fittings/Clamps	Ideal Flex-Gear
Hardlines	.75" diameter copper wrapped in insulation and a protective nylon sleeve
Hose and Line Securement	Stauff Blocks & P-clamps

Main HVAC

Connection/Fittings/Clamps	Brazed & JIC
Hardlines	.875" diameter copper wrapped in insulation
Hose and Line Securement	Stauff Blocks

Hoses, Fittings & Clamp Types

Manuli Hoses

Manuli hoses are constructed from oil-resistant synthetic rubber and reinforced with single high-tensile steel braid. Manuli hoses are known for their high ozone, weather and heat resistant properties. All hose assemblies are skived and crimped with two-piece fittings.

Venair Hoses

Intended for use in vehicle cooling systems, the Venair hoses used in New Flyer cooling systems are constructed from blue VMQ silicone rubber and are reinforced with 4 layers of aramid fabric. An interference fit is used, which improves sealing pressure/ push on force across circumference of the spigot surface.

2807

Highly durable extruded PTFE tube with stainless steel wire braid. Operating temperature Range -73°C to + 260°C. Meets SAE 100R14A.

Ideal SmartSeal

Ideal SmartSeal constant torque clamps exhibit superior sealing compared to traditional worm gear hose clamps. These SmartSeal clamps have excellent band loading and even pressure distribution, creating a uniform high quality seal onto hardlines. A unique trough-shaped design creates higher pressure loading compared to a conventional worm gear design, and increases resistance against potential leaks. The trough shape also helps by penetrating deeper into the house wall due to the narrower cross-section. Outside, chamfered liner edge protects the hose component from cutting.

Ideal WaveSeal

Ideal WaveSeal constant torque clamps exhibit superior sealing compared to traditional worm gear hose clamps. These WaveSeal clamps have excellent band loading and even pressure distribution, creating a uniform high quality seal onto hardlines. The O-ring effect allows the hose to act as an additional spring component. Outside, chamfered liner edge protects the hose component from cutting.

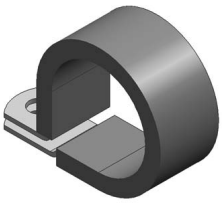
Ideal Flex-Gear CT Clamp

Ideal Flex-Gear clamps have high pressure sealing capability compared to other similar constant torque/ Belleville washer clamps, or standard non spring compensating worm gear clamps. The spring deflection of the Ideal Flex-Gear clamp is significantly greater than other similar constant torque/Belleville washer clamps. The Ideal Flex-Gear clamps have large diameter spring washers and a large spring stack height which allows for a considerable range of spring compensation.

Block Clamps

Block clamps are used extensively to mount and secure hoses throughout the coolant system. New Flyer uses Stauff Twin series PA Polyamide block clamps.

P-Clamps



P-Clamps are widely used throughout the coolant system to restrain flexible hoses and are typically used when a block clamp is not practical. New Flyer uses P-clamps comprised of a stainless steel strap (ASTM A240, SAE AMS 5516) and a full box, high temperature silicon cushion (SAE AMS 3303, Rated -85°F to +401°F).

Heavy Duty Cable Ties & Hellerman Mounts

Releasable lashing cable ties and Hellerman cable mounts are also widely used by New Flyer in the cooling system and are used in much the same way as P-clamps. Generally cable ties and Hellerman mounts are used when ease of serviceability is concerned.

	Heavy Duty Cable Ties	Hellerman Mounts
Material	Weather Resistant Nylon 6.6	Polyamide 6.6 impact modified, heat stabilized, UV resistant
Operating Temperature	-40 F to +239 F	-40 F to +230 F continuous
Flammability	UL94 HB (Horizontal Burn)	UL94 HB (Horizontal Burn)

JIC Fittings

JIC connection fittings on flexible hoses are also used commonly in the Xcelsior® cooling system. Defined by the SAE J514 and MIL-F-18866 standards, JIC fittings are a type of flare fitting machined with a 37-degree flare seating surface. They provide a high quality leak free seal.

Brazing

It is a New Flyer design goal to minimize the total number of brazed connections in the coolant system. When brazing is required, design is taken into account to ensure an appropriate heat sink is present to avoid detrimental heated affect zones (HAZ). Furthermore, design care is taken to ensure sufficient space is provided for clamping surfaces in and around braze beads.

Thermal Wrap

Thermflex® 1210 is a heat treated and saturated sleeve that provides superior protection against conducted and convected heat. Constructed of braided fiberglass, Thermflex® is used to protect components in high temperature areas.

Quality Standards & Testing

Quality

High quality first time assembly is achieved with close adherence to supplier recommended torque and installation guidelines. Quality inspections are conducted on every bus and torque marks are used to ensure all components are installed properly.

Testing

Every Xcelsior® undergoes a coolant system leak test as a check out procedure. The coolant system is pressurized and any leaks or malfunctioning equipment is identified and fixed.

NEW FLYER®

Built to RELY ON:

Switch Box Keypad

CCB-002578

NEW FLYER®

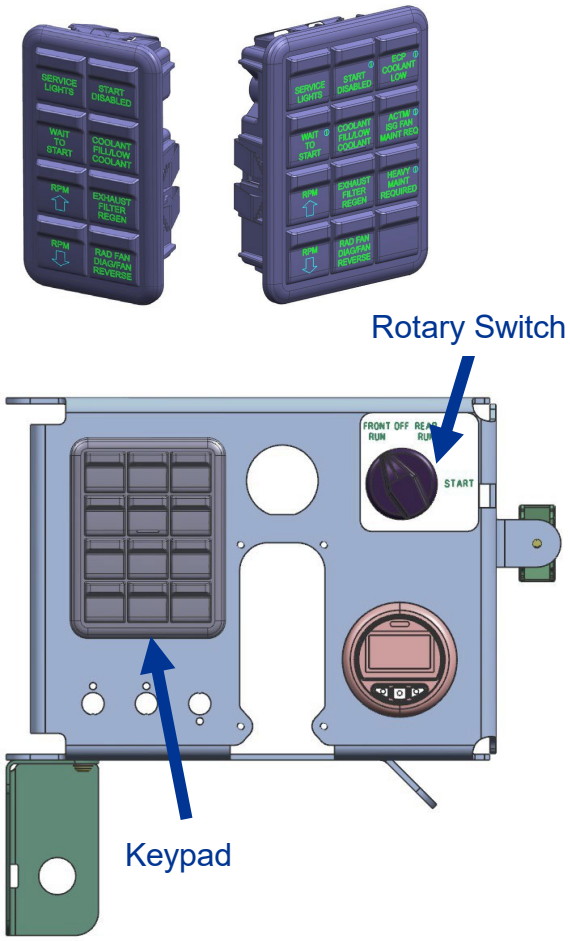
Best Bus Value

A New Flyer Continuous Improvement Initiative to enhance *Best Bus Value* for all of our customers:

- Meeting and exceeding customer expectations
- Providing quality products
- Considering cost effectiveness
- Ensuring due diligence through testing or other data analysis
- Considering the impact to bus weight
- Considering maintainability
- Considering warranty

Overview of New Switchbox

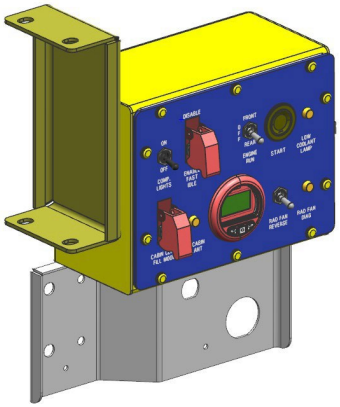
- Replace up to 15 toggle switches and indicators with a network-enabled IP67 rated keypad
- Modular switch box can have other features added on if required
- Replace remote throttle and/or fast idle switch with RPM ↑/↓ buttons
- Includes replacing the start pushbutton and engine run switch with a rotary switch
  - A lock out is available for the rotary switch.



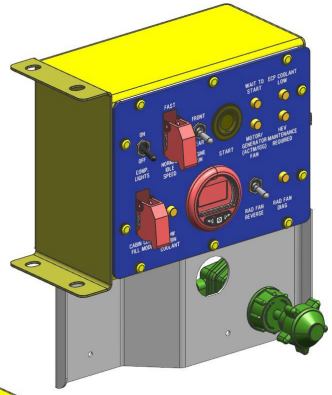
NEW FLYER®

Switch Box Comparison

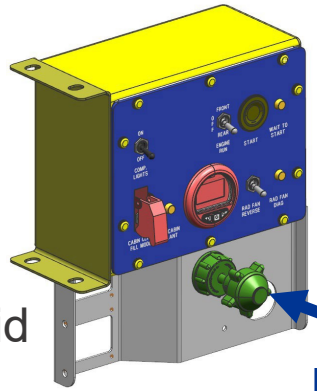
Current Switch Boxes



CNG



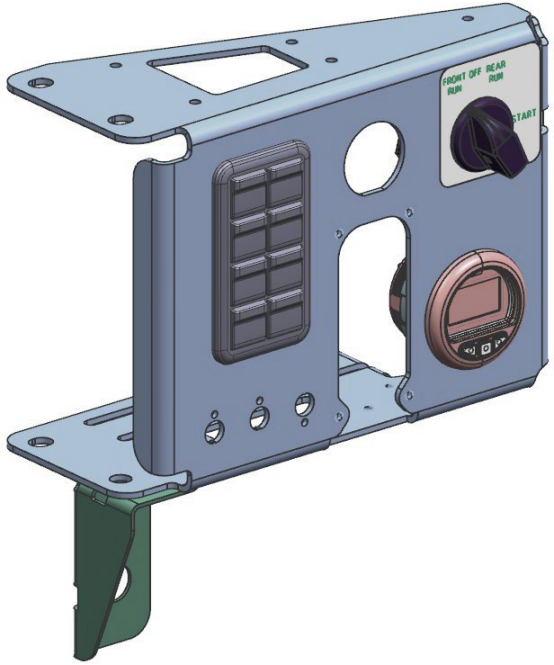
BAE
Hybrid



Diesel/
Diesel Hybrid

Remote Throttle

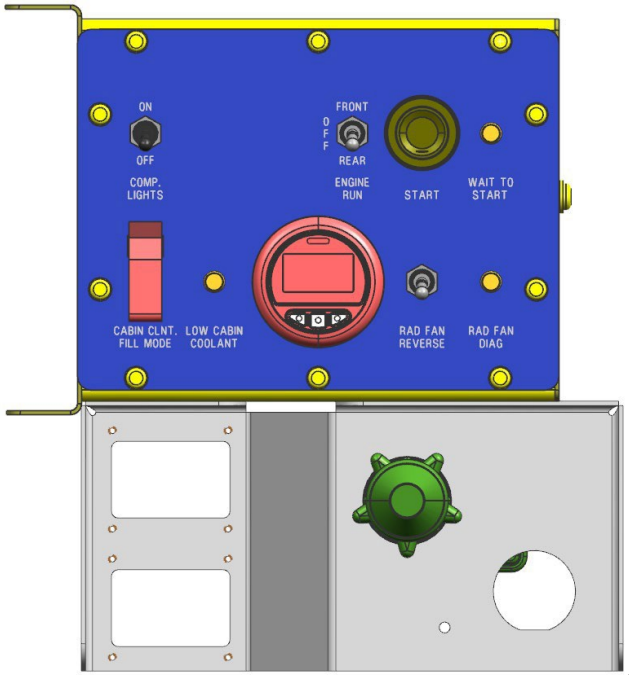
Proposed Switch Box



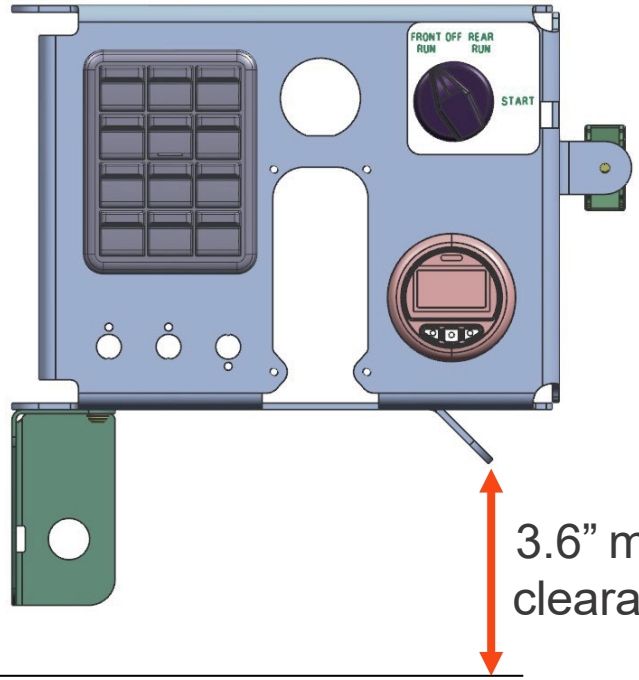
NEW FLYER®

Switch Box Comparison

Current Diesel Switch Box



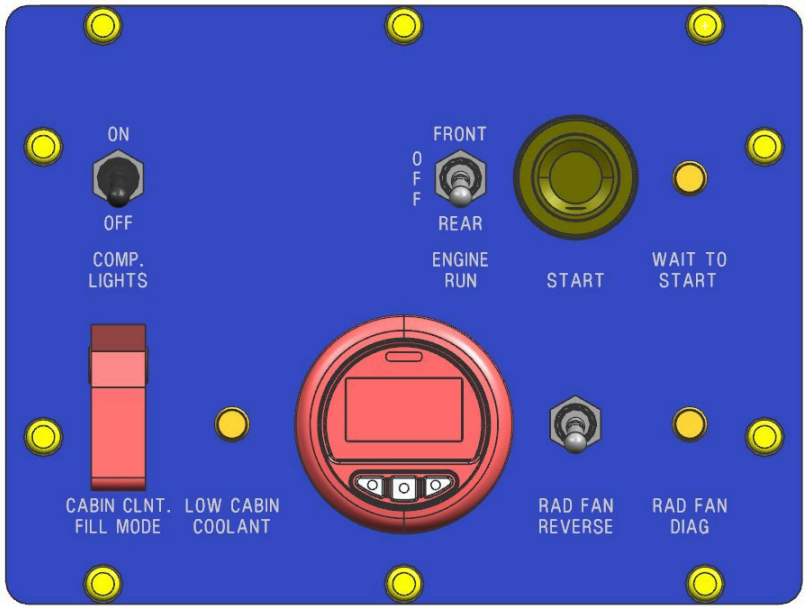
Proposed Switch Box



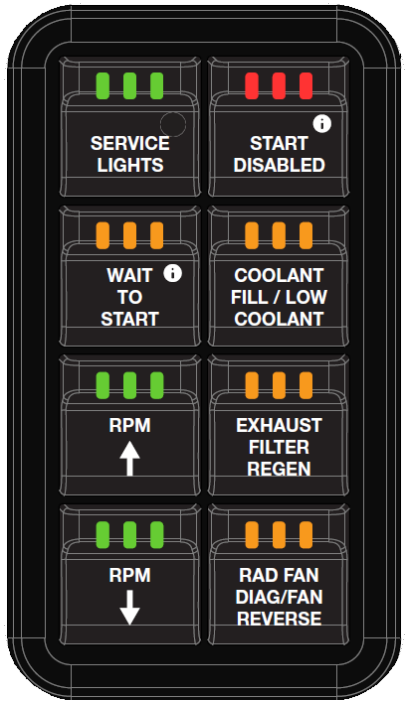
NEW FLYER®

Switch Box Comparison

Current Diesel Switch Box



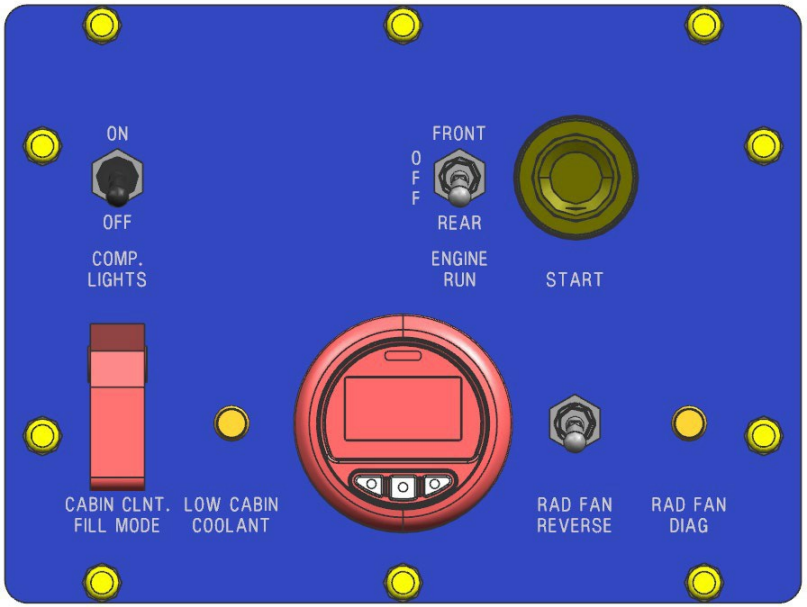
Proposed Diesel Keypad



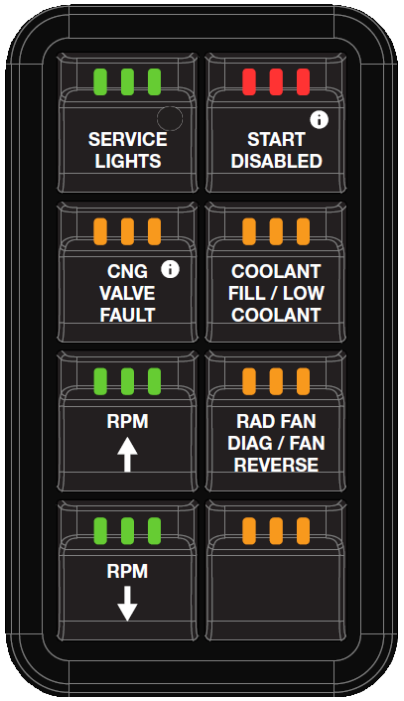
NEW FLYER®

Switch Box Comparison

Current CNG Switch Box



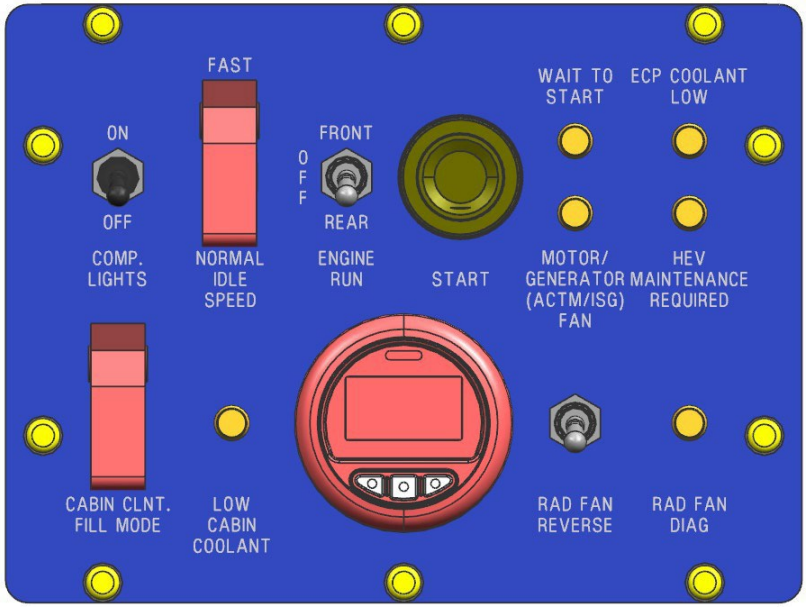
Proposed CNG Keypad



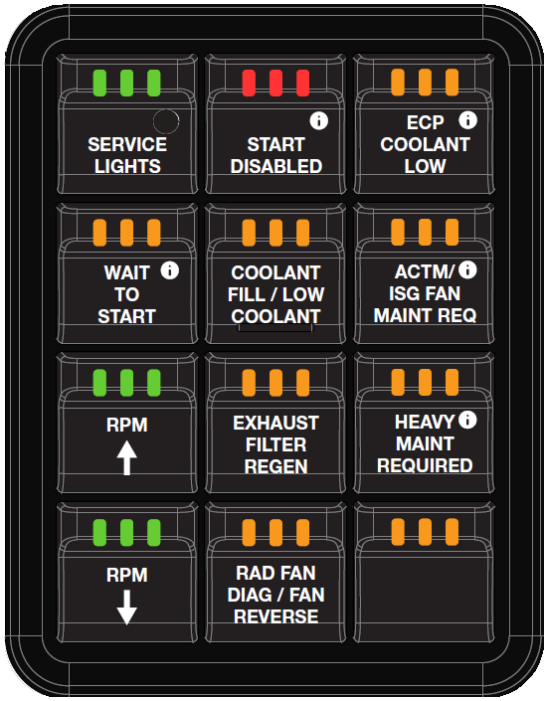
NEW FLYER®

Switch Box Comparison

Current BAE Hybrid Switch Box



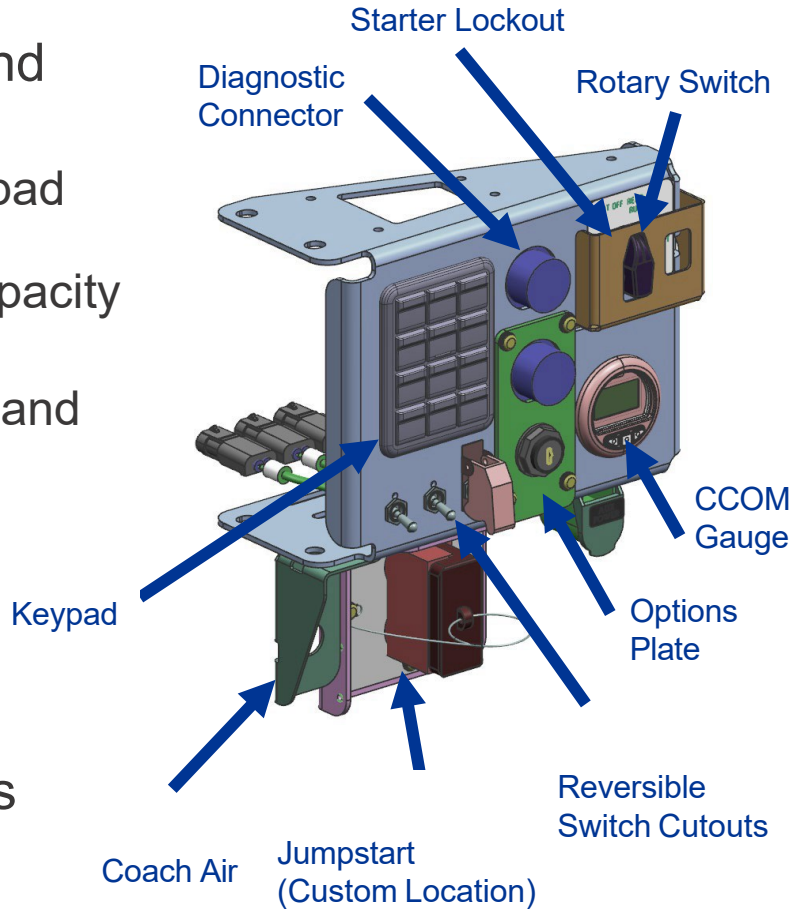
Proposed BAE Hybrid Keypad



NEW FLYER®

Benefits of New Switchbox

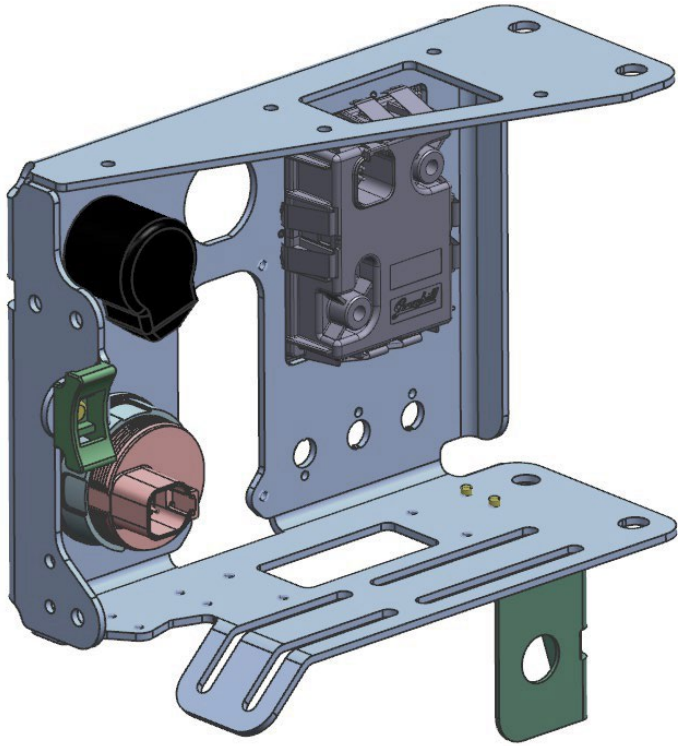
- Increases the capacity for switches and custom features
  - A single J1939 network enabled keypad can replace up to 15 switches and indicators (currently the maximum capacity is 10 switches and indicators)
  - Buttons can combine some switches and indicators further increasing feature capacity
- Reduces weight by 1 lbs.
- Options plate and reversible switches available for property-specific features
- Starter lockout available



NEW FLYER®

Benefits of New Switchbox

- Includes previously custom features as standard where applicable:
  - Engine compartment throttle control
  - Start disabled indicator
  - Exhaust filter regen switch (Diesel and Diesel Hybrid)
  - CNG valve fault indicator
- Provides better access to service/replace switch box components
- Increased access to engine compartment with up to 3.6” more clearance



Compatibility / Maintenance / Warranty

- Uses the same enclosure for all platforms
- The proposed design is not interchangeable with current switch boxes due to programming differences and changes to the body harness
- The keypad warranty is comparable to the warranty on the toggle switches currently used on the switch box
- The keypad is IP67 rated (Washdown14L/min @ 8kPa 80C)
  - Heat and washdown testing was completed to validate that the keypad will hold up in the engine compartment.
  - The switchbox components are sealed against water and dust intrusion.
- Available lock out for the rotary switch to lock out the coach in the OFF position for safety while servicing the coach

Questions?

NEW FLYER®

Built to RELY ON:

Tab 15, Bus Technical Summary

Solicitation Requirements:

N/A

New Flyer Response:

Please see the attached New Flyer **Tab 15a, Bus Technical Summary** for the proposed bus.

Option	Description	Tech Summary Description
100-00	COACH LENGTH	Xcelsior - 40' coach.
100-03	STRUCTURAL MATERIAL	(B),Carbon steel/ferritic sst.
100-04	FUEL TYPE	(B),Diesel, compatible up to 20% biodiesel.
100-05	EPA/ENGINE MODEL YEAR	2024
100-09	DOCKET 90 SPEC	(A),For interior of coach (as per spec).
100-0B	POWERTRAIN CAN BAUD RATE	(B),500kbps.
201-01	FRONT BUMPER	(S),Romeo Rim, three piece, front bumper.
201-03	FRONT TOWING PROVISIONS	(B),Basic set-up, incorporated in front chassis. Tow adapters are required.
201-05	REAR BUMPER	(B),Romeo Rim, three piece, rear bumper with anti-ride feature.
203-01	FRONT AXLE	(B),M.A.N. VOK-07-F, GAWR 15,873 lbs. With disc brakes. Hub mount, Knorr cylinders, Ferodo lining with low copper (<5%) brake pads.
203-02	SECUREMENT OF BRAKE LININGS	(S),Bonded.
203-06	SHOCK ABSORBERS	(S),Koni.
203-07	FRONT STABILIZER BAR	(B),SR specific application is approved by NF Engineering.
203-0A	FRT AXLE AND WHEEL SPLASH APRONS	(A),Full width, fore of axle and wheels. Also, two additional aprons aft of the wheels.
203-0B	RADIUS ROD BUSHINGS	(B),Windowed
204-01	REAR AXLE	(T),M.A.N. 4.56:1. Model HY-1350-F. GAWR 28,660 lbs. With disc brakes, hub mount, Knorr cylinder, Ferodo lining with low copper (<5%) brake pads.
204-03	REAR AXLE GEAR OIL	(B),Synthetic.
204-09	REAR AXLE DRAIN PLUGS	(A),FEMCO magnetic.
204-0A	REAR AXLE MUD FLAP	(B),One aft of rear axle. (Requirement is determined by local climate, ice build-up, high ambient temperature.)
204-0C	REAR WHEEL MUD FLAP	(B),One aft of each rear wheel.
205-01	TIRE SUPPLIER	(A),Customer supplied tires
205-06	WHEELS	(A),Alcoa 22.5" x 8.25" aluminum. Polished Durabright finish.
205-0J	STEERING AXLE TIRES	(B),305/70R/22.5, Michelin X InCity Z (65 mph).
205-0M	REAR AXLE TIRES	(B),305/70R/22.5, Michelin X InCity Z (65 mph).
209-01	POWER STEERING PUMP	(B),Berendsen electric power steering pump. Mounted at the front streetside.
209-02	POWER STEERING HOSES	(B),Gates G2XH
209-03	POWER STEERING DIAGNOSTIC FTGS	(B),At steering box.
209-05	POWER STEERING RESERVOIR	(S),Required.
209-06	POWER STEERING LOW LEVEL FLUID INDICATOR	(A),Required at instrument panel.
209-08	POWER STEERING DRAIN PLUG	(B),Magnetic plug.
209-09	POWER STEERING UNIT	(S),Sheppard M110, power assisted, frame mounted.
209-0A	POWER STEERING SYSTEM FLUID	(B),Dexron III, mineral based.
209-0B	POWER STEERING SENSOR	(B),Hydraulic level sensor required.
219-01	FUEL/PROPULSION SYSTEM	BAE hybrid with B6.7 diesel engine.
219-02	PROPULSION,HP,TORQUE, TYPE	(S),Cummins B6.7 2021 emissions-standard diesel engine, 280 horsepower (Engine output is controlled by Hybrid Drive). Refer to 100-05 for EPA/Engine Model Year.
219-05	AIR COMPRESSOR	(A),Direct coupled air compressor powered by electric motor.
219-06	AIR COMPRESSOR HIGH VOLTAGE INTERLOCK SWITCH	(B),Not Required, Junction box provided with tamperproof hardware.
219-09	CUMMINS DIESEL FUEL FILTERS	(B),For ISB's, Cummins primary and secondary fuel filter system. the primary filter has a priming pump.

Option	Description	Tech Summary Description
219-0B	CUMMINS DIPSTICK, LOCATION	(S),Static oil level indicator, on curbside of engine.
219-0C	ENGINE & TRANS FLUID FILL TAGS	(S),For engine and transmission dipsticks.
219-0D	ROAD SPEED	(A),Top road speed is governed. Set at 60 MPH (97 KPH).
219-0H	HYBRID DRIVE START/STOP	(S),Shuts off and restarts engine automatically to reduce idling at stops.
219-0J	BAE DRIVE MODES, SWITCH LOCATION	(A),Shuts engine off with input/switch on side console, light up, allows operation for short distances (<500 yards at speeds < 15 mph).
219-0M	TRANSMISSION/HYBRID DRIVE/TRACTION MOTOR	(T),As per Gen 3 BAE hybrid system, GPM-12.
219-0P	TRANSMISSION SHIFTING	(S),Foot on brake enables shift when in neutral.
219-18	FLUID, TRANS/HYBRID DRIVES	(B),Dura Drive HD synthetic
219-1A	ENG/TRANS OIL DRAIN PLUGS	(A),ETTCO/FEMCO for engine and transmission.
219-1C	AIR CLEANER	(B),Donaldson. Reusable housing with disposable cartridge/filter.
219-1D	AIR RESTRICTION INDICATOR	(B),Mechanical gauge mounted directly on air intake tube.
219-1E	EXHAUST SYSTEM	(S),Single module DPF/SCR combined.
219-1F	EXHAUST TAIL PIPE ORIENTATION	(B),Curved pipe set to 45 degrees to streetside.
219-1G	EXHAUST BLANKETS FOR CUMMINS DIESEL OR CNG	(B),Provided for the exhaust tubes.
219-1H	EXHAUST REGEN SWITCH LOCATION	(A),Single switch in destination sign panel required.
219-1U	ENGINE/PROPULSION SWITCH BOX	(B),Basic indicator configuration with run/start switch.
219-1W	ENGINE SPEED CONTROL AT SW BOX	(B),Keypad button (controls engine RPM).
219-22	ENGINE COMPT GAUGES	(S),Programmable CAN communicator. Standard Features: Engine Oil Pressure, Engine Water temperature, Tachometer, 12V/24V battery voltage, Hour Meter, Exhaust Temp, Active Faults, Drivetrain Specific features.
219-25	ENG SWITCHBOX KEYPAD	(B),Includes service light, fan reverse and coolant fill switches and start disabled, wait to start, low coolant, ECP coolant low and HEV maintenance required indicators.
219-27	ENGINE OIL FILL TUBE & CAP	(B),Basic Cummins supplied.
219-2E	BELT GUARD	(B),The engine pulley guard hinged to open curbside. Yellow powder coated.
219-2F	BELT GUARD LATCHING	(B),SST adjustable draw latch.
219-2H	OIL SAMPLING	(A),Required for engine, using KST probalizer fitting.
219-2J	OIL SAMPLING, EASY ACCESS	(A),For engine probalizer fitting located at street side engine strut.
219-2K	DEF(DIESEL EXH FLUID) TANK	(B),Manual fill is set in the lower curbside fusebox access door with NFIL fill cap.
219-2U	HYBRID DEPOT DRIVE	(A),Required
219-2Z	COOLANT PRESSURE FILL HOSE	(B),Gates G2XH.
219-31	DIESEL HYBRID AUTO SHIFT TO NEUTRAL	(B),Immediately shifts to neutral when propulsion system is selected in range and the parking brake is applied. Also, after a 5-minute delay, whenever the exit door brake interlock is applied.
231-02	RADIATOR,CAC,HYDR FLUID COOLER	(B),EMP MH5 GEN4 with full diagnostic capabilities. 3 x 15" fans and 2 x 11" fans. Includes hybrid WEG cooler.
231-04	RADIATOR REVERSE FAN SW & DIAG LAMP	(B),Keypad button.
231-06	SURGE TANK	(B),5 gallon cylindrical SST tank.
231-08	SURGE TANK ENG MAINT & DERATE SENSOR MFR	(A),Veritech
231-09	SURGE TANK PRESSURE TEST PORT	(B),Schrader valve fitting provided.

Option	Description	Tech Summary Description
231-0A	SURGE TANK PRESSURE RELIEF VALVE	(B),Radiator cap (LEV-R VENT), built into surge tank cap.
231-0B	SURGE TANK SIGHT GLASS	(B),Graduated sight glass (glass material).
231-0C	RAD TUBES	(S),SST.
231-0F	COOLANT FLUID/ANTIFREEZE	(A),ES COMPLEAT 50/50 distilled water & propylene glycol premix plus corrosion inhibitors.
231-0G	TRANSMISSION/HYBRID DRIVE COOLER	(S),Built into rad for BAE hybrids with external pump.
231-0J	TRANSMISSION/HYBRID DRIVE COOLER PUMP	(S),AMETEK pump.
231-0K	COOLANT RECOVERY TANK	(B),required.
241-01	DIESEL FUEL TANK MATERIAL	(B),Cross-linked polyethylene.
241-02	DIESEL TANK CAPACITY AND FILL TYPE	(B),100 useable US gallons. Pressure filled.
241-03	DIESEL FILLER CAP	(B),Posi-snap flip type.
241-04	DIESEL FUEL SENDER	(S),Required.
241-05	DIESEL FUEL LEVEL INDICATION	(A),Gauge on instrument panel LCD screen, and uses indicator at the instrument panel cluster.
241-07	DIESEL FUEL HOSES,ENGINE COMPT	(S),GH100.
241-08	DIESEL FUEL LINES,TANK TO BULKHEAD	(S),Orange, fuel grade nylon tubing.
246-01	AIR COMPRESSOR DISCHARGE LINE	(S),Teflon 2807 SST braided hose.
246-02	BASIC AIR TANKS	(B),Combo Tank 1 (Wet Tank + Primary Brake Tank), Combo Tank 2 (Front Axle Kneeling Tank + Accessory Air Tank), Secondary Brake Tank.
246-04	AIR TANK DRAIN VALVES	(B),Manual 1/4 turn valve.
246-06	WET TANK DRAIN VALVE	(B),Manual 1/4 turn valve.
246-09	RIDE HEIGHT SENSORS	(A),Barksdale mechanical leveling valves.
246-0A	RIDE HEIGHT SETTINGS,NORMAL	(B),Front ride height is 4.0" axle to bump stop.
246-0E	DOOR INTERLOCK	(B),Applied to entrance and exit doors. Foot on brake to release interlock, applied via multiplex system programming.
246-0F	FRONT AIR SPRING ISOLATION	(S),With pressure switch.
246-0G	DRIVER'S PARK BRAKE ALARM	(A),A switch in the driver's seat cushion triggers the kneeling alarm to alert the driver that the park brake is not set. A light at the instrument panel is also activated.
246-0H	PARK BRAKE PRESSURE SETTING	(S),40 psi auto-apply park brake valve. 60 psi pressure switch for park brake light activation.
246-0K	AIR DRYER	(A),Graham White QBA60NX5
246-0M	AIR DRYER LOCATION	(B),Behind the rear streetside wheelhouse, on the bulkhead.
246-0U	PARK BRAKE ACTUATION	(B),Pull To Apply.
246-0V	PARK/EMERG BRAKE LOCATION	(S),On side console panel.
246-13	FRONT TOW CONNECTOR	(A),Male 1/4" NPT with Series 10 coupler and 0.56" hex fitting.
246-14	FRONT AIR CONNECTOR ARRANGEMENT	(B),Located below the bumper, streetside.
246-15	FRONT AIR CHARGE CONNECTOR	(A),Male 1/4" NPT with Series 10 coupler and 0.56" hex fitting.
246-17	REAR AIR CHARGE CONNECTOR TYPE	(A),Male 1/4" NPT with Series 10 coupler and 0.56" hex fitting.
246-1B	FLEXIBLE AIR LINES	(S),Synflex colour coded. Green: rear service brakes and supplies. Red: front service brakes. Brown: parking brake. Black: accessories and brake hose. Yellow: compressor and governor. Blue: suspension.
246-1E	ABS	(S),Wabco.
246-1F	TRACTION CONTROL	(B),Wabco system, to reduce drive wheel overspin.

Option	Description	Tech Summary Description
246-1J	FRONT CHARGE AIR ROUTING	(B),Direct charge to wet tank.
246-1K	REAR CHARGE AIR ROUTING	(B),Direct to air dryer, connected after air dryer.
246-27	AIR SYSTEM TRANSDUCER FAULT DETECTION	(B),Transducer Fault Detection - Transducer voltage falls to 0V if transducer failure occurs.
246-NEW	SPECIAL INCLINE LEVELLING FEATURE	(T),Guarded switch provided on side console to enable customer specific incline levelling feature.
260-01	BATTERY MANAGEMENT	(B),Transtech regulator w/Low Voltage Disconnect, temperature and current sensors to optimize battery life.
260-02	BATTERY VOLTAGE REGULATOR	(B),Transtech REG24C w/J1939 and data logging.
260-03	BATTERY VOLTAGE REGULATOR LOCATION	(B),Mounted inside fuse box.
260-04	BATTERY TYPE / MFR	(A),Two East Penn 8D Absorbed Glass Matt (AGM) maintenance free batteries. 1450 CCA. Drop posts: 3/8" positive, 3/8" negative.
260-05	BATTERY CABLES	(S),Red heat shrink on 24 volt positive cable end and light blue heat shrink on 12 volt positive cable end.
260-09	BATTERY TRAY	(S),Slide out battery acid resistant polyethylene enclosure with SST sub frame, SST bearings and rubber isolation mounts. Located aft of the curbside rear wheelhouse. Note: battery access door opens to the side.
260-0C	POSITIVE BATTERY DISCONNECT SW	(B),Required with quick access through flip-open door. Uses a micro-switch for propulsion shutdown.
260-0E	BATTERY VOLTAGE EQUALIZER	(B),Vanner 100 amp.
260-0F	JUMP START MANUFACTURER/TYPE	(A),ANDERSON SB350 RED
260-0G	JUMP START LOCATION	(B),Mounted on underneath side of fusebox, accessible via the DEF fill access door.
260-0Y	BAE ELECTRONIC COOLING PACKAGE (ECP)	(B),EMP cooler with Ametek pump for propulsion control and accessory power system.
260-0Z	BAE ENERGY STORAGE SYSTEM (ESS)	(B),3G-32K (Next Gen)
260-10	ACCESSORY POWER SUPPLY	(E),BAE MAPS-2DM3A 2 APC (200 Amp @ 28V DC each). 3 API (17.5 KW at 230 V 3-Ph AC each). XDE40/35 with electric accessories for use with Gen 3.
260-15	ROOF FAIRING / SKIRTS ENCLOSURE	(S),Fairing with full length skirts for XDE's.
260-1B	BATTERY VOLTAGE EQUALIZER QUANTITY	(B),One
269-01	P.A. AMPLIFIER MFR / TYPE	(A),Included with AVA or AVL system.
269-0C	GOOSENECK MICROPHONE	(B),REI, approximately 30" long from base to end of microphone. Black neck and head.
269-0D	GOOSENECK MICROPHONE LOCATION	(B),Inverted, clipped to the A-pillar. Microphone clip is 15.26" from bottom of destination sign closeout panel.
269-0E	GOOSENECK MICROPHONE SWITCH	(A),Foot switch.
269-0G	INTERIOR SPEAKER MFR	(B),TCB
269-0H	PRIMARY INTERIOR SPEAKERS	(T),Six: All six mounted to light panels.
269-0K	EXTERIOR SPEAKERS,LOCATION	(B),At basic location above entrance.
269-0M	EXTERIOR SPEAKER MFR	(B),Shekonic
269-0N	EXTERIOR SPEAKERS,LOCATION, RR	(A),Additional location above curbside exit door.
269-0Z	PRIMARY PA SYSTEM	(A),To AVA/AVL System
269-13	EXTERIOR SPEAKER QUANTITY	(A),Two

Option	Description	Tech Summary Description
269-14	EXTERIOR SPEAKERS, LOCATION, REAR, MFR	(B),Shekonic
269-1E	EXTERIOR SPEAKER COIL	(B),Single coil.
273-01	HEADLIGHTS	(S),NFIL Xcelsior LED low beam and high beam headlights.
273-02	DAY RUN HEADLIGHTS	(B),Required.
273-03	FRONT TURN SIGNALS	(S),NFIL amber LED. Integrated with headlight assembly.
273-06	TAIL LIGHT ARRANGEMENT	(B),Amber, red (stop/tail), red (stop/tail), white.
273-07	TAIL LIGHTS	(B),4" Dialight LED, grommet mounted.
273-08	CENTER STOP / DECELERATION LIGHT SIZE	(B),18" X 1 " Dialight
273-09	WHITE BACK-UP LIGHT	(B),4" Dialight LED, grommet mounted.
273-0A	STOP LIGHTS ON WITH RTRDR/REGEN BRAKE	(B),Required.
273-0B	STOP LIGHTS ON WITH PARK BRAKE OR INTERLOCK	(S),When park brake or interlock are engaged.
273-0E	CENTER STOP / DECELERATION LIGHTS QTY	(A),Two
273-0F	CENTER STOP / DECELERATION LIGHTS LOCATION	(B),At lower edge of rear crown panel.
273-0H	SIDE TURN SIGNALS,TYPE / QTY PER SIDE	(B),2 amber Dialight LED Lamps, 12 volt.
273-0J	SIDE TURN SIGNAL FUNCTIONALITY	(B),Single intensity, Dialight LED lamps.
273-0K	SD TURN SGNL GUARD BRKT, MATERIAL/CTG	(B),Aluminum, painted per paint scheme.
273-0M	CURBSIDE TURN SIGNALS LOCATION	(B),Lamps are aft of front and fore of rear wheelhouses.
273-0N	STREETSIDE TURN SIGNALS LOCATION	(B),Lamps are fore of all wheelhouses.
273-0P	KNEELING/RAMP LIGHT AT ENTRANCE	(S),2.5" Dialight LED.
273-0T	MARKER / CLEARANCE LIGHTS	(B),Dialight LED without guard all around.
273-0V	REFLECTORS	(B),Self-adhesive decals installed at NFIL basic positions.
273-0W	REAR LICENCE PLATE LIGHT	(B),Smartrend LED.
273-10	TIMED SHUT-OFF,ENTR AREA LIGHTS	(B),The program is set to shut the lights off when the door closes.
273-12	TIMED SHUT-OFF,EXIT AREA LIGHTS	(S),The program is set to shut the lights off five seconds after the door closes.
273-1F	CENTER STOP / DECELERATION LIGHTS COLOR	(B),Red
273-1G	CURBSIDE CORNERING LIGHTS	(A),One curbside lamp located forward of the rear axle.
273-1R	MARKER / CLEARANCE LIGHTS FUNCTIONALITY	(B),New Flyer standard marker/clearance light functionality to meet applicable FMVSS/CMVSS regulations.
273-23	MARKER LIGHTS LOCATION	(B),New Flyer standard marker light locations to meet applicable FMVSS/CMVSS regulations.
273-25	EXTERIOR LIGHTS	(B) Day Run, Night Run, and Night Park modes illuminate the tail lamps, marker/clearance lamps, and license plate lamp. Mandatory for Canadian customers.
273-26	CENTER STOP/DECELERATION LIGHT FUNCTIONALITY	(B),Basic stop functionality.
273-27	CENTER STOP/DECELERATION LIGHT VOLTAGE	(B),12 Volts

Option	Description	Tech Summary Description
277-02	INTERIOR PASSENGER LIGHTING	(B),NFIL LED, 24 VDC.
277-04	INTERIOR LED LIGHT FUNCTIONALITY	(B),First bank of lights (at 0% pre-set) on each side turn on when entrance door is opened and off when door is closed.
277-07	EXIT BASEPLATE / ELEC PNL ACCESS	(B),At each exit door, NFIL set-up, through removable ad frame.
277-0B	TINTED LED PASSENGER LIGHT COVERS	(B),White for all lights.
277-0C	FAREBOX LIGHT	(B),One fixed LED light.
277-0F	DRIVER'S LIGHT	(B),One sealed 2.5" white high output Smartrend LED light.
277-0K	SDS SERVICE LIGHT	(B),One LED lamp, provided at upper front of SDS enclosure.
277-0M	SDS SERVICE LIGHT SWITCH CONTROL	(B),With switch.
277-0N	PROPULSION COMPARTMENT LIGHTS	(B),Smartrend, four 1.38" LED lights.
277-0V	REAR DECK STEP LIGHT	(B),LED.
277-0W	INTERIOR DOOR HEADER LIGHTS, ANTI-GLARE SHIELD COLOR	(B),LED strip light (approx 18" long) provided above doors. With black anti-glare shield.
277-0Y	INTERIOR DOOR HEADER LIGHTS/ QUANTITY (ENTRANCE)	(B),Single strip.
277-11	INTERIOR DOOR HEADER LIGHTS/ QUANTITY (EXIT)	(B),Single strip.
277-13	EXIT AND ENTR MECH BOX SERVICE LIGHTS	(A),Smartrend LED with switch, at basic locations.
277-14	EXIT AND ENTR MECH BOX SERVICE LIGHTS QUANTITY	(A),1 at entrance, 1 at each exit door.
277-18	SIDE CONSOLE COMPT SERVICE LIGHT	(A),Smartrend LED light.
277-19	SIDE CONSOLE COMPT SERVICE LIGHT WITH SWITCH	(A),Switch mounted with lamp assembly.
277-1A	REAR PLC AND FUSEBOX SERVICE LIGHTS	(S),Provided, LED.
277-1T	FRT DEST SIGN COMPT SERVICE LIGHT	(A),LED light with switch.
277-29	SIDE CONSOLE COMPT SERVICE LIGHT MOUNTING LOCATION	(B),Front Structure
277-2B	CURBSIDE FORWARD HVAC DUCT ORIENTATION ON LIGHT PANEL	(B), Duct fixed pointed towards the aisle.
280-01	PASSENGER SIGNAL CHIMES	(B),One basic electronic chime above driver. Chime has single tone which sounds once for regular activation, twice for wheelchair positions.
280-03	PASSENGER SIGNAL PULLCORDS	(B),Yellow cords are required.
280-07	HORIZONTAL PASSENGER SIGNAL PULLCORDS	(B),Set at NFIL designated basic height. All decks.
280-09	LWR DECK VERT PULLCORDS	(A),Three: two at first and second streetside pillars and one at second curbside pillar forward of the face of the upper deck.
280-0D	SECUREMENT OF VERTICAL PULLCORDS	(B),Looped or clamped to the horizontal depending on the location.
280-0T	PASSENGER SIGNAL TYPE AT WHEELCHAIR POSITIONS	(A),Push button mounted directly to the seat bottom.

Option	Description	Tech Summary Description
280-0U	PUSH BUTTON SIGNAL AT WHEELCHAIR POSITIONS	(T),Blue push button in blue casing with wheelchair symbol mounted directly to the seat bottom on both CS & SS.
280-0V	PUSH BUTTON SIGNAL AT EXIT	(T),Mounted facing aisle on stanchion fore of exit, old LFR style square non-recessed button.
280-0W	PUSH BUTTONS,VERT AND SEAT STANCHIONS	(T),Six aisle facing push buttons, four on streetside and two on curbside, old LFR style square non-recessed buttons.
280-0Y	PUSH BUTTON SIGNALS,FRT W/HOUSE STANCH	(T),C/S and S/S stanchions aft of the wheelhouse, 42" from floor to bottom of switches. Aisle facing, old LFR square non-recessed buttons.
280-18	EXIT/ENTRANCE DOOR CHIME	(B),Not required.
284-01	ELECTRONIC CONTROL SYSTEM	(S),Vansco.
284-02	SYSTEM VOLTAGE	(S),24 VDC primary, 12 VDC secondary.
284-03	SWITCHES	(S),Water resistant.
284-04	SPARE INPUT/OUTPUT PORTS FOR MULTIPLEX SYSTEM MODULES	(S),Minimum 10% input and 10% output, per electrical panel location.
284-06	HAZARD WARNING LIGHTS	(B),Front, side and rear lights flash for hazard warning.
284-0B	SDS ELECTRICAL PANEL ORIENTATION	(B),Facing streetside.
284-0D	SDS ELECTRICAL PANEL LOCATION	(B),Mounted on backside of SDS rack.
284-0F	ENTRANCE DOOR CONTROLLER	(A),Extended with 5 position settings.
286-01	INSTRUMENT PANEL	(B),LCD touch display screen. Acrylic material with luminescent lighting, with Vansco Instrument Panel Cluster module.
286-02	SHIFT SELECTOR LOCATION	(S),Located on instrument panel.
286-03	EXTERIOR LAMP TEST	(B),Simultaneously depress both turn signals.
286-04	SPEEDOMETER	(B),part of Vansco instrument panel cluster. Set to display miles. With odometer (the display can be toggled to show Trip1, Trip 2, engine hours).
286-05	AUDIBLE SOUND FOR TURN SIGNALS/HAZARDS	(B),Using click sound for turn signal and for hazard warning.
286-06	BRAKE/ACCELERATOR INTERLOCK DEACTIVATED WARNING	(A),provided by audible alarm and separate red warning lamp on instrument panel. (Must have in California.)
286-0C	REGENERATIVE BRAKE DISABLE SWITCH LOCATION	(A),Inside destination sign compartment.
286-0D	SILENT ALARM	(A),required.
286-0F	SILENT ALARM SW LOCATION	(A),On vertical face of the side console.
286-0P	DIAGNOSTICS PLUG LOCATIONS	(B),Under the front dash (left of the steering column), at fwd face of the SDS barrier (above driver) and at the engine switch box and one BAE diagnostic connector at fwd face of the SDS.
286-0T	AUXILIARY POWER PLUG, 12VDC LOCATION	(A),Auxiliary power plug at forward face of the SDS barrier (above driver).
286-0V	SWEEPER LIGHT SWITCH	(A),required.
286-0Y	SWEEPER LIGHT SWITCH LOCATION	(A),required in the side console.
286-1W	DRIVER'S SEAT BELT ALARM LOCATION	(A),Indicator light on IP panel with audible buzzer.
289-01	SECUREMENT OF HARNESSES	(B),Hellerman tyton clamps, with Panduit releasable cable ties.
296-01	WIRING DECAL,REAR PLC AND FUSEBOX	(S),Provided, laminated.
296-02	WIRING DECAL,SIDE CONSOLE	(A),Laminated, secured on underside of curbside equipment box.
296-07	SIDE CONSOLE DOOR DECAL LANGUAGE	(B),English

Option	Description	Tech Summary Description
298-01	WATER TEST DURATION	(A),20 minutes.
298-02	WATER TEST DURATION A/C	(B),Water Test with A/C on
304-01	EXTERIOR PAINT TYPE	(S),Axalta Imron Elite high solids polyurethane.
304-02	EXTERIOR PAINT CLEARCOAT	(A),Required.
304-06	HIGH VOLTAGE SAFETY DECALS	(S),Required.
304-07	CORROSION PROTECTION	(B),grit blasted frame, moisture cure zinc-rich primer (applied for 12 year protection), anti-chip undercoating, corrosion preventive coating sprayed inside frame tubes up to roof line.
304-09	EXTERIOR LOGOS,NFIL	(B),NFI logos and Xcelsior logos in standard locations.
304-0A	EXT DECALS,CUSTOMER SPECIFIC	(A),Required. Customer to provide the Engineering paint group with specific requirements.
304-0D	INTERIOR DECALS, CUSTOMER SPECIFIC	(A),Required.
304-0E	PASSENGER COMPARTMENT DECAL LANGUAGE	(T),English / Spanish / Chinese / Tagalog. Passenger compartment decals are the decals within the area of the coach designed for the seating of passengers and that are intended primarily for passenger viewing.
304-0F	INTERIOR FLEET NUMBER DECALS	(B),Required.
304-0G	MAINTENANCE DECAL LANGUAGE	(B),English. Maintenance decals are the decals that will be referenced primarily when performing maintenance on the coach.
304-0H	KNEELING / RAMP DECALS	(T),Not required.
304-0J	AIR TANK DECALS	(B),NFIL basic.
304-0M	EXT FLEET NUMBERS,NON-ROOF	(B),Required (reflective).
304-0N	EXTERIOR FLEET NUMBERS,ROOF	(A),Required (reflective).
304-0U	HYBRID SAFETY DECALS	(B),Required.
306-02	FIRE EXTINGUISHERS	(B),5 lb ABC class. With gauge, hose and mounting bracket. UL compliant for US customers.
306-03	FIRE EXTINGUISHER LOCATION	(A),Inside the curbside equipment box.
306-05	SAFETY TRIANGLE LOCATION	(A),In equipment box on curbside luggage rack.
350-01	DRIVER'S PEDALS, POSITION / TYPE	(E),Pedals adjustable fore/aft. Brake pedal angle set at 45 degrees from pedal to floor. Throttle pedal angle set at 45 degrees from pedal to floor.
350-04	BRAKE VALVES	(S),E6.
350-07	TURN SIGNAL SWITCHES	(B),Basic switches, floor mounted.
350-08	DIMMER SWITCH	(B),Foot switch located beside side console panel.
350-0C	P.A. SYSTEM SWITCH	(T),Foot switch located on the top of the turn signal switches.
350-0D	HAZARD WARNING LIGHT SW LOCATION	(B),On side console.
350-0G	STEERING COLUMN	(B),Douglas Autotech with tilt and telescopic features.
350-0H	STEERING WHEEL	(B),2 spoke, 18" diameter hard padded.
350-0M	DUAL HORN	(B),Provided with splash shield.
400-01	JACKING / LIFTING PADS	(B),4" diameter round pads at front and rear chassis.
420-02	EXTERIOR SIDE PANELS	(S),Fiberglass.
420-05	CURB & STREET SIDE ENG COMPARTMENT, SIDE CONSOLE ACCESS DOORS, STRUTS	(B),Supported by gas struts.
420-06	CURB & STREET ENG COMPARTMENT, BATTERY DOORS, LATCHES	(B),Quarter turn chrome plated 5/16" square key latches. Also, used for the separate battery access door.
420-07	CURBSIDE PROPULSION COMPARTMENT DOOR	(T),Includes battery disconnect switch access door (using a gas strut) and a DEF manual fill access door. SFMTA specific door with 1" additional clearance at bottom edge.
420-09	DEFROSTER ACCESS DOOR LATCHES	(B),4 quarter turn chrome plated 5/16" square key latches.

Option	Description	Tech Summary Description
420-0A	STREET SIDE ENGINE (RADIATOR) ACCESS DOOR	(B),With wavy screen.
420-0B	BATTERY COMPARTMENT DOOR	(B),Solid door located aft of the curb side rear wheel, separate from the engine/propulsion compartment.
420-0C	DIESEL FUEL FILL DOOR	(B),Basic hinged door located forward of the curbside rear wheelhouse.
420-0D	SURGE TANK DOOR	(B),Basic hinged door.
420-0F	SIDE CONSOLE DOOR LATCHES	(B),Quarter turn chrome plated 5/16" square key quad latches.
420-0G	PROPULSION DOOR	(B),Screened door with built-in handle.
420-0H	PROPULSION DOOR STRUTS	(B),Two, the streetside strut has a locking mechanism.
420-0J	PROPULSION DOOR LATCHES	(B),Quarter turn chrome plated 5/16" square key quad latches.
420-0M	REAR LICENSE PLATE RETENTION	(B),Centered with bottom retainer and two upper inserts.
420-0N	ENGINE DOOR PROXIMITY SWITCH	(B),Required on Curb Side.
420-0P	RAIN GUTTER	(S),0.44" cross section bonded.
420-0R	ROOF HATCH INSTRUCTION LANGUAGE	(B),English.
420-0T	ROOF HATCH SIZE,FRONT	(B),24" X 24"
420-0U	ROOF HATCH TYPE,FRONT	(B),Basic hatch/vent.
420-0V	ROOF HATCH VENDOR,FRONT	(B),Transpec Worldwide.
420-15	ROOF HATCH SIZE,REAR	(B),24" X 24"
420-16	ROOF HATCH TYPE,REAR	(B),Basic hatch/vent.
420-17	ROOF HATCH VENDOR,REAR	(B),Transpec Worldwide.
420-1B	WIPERS	(A),Sprague motors 24 volt electric with Sprague wet arm wipers. Intermittent.
420-1E	WINDSHIELD WASHER BOTTLE	(B),5 US gallon with electric powered pump mounted using 4 weld nuts.
420-1F	WINDSHIELD WASHER FILL LOCATION	(S),Accessed via a flip-out door built into the exterior side console access door.
420-1G	LOWER DRIVER'S VENT	(B),Provided.
420-1H	FENDERS	(B),Molded polyurethane.
420-1K	S1 WHEEL GUARDS	(A),Required on curbside forward of rear axle.
420-1M	EXTERIOR UPPER REAR	(B),Fiberglass panel with no door and no window.
420-1T	FRONT LICENSE PLATE LOCATION	(A),On street side of defroster door.
420-1U	FRONT LICENSE PLATE RETENTION	(B),Four inserts.
420-24	WIPERS, MOTOR ARM LENGTH	(B),34" long arm
420-25	WIPERS, WIPER BLADE LENGTH	(B),26" long blade
420-26	WIPERS, SPRAY STREAMS PER ARM	(B),2 streams per arm
420-2B	DRIP EDGE FOR REAR CROWN PANEL/HVAC DOOR	(B),Drip Edge along the bottom edge of the Rear Crown Panel/HVAC door to divert water entering the engine/propulsion compartment.
420-2C	SS REAR UPPER CORNER PILLAR VENTING	(B),4 round screened openings
420-2D	UPPER CORNER PILLAR DOOR LATCHES	(B),Quarter turn chrome plate 5/16" square key latches.
421-01	INSULATION,SIDEWALL AND ROOF	(S),Polyisocyanurate foam. meets Docket 90 spec.

Option	Description	Tech Summary Description
421-02	INSULATION,EXHAUST CAVITY	(B),Heat-resistant fiberglass mat.
421-03	PROPULSION COMPARTMENT INSULATION	(S),Noise reduction acoustical foam, retained by perforated aluminum panels.
422-02	CEILING PANELS AFT OF FRONT WHEELHOUSE INCLUDING REAR PLC	(A),Limousine Grey, SST trim.
422-03	CEILING / HVAC COVER PANELS ABOVE FRONT WHEELHOUSES	(A),Limousine grey fiberglass.
422-04	HVAC RETURN AIR GRILLE DOOR LOCK	(A),3 quad latches.
422-05	ENTRANCE / DRIVER'S AREA PANELS COLOUR	(B),black. Includes dash, dest sign c/out, ent. mech. box, driver's o/head panels. and if used, ent. floor heat duct, frt. RH harness cover is black powder coated alum.
422-06	DRIVER'S CEILING PANEL MATERIAL	(B),Melamine.
422-07	INTERIOR PIER PANEL MATERIAL	(B),Thermoplastic.
422-08	PIER PANEL COLOUR	(A),Limousine Grey
422-0A	INTERIOR LOWER SIDEWALL MATERIAL	(B),Melamine
422-0C	INTERIOR SIDEWALL MELAMINE	(B),Charcoal Grey Gloss.
422-0D	INTERIOR PROPULSION COMPARTMENT ACCESS PANEL	(B),There is a single hinged panel under the rear seat.
422-0E	INTERIOR UPPER REAR PANEL	(A),Bulkhead panel covered with melamine material. With large central access door.
422-0G	MELAMINE UPPER REAR INTERIOR PANEL	(A),Charcoal grey gloss.
422-0H	TRIM,CARPET/MELAMINE UPPER REAR INTERIOR PANEL	(B),Painted steel to match panel.
422-0K	CURB AND STREET SIDE REAR BULKHEAD ACCESS PANELS	(A),Melamine covered DB plywood.
422-0M	HRNS/AIR LINE COVERS AT UPPER DECK	(B),Painted flat black.
422-0N	FRT DEST SIGN DOOR LATCHES	(B),Short wing quad latches.
422-0P	DRIVER'S OVERHEAD PANEL	(S),With locker.
422-0R	DRIVER'S LOCKER LATCH	(B),Short wing quad latch.
422-0T	DRIVER'S COAT HOOK AND STRAP	(B),Located on the forward face of the harness cover behind the driver.
422-0U	SECURE DIAGNOSTIC STATION	(B),Above street side front wheelhouse. Incorporates driver's barrier. With four Take One pockets. Quantity of trays as per customer and / or as per electronic equipment within compartment.
422-0V	SDS ENCLOSURE COLOUR	(B),Flat Black.
422-0W	SDS ENCLOSURE DOOR LATCHES	(A),Two 5/16" sq key quad latch, paddle latch (CH751 key)in center
422-13	FRONT SUNVISOR / ROLLERBLINDS	(A),Black rollerblind with 20" travel & 38" wide
422-14	SIDE SUNVISOR/ROLLERBLIND	(A),Black rollerblind. Scissor type with 20" travel and a padded sunvisor combination.
422-15	SQUARE KEY T-HANDLE	(B),Located at lower left of driver.
422-16	ENTRANCE MECHANISM BOX DOOR LATCH	(B),Two short wing quad latches.
422-18	GRAB HANDLE NEAR FRONT ROOF HATCH	(B),Required.

Option	Description	Tech Summary Description
422-1B	C/S,S/S REAR BULKHEAD ACCESS PANELS, OPENING METHOD	(B),Removable access panels.
422-1R	FRONT DASH, ACCESS PANEL LATCH	(B),Quarter turn, black powder coated 5/16" square key quad latches.
422-1W	INTERIOR UPPER REAR PANEL, TRIM OPTIONS	(B),Flat Trim Design
422-21	INTERIOR UPPER REAR PANEL, OPENING METHOD	(B),Hinged at top, held open with prop rod.
422-22	INTERIOR UPPER REAR PANEL, LATCHES	(A),Tri-Latch
422-23	INTERIOR REAR PLC ENCLOSURE, LATCHES	(A),Tri-Latch
423-0B	AD FRAME, SDS ENCLOSURE, FRAME MATERIAL	(A),Clear Polycarbonate
423-0C	AD FRAME, SDS ENCLOSURE, REAR	(A),17"x11" Ad Frame
423-0D	AD FRAME, SDS ENCLOSURE, DOOR	(T),One 17"x11" Ad Frame
450-02	FLOORING	(A),Lower deck uses SpaceAge composite flooring. Upper deck uses fiberglass composite for step and floor to the rear wheelhouses and SpaceAge composite flooring to the rear.
450-03	DRIVESHAFT / TRANSMISSION / DRIVE MOTOR ACCESS PANELS	(B),Two panels set in the floor, one to access the driveshaft and the other to access the transmission.
450-06	ALTRO FLOOR COVERING	(T),Rocket TFFG 2704F (2.7 mm / 0.11" thick), for aisle and underseats. With warning inlays at exit vestibules.
450-0A	STEP TO UPPER DECK	(T),Yellow anti-slip coating is applied to the edges and vertical faces of the step with yellow/black caution stripe decals required at each step.
450-0B	FRONT AXLE STANDEE LINE	(A),One yellow flooring safety line provided aft of the hump at the front axle.
450-0C	ENTRANCE NOSING	(B),Nosing is 2" wide yellow anti-skid applied to the ramp.
450-0D	EXIT NOSING	(B),2.5" yellow nosing for Altro / Tarabus flooring.
450-0E	EXIT DOOR FLOOR MARKING	(T),SFMTA specific "no Standing" symbols at exit vestibule area.
450-0F	REAR SEAT RISER COVERING MATERIAL	(B),Same material and colour as used for the flooring.
450-0J	DRIVER'S PLATFORM FLOORING	(A),Rocket TFFG2704F (2.7 mm / 0.11" thick)
450-0K	DRIVER'S PLATFORM TRIM	(B),SST.
450-0M	OUTER WHEELHOUSES	(B),SST front and rear.
450-0N	INTERIOR FRONT W/HOUSE (LUGG RACK) COLOURS	(B),Matte black, painted stipple. An LED aisle light is provided on the streetside. Also, SST scuff guards are provided.
450-0T	TRIM UPPER DECK	(B),Aluminum.
450-0Y	FLOOR MARKINGS/LOGOS, QTY CURB SIDE	(A),One required
450-0Z	FLOOR MARKINGS/LOGOS, QTY STREET SIDE	(A),One required
450-11	ADDITIONAL STANDEE LINE MARKINGS/LOGOS	(T),Rear standee line aft of "No Standee" markings at exit door.
450-13	INTERIOR FRONT W/HOUSE (LUGG RACK), SCUFF GUARDS	(B),Standard height scuff guard
450-14	EXIT DOOR, WHEELHOUSE AND UPPER DECK TRIM, MATERIAL	(B),Aluminum Trim
460-01	WINDSHIELDS	(B),72% light transmittance green laminated. With blue shade band for street and curb sides.

Option	Description	Tech Summary Description
460-02	WINDSHIELD PROTECTIVE FILM	(B),Required for coach delivery beyond a 500 mile radius of final assembly.
460-04	PASS / DRVR'S WINDOWS MANUFACTURER	(A),Ricon flush mounted.
460-05	FLUSH PASSENGER WINDOWS	(A),Bottom is fixed, top tip-in.
460-07	SDS WINDOW	(A),Full fixed picture window supported by gas strut with push button mechanism. Glazing matches passenger window.
460-08	FLUSH WINDOW GLAZING	(A),Grey, 50% light transmittance, tempered.
460-0A	FLUSH WINDOW LOCKS	(A),Locking set-screw.
460-0C	WINDOW FRAME COLOUR	(A),All window frames are black powder coated aluminium.
460-0D	WINDOW EMERGENCY EGRESS	(A),All windows to be emergency egress per customer spec except last transitional window on CS & SS and window on CS pos#1 above the luggage rack.
460-0E	SIDE DESTINATION SIGN WINDOWS	(A),Curbside and streetsides. Fixed clear top and fixed bottom. Bottom matches passenger window glazing. (review 470 for side sign details).
460-0G	WINDOW GLAZING REPLACEMENT	(A),Basic replacement.
460-0H	PASS WINDOW LINERS AND COATINGS	(A),0.12" acrylic liners on all windows.
460-0J	PASS WINDOW THICKNESS	(A),5 mm
460-0K	DRIVER'S WINDOW,FLUSH	(A),With dual sliding sashes, exterior and interior handles (Knob style). Non-egress.
460-0P	DRIVER'S WINDOW GLAZING	(A),Tempered with minimum 70% light transmittance.
470-01	DESTINATION SIGNS MFR	(B),Luminator, LED display system.
470-02	DEST SIGN CONTROL UNIT LOCATION	(B),Under driver's overhead panel, at forward position of sawtooth panel.
470-04	LUMINATOR FRT.DEST.SIGNS	(A),Spectrum Gen 4 full color LED, 24 rows x 200 columns.
470-07	FRONT DESTINATION SIGN GLASS	(A),Heated and laminated.
470-0A	CURB SIDE DESTINATION SIGN LOCATION	(A),At the second window, aft of the entrance door.
470-0B	LUMINATOR CURBSIDE DEST.SIGNS	(B),Horizon amber LED, 8 X 96 (36.3" wide display).
470-0E	STREET SIDE DESTINATION SIGN LOCATION	(A),Required at third window.
470-0G	FRONT ROUTE SIGN	(A),Luminator Horizon, LED, amber, 12 X 40.
470-0H	REAR ROUTE SIGN,LOCATION	(B),At the upper curbside.
470-0J	LUMINATOR REAR ROUTE SIGNS	(A),Horizon amber LED, 16 X 48 with camera.
470-0P	AVA / AVL SYSTEM	(A),Conduent system
470-10	AVA/AVL LED SIGN LOCATION	(A),Required on the HVAC overhead enclosure and facing the front at rear door area.
470-11	AUTO VEHICLE MONITORING SYSTEM (AVM)	(A),Fleetwatch
470-12	SECOND AUTO VEHICLE MONITORING SYSTEM (AVM)	(T),Provisions for Viriciti Datahub
470-16	NEW FLYER CONNECT-DIAGNOSTIC & MONITORING SYSTEM	(A),Diagnostic & Monitoring - required with driver maneuver awareness system (DMAS).
470-1B	LUMINATOR STREET SIDE DEST SIGN	(A),SMT amber 8x96 (38.30" wide display)
470-1P	AVA/AVL LED SIGN	(A),Avail Sunrise LED sign, amber, 16 character. Supplied by Avail. Cutout Size 26.40" X 2.375".

Option	Description	Tech Summary Description
470-20	NF CONNECT SUBSCRIPTION TERM	(A), 12 years.
480-02	EXTERIOR MIRROR MANUFACTURER	(B),Hadley.
480-03	EXTERIOR SS MIRROR GLASS STYLE	(B),2/1 (upper portion is flat, lower portion is convex).
480-04	EXTERIOR SS MIRROR GLASS SIZE	(B),8" x 15"
480-05	EXTERIOR SS MIRROR HEATING REQUIREMENTS	(A),Heated.
480-06	EXTERIOR SS MIRROR POWER OPTIONS	(A),Dual remote control. (The upper and lower portions are remote controlled.)
480-08	EXTERIOR SS MIRROR ARM FUNCTIONALITY	(A),Spring back. Mirror arm springs back to its previously set position after deflection.
480-09	STREET SIDE MIRROR MOUNT	(A),High mount.
480-0E	EXTERIOR CS MIRROR GLASS STYLE	(B),2/1 (upper portion is flat, lower portion is convex)
480-0F	EXTERIOR CS MIRROR GLASS SIZE	(B),8" x 15"
480-0G	EXTERIOR CS MIRROR HEATING REQUIREMENTS	(A),Heated.
480-0H	CURB SIDE MIRROR POWER OPTIONS	(B),Dual remote control. (The upper and lower portions are remote controlled.)
480-0K	EXTERIOR CS MIRROR ARM FUNCTIONALITY	(A),Spring back. Mirror arm springs back to its previously set position after deflection.
480-0R	CURB SIDE ADD-ON MIRROR LOCATION	(A),Mounted above mirror housing
480-0T	CURB SIDE ADD-ON MIRROR	(A),6" convex
480-0V	STREET / CURB SIDE MIRROR W/TURN SIGNAL	(A),LED, in mirror glass.
480-11	STREET / CURB SIDE HEATED MIRROR ACTIVATION	(A),Controlled by quad switch (membrane).
480-13	DRIVER'S REAR VIEW MIRROR	(A),8" x 15", black, flat.
480-14	SPOT MIRROR	(B),6" diameter flat mirror with short arm, located at curbside front.
480-15	EXIT DOOR MIRROR	(B),convex, 12" diameter, mounted on curved modesty panel stanchion.
480-26	STREET/ CURB SIDE MIRROR ARM MATERIAL	(B),Carbon steel
490-01	ENT DOOR DRIVE SYS	(B),Electric
490-02	ENTRANCE DOOR	(A),Vapor dual linear. Door panels slide completely inside the door portal opening. Only for electric entrance door drive system.
490-03	ENTR DOOR LIMIT SWITCH SET-UP	(B),Solid state proximity switch.
490-04	ENTRANCE EMERGENCY RELEASE VALVE	(B),Within mech box.
490-05	ENTRANCE DOOR MAGNETIC DUMP VALVE	(B),Required, located at baseplate.
490-07	ENTR/EXIT FRANG.COVER,LANGUAGE	(B),English.
490-09	ENTRANCE DOOR COLOUR, INTERIOR	(S),Black
490-0B	ENTRANCE DOOR HANDLES	(B),Yellow powder coated.
490-0K	ENTRANCE DOOR GLAZING	(B),Full length single piece, 72% green.
490-0V	ENTR/EXIT FRANG.COVER	(S),Perforated cover
490-0W	ENT AND EXIT DOORS, INTERIOR AND EXTERIOR PANEL COLOR	(B),Black Powder Coat

Option	Description	Tech Summary Description
491-01	EXIT DOOR DRIVE SYS	(B),Electric with pneumatic emergency release.
491-02	EXIT DOOR	(A),One rear curbside exit door. Wide Vapor Ameriview Outside Sliding Plug, 44.7" between panels.
491-03	SLIDE GLIDE EXIT LIMIT SWITCH	(B),Solid state proximity switch.
491-04	EXIT DOOR CONTROL	(A),Driver controlled at side console, using Vapor Class Acoustic Sensing System to detect obstruction on closing.
491-06	CLASS SYSTEM VOICE ANNUNCIATION	(A),Female voice. English instructions programmed as per customer requirement.
491-0D	EXIT DOOR SENSITIVE EDGE	(A),Electric sensitive vertical edge sensor provided at all exit doors.
491-0H	EXIT FRANGIBLE COVER SECUREMENT	(A),Captive Torx screw.
491-0N	EXIT DOOR PASSENGER BOARDING SWITCH	(A),Switches mounted on the interior of the exit door glass that can be activated from the interior or exterior. Permits passenger entry and exit through exit door.
491-0P	EXIT DOOR GREEN LIGHT	(B),LED green light indicates that the exit door is set to open.
491-0T	EXIT DOOR ALARM	(B),Buzzer and red 'rear door open' indicator at the instrument panel activated when the sensitive edge is triggered.
491-0U	EXIT DOOR GLASS SIZE	(A),1/2 top, no glass at bottom, with interior Kickplate.
491-0V	EXIT DOOR GLAZING	(B),6 mm
491-0W	EXIT DOOR,GLASS LINER,INTERIOR	(A),3M multi-layer film to protect interior side of exit door glass.
491-12	EXIT DOOR GREEN LIGHT MOUNTING ORIENTATION	(B),Exit door green light mounted horizontally on baseplate
526-01	40' PASSENGER SEAT QUANTITY	(T),32
526-04	PASSENGER SEAT MANUFACTURER	(A),United State Seating
526-05	USS PASSENGER SEAT MODEL	(A),Gemini seats.
526-06	USS D90 SPEC	(A),Required.
526-09	REAR BENCH SEAT	(B),1-3-1 hinged seat.
526-0A	PASSENGER SEAT MOUNTING	(B),Cantilever.
526-0B	SEAT MOUNTED GRABRAIL	(A),Thermoplastic.
526-0C	FIRST SEAT,CURBSIDE UPPER REAR	(B),Forward facing.
526-0D	FIRST SEAT,STREETSIDE UPPER REAR	(B),Forward facing.
526-0F	PASSENGER SEATING BARRIER	(A),Integrated with restraint system.
526-0G	SEAT POSITION,FORWARD OF REAR EXIT	(A),Aisle facing.
526-0R	USSC DRIVER'S SEAT MODEL	(A),9100 ALX. Has 2 point seat belt. Has air suspension and lumbar.
526-0W	DRIVER'S SEAT COVER	(B),All vinyl.
526-0Y	DRIVER'S SEAT BELT	(A),Lap belt with retractor on right hand side.
526-0Z	DRIVER'S SEAT BELT ALARM SWITCH	(A),Required.
526-10	DRIVER'S SEAT BELT COLOR	(A),Orange
526-11	DRIVER'S SEAT BELT SWITCH	(A),Required with 'Fastened" configuration, normally open switch.
526-14	DRIVER'S SEAT BASE RISER MATERIAL	(A),SST.
526-15	DRIVER'S SEAT PARK BRAKE ALARM	(A),Switch is required in seat cushion to trigger driver's park brake alarm (ref. option 246-0G).
526-17	DRIVER'S SEAT HEADREST	(B),Required, vinyl headrest

Option	Description	Tech Summary Description
526-18	WHEELCHAIR POSITIONS, QUANTITY	(T),Two. One forward of the curbside exit door and one aft of the streetside front wheelhouse.
526-19	CS WHEELCHAIR RESTRAINT SYSTEM	(A),Q'POD forward facing barrier with integrated wheelchair restraint.
526-1A	SS WHEELCHAIR RESTRAINT SYSTEM	(A),Q'POD forward facing barrier with integrated wheelchair restraint.
526-1D	SHOULDER HARNESS,W/CHR RESTRAINTS	(A),Integrated with Q-Pod restraint system.
526-1F	STANCHION / GRABRAIL STYLE	(B),Curved style vertical stanchions. Using cast SST fittings for vertical and horizontal stanchions.
526-1G	OVERHEAD HORIZONTAL GRABRAILS	(B),SST.
526-1H	OVERHEAD GRABRAIL HANDHOLD STRAPS	(A),Grey PVC straps in yellow Bentech mounts,secured to horizontal stanchions,locations as per customer spec.
526-1J	OVERHEAD GRABRAIL HANDHOLD STRAPS,QUANTITY	(A),Twenty-four
526-1K	COLOR - STANCHIONS AT EXITS & RR RISER STEP	(B),Yellow SST.
526-1N	VERT AFT OF S/S FRT W/HOUSE	(B),To match colour of vertical seat stanchions (see Option 526-1T).
526-1P	VERT FORE OF C/S FRT W/HOUSE	(A),Black SST.
526-1R	VERT AFT OF C/S FRT W/HOUSE	(B),To match colour of vertical seat stanchions (see option 526-1T).
526-1T	VERTICAL STANCHIONS AT SEATS - COLOR	(B),SST.
526-1V	EXIT ASSISTS	(A),Required on both sides of exit door(s). Type and colour as per customer spec.
526-22	FRONT CURBSIDE LUGGAGE RACK	(B),Horizontal tube wraps around aft, aisle and fore sides.
526-23	FAREBOX GRABRAIL STYLE	(A),SST wrap around stanchion w/ shorter dash stanchion.
526-26	MODESTY PANEL MELAMINE COLOR	(B),Charcoal Grey Gloss
526-27	C/SIDE FORE UPR DECK MOD PNL, GAP	(B),Approximately 2" diagonally.
526-28	UPPER PANEL AFT OF EXIT(S)	(A),0.5" clear polycarbonate, basic width.
526-29	BARRIER AT STREET SIDE REAR RISER	(B),Modesty panel (material and color per 526-25/526-26).
526-2B	BARRIER REAR BENCH SEATS	(A),Double stanchion bar. Stanchion color to match vertical stanchions at seats (526-1T).
526-2J	DRIVER'S DOOR	(A),One piece, full height Arow Global driver's door with extended sliding glass top.
526-2M	BARRIER FWD OF EXIT(S)	(A),Upper panel, 0.5" clear polycarbonate, wide width panel. Also, lower melamine panel (material and colour as per option 526-25/526-26).
526-2T	EMERGENCY INSTRUCTIONS	(B),English
526-32	DRIVER'S SEAT, FORE/AFT SEAT TRAVEL	(A),The fore / aft seat travel is 11.8".
526-35	DRIVER'S DOOR PANEL MATERIAL	(A),5/16" AS2 Tempered glass
526-37	FRONT CURBSIDE LUGGAGE RACK COLOR	(B),SST
526-3B	FAREBOX GRABRAIL COLOR	(A),Black
526-3V	SEAT FWD OF REAR BENCH SEAT	(B),Forward facing.
549-02	HVAC UNIT 1	(B),Thermo King RLFE rooftop A/C unit. Safe-T-Walk is provided for rooftop units.
549-04	HVAC UNIT MOTOR TYPE	(S),Brushless motor for primary heating & cooling system.
549-05	REFRIGERANT	(B),R-407C freon.

Option	Description	Tech Summary Description
549-06	HVAC AIR INTAKE	(B),Recirculated air only.
549-07	HVAC RETURN AIR FILTER	(A),TK electrostatic (reusable) filter.
549-0C	HVAC SYSTEM VALVES	(S),Brass ball valves with basic handles.
549-0D	A/C AND HEATER LINE CLAMPS	(B),Ideal.
549-0E	A/C COMPRESSOR	(S),Electric driven compressors integrated into the main HVAC unit.
549-0J	HVAC ELECTRONICS	(B),Thermo King Intelligaire 3, valid for A/C or heater units. With limited diagnostic capabilities.
549-0K	HVAC CONTROL PANELS	(B),Thermo King, installed at the HVAC unit.
549-0N	A/C PRESSURE READINGS	(B),Obtained via the Thermo King Intelligaire 3 control panel.
549-15	HVAC FAN SPEED SWITCH	(B),Not required.
549-16	BOOSTER PUMP	(B),Rotron
549-1A	DEFROSTER	(T),MCC 3 speed brushless motor, electrically controlled damper. SFMTA specific non-derated.
580-01	FRONT WHEELCHAIR RAMP	(A),LIFT-U model LU18-09 electric dual mode ramp at front door. 32" wide, with 1:6 slope.
580-02	FRONT RAMP CONTROL	(B),Ramp switch at driver's instrument panel.
580-08	WHEELCHAIR RAMP,SURFACE	(A),Other surface treatment. Surface treatment details are to be listed in the appropriate task comments directly.
580-0G	KNEELING/RAMP DEPLOYMENT WARNING BEEPER	(A),IP68-rated beeper, extra loud fast beep.
580-0H	FRONT KNEELING/RAMP DEPLOYMENT WARNING BEEPER LOCATION	(B),Curbside under front mask.
580-0V	WHEELCHAIR RAMP TOOL	(A),Short Lift-U ramp tool required
600-05	BACK-UP ALARM	(B),Basic alarm located on curbside.
600-06	BACK-UP ALARM SOUND LEVEL	(B),107 dBA.
600-0J	SDS TRAY QUANTITY	(A),Four trays total.
600-0M	FAREBOX PEDESTAL	(A),Stainless Steel Material. Length = 26.56"; Front fore length = 12.13"; Width = 14.21"; Height = 7". With farebox mounting plate.
600-0N	FAREBOX	(E),41" Genfare Odyssey.
600-0P	FAREBOX,SUPPLIED BY	(A),Supplied and installed by customer.
600-0R	FAREBOX POSITION / HOLES	(A),Located in customer specified position whether installed by NFIL or by customer.
600-12	FARECARD READER VENDOR	(A),Cubic.
600-13	FARECARD READER SYSTEM	(A),Connected to fare box
600-14	FARECARD READER PROVISIONS	(A),Harnesses and mounting bracket required.
600-1D	CURBSIDE FRONT EQUIPMENT BOX	(A),Standard box.
600-1F	DRIVER'S STORAGE BOX BEHIND SEAT	(A),Basic box with lift & turn compression latch, no key.
600-1N	TAKE ONES,PASSENGER AREA	(A),Mounted on Pier Panels
600-24	TRASH CONTAINERS	(A),Trash receptacles, stainless steel by ASI
600-26	RADIO,COMMUNICATION SYSTEM	(A),Complete system installed by NFIL.
600-2G	VIDEO SURVEILLANCE SYSTEM	(A),Interior and exterior cameras.
600-2H	VIDEO SURVEILLANCE SYSTEM,MFR	(T),RCM Security Consulting
600-2P	DASHCAM	(A),Drivecam system, required.
600-2U	TURN ANNUNCIATOR SYSTEM	(A),Sonalert

Option	Description	Tech Summary Description
600-31	FIRE SUPPRESSION	(B),Amerex Safety Net System.
600-32	FIRE SUPPRESSION BOTTLE LOCATION	(A),Located on rear shelf.
600-33	FIRE DETECTION SENSORS	(C),Amerex fire detection sensors - linear wire in engine compartment. Fire or smoke conditions in the battery compartment shall actuate a visual and audible alarm at the operator's control panel.
600-34	FIRE SUPPRESSION BOTTLE	(A),Amerex System with V25 lb dry chemical agent tank without inline blowout adapter and V13 lb dry chemical agent tank without inline blowout adapter.
600-35	FIRE SUPPRESSION BOTTLE ACCESS DOOR	(B),Required without sight window.
600-36	FIRE SUPPRESSION DISPLAY PANEL LOCATION	(B),Under driver's overhead panel at middle position of sawtooth panel.
600-37	FIRE SUPPRESSION, UNINTERRUPTIBLE POWER SUPPLY (UPS) BATTERY BACKUP	(A),Required.
600-3V	BICYCLE RACK MANUFACTURER/MODEL	(A),Byk Rak, 3 position, front mounted.
600-3W	BICYCLE RACK MOUNTING	(A),Bolted slide-in standoff
600-3Y	BICYCLE RACK REMOVAL	(A),Bolted rack.
600-3Z	BICYCLE RK MATL/COLOR	(A),SST, satin anti glare finish.
600-40	BIKE RACK DEPLOY INDICATOR LIGHT	(A),Required.
600-41	BICYCLE RACK MFR LOGO	(A),Provided.
600-42	BICYCLE RACK INSTRUCTIONS	(A),English / Spanish
600-4M	POWER INVERTER LOCATION	(A),Mounted on tray inside the SDS enclosure.
600-4Y	PASSENGER USB CHARGERS	(A),Required.
600-4Z	PASSENGER USB CHARGER LOCATION	(A),Incorporated (where available) into seats.
600-5A	AUTOMATIC PASSENGER COUNTER SYSTEM	(A),Full system.
600-5B	AUTOMATIC PASSENGER COUNTER	(A),IRIS/IRMA (stand-alone system)
600-5H	POWER INVERTER	(A),700W, 24VDC
600-5K	AUTOMATIC PASSENGER COUNTER (APC) EXIT DOOR BASEPLATE SENSOR, QTY	(A),One
600-5M	IRIS/IRMA AUTOMATIC PASSENGER COUNTER (APC) MODEL	(A),Matrix.
600-5T	RADIO SYSTEM SUPPLIER	(A),Harris
600-5U	RADIO SYSTEM MODEL	(A),Harris
600-5V	RADIO CONTROL HEAD LOCATION	(A),Mounted on right hand side of driver's dash panel
600-5Z	DRIVER'S RADIO HANDSET/HAND-HELD MIC LOCATION	(T),Mounted on the inside of the driver's door.
600-68	TRASH CONTAINERS LOCATION	(A),Front of C/S luggage rack, into entr door area.

Option	Description	Tech Summary Description
600-6F	FAREBOX PEDESTAL TREATMENT	(A),Black Line X
600-6G	FAREBOX PEDESTAL NOSING	(A),Yellow rubber trim
600-6H	FAREBOX ORIENTATION	(A),Rotated 6 degrees clockwise from vertical face of driver's platform.
600-6T	TURN ANNUNCIATOR SYSTEM LOCATION	(A),Underbody curbside mounting fore of exit door/s.
600-6V	CURBSIDE FRONT EQUIPMENT BOX. LOCK/LATCH TYPE	(A),Paddle Latch, no lock
600-74	TAKE ONES, PASSENGER AREA, HOLDER SIZE AND POCKET QTY	(T),Three message boxes, 4.6L" X 7.1H" X 1.7W". 2 on streetside and 1 on curbside.
600-7G	CURBSIDE FRONT EQUIPMENT BOX, COLOR	(B),Black
600-7J	CURBSIDE FRONT EQUIPMENT BOX, SAFETY TRIANGLE DIVIDER	(A),Left Side
600-7K	CURBSIDE FRONT EQUIPMENT BOX, CENTRAL DIVIDER	(A),Required
600-7N	CURBSIDE FRONT EQUIPMENT BOX. HINGE ORIENTATION	(B),Parallel to CS window
600-87	BIKE RACK DEPLOYMENT SWITCH	(A),Required.

Tab 16, Recommended Stocking List

Solicitation Requirements:

N/A

New Flyer Response:

Please see the attached New Flyer **Tab 16a, XE40 Recommended Spare Parts List** for the proposed bus.

Thank-you for purchasing New Flyer buses. To assist you in planning the initial spare parts requirements necessary to maintain your new SR TBD model XDE40 bus fleet, we have prepared the following Recommended Stocking List (RSL). This RSL contains a summarized list of part numbers that may be used to support anticipated customer “First Bus” delivery and initial service life maintenance requirements for your new bus fleet. This listing will assist you in assessing and planning immediate stock levels and inventory requirements and it is customizable based upon your specific maintenance philosophy and service level objectives. This RSL will identify system Level Descriptions, Parts Numbers, Item Descriptions, the NFI Parts Stocked status as well as any associated lead/shipping times. These parts are expected to be required on a recurring basis, due to normal wear and tear, or as prudent contingency spare parts for the most common types of minor parts damage or loss.

A full Parts Provisioning Listing will be compiled and provided upon completion of your final New Flyer parts manuals. This more comprehensive Parts Provisioning Listing will identify the anticipated parts required to support your SR TBD model XDE40 bus fleet over the first two to five years of operation.

If you have any questions regarding the report or regarding specific parts or pricing, please contact your Customer Service Specialist at 1-800-665-2637.

The corresponding prices are not included in the Bus Price.

Contact Information:

Customer Service Representative: TBD

Territory Sales Representative: TBD

Customer Service Specialist: TBD

Bus Build Information

Report Date: Nov 3, 2023
Customer Name: SFMTA
Bus Model: XDE40
***Parts and Unit Prices are subject to change with final bus specification**

Legend:
A/R- As Required
LTOR- Lead Time On Request
POR- Price On Request

Recommended Stocking List (Prices effective for 15 days from Report Date)

Part Number	Part Description	Total Qty per Bus	Stock Item	Lead Time (Business Days)	Unit Price (USD)
303734	Air Spring Bellows	4	Y	30	$ 100.86
528578	Assembly - Booster Pump 27V	1	N	120	$ 1,431.13
370035	Assy - Cylinder 10 lbs	1	Y	5	$ 16.88
492796	Assy - Cylinder 130 lbs	2	Y	5	$ 40.07
102264	Assy - Cylinder 25 lbs	2	Y	5	$ 31.39
521196	Assy - Cylinder 80 lbs Locking (Engine Door)	1	Y	5	$ 32.62
6466348	Assy - Headlamp LED - CS	1	Y	LTOR	POR
6466349	Assy - Headlamp LED - SS	1	Y	LTOR	POR
246775	Assy - Lamp Back-Up White (12V)	2	Y	LTOR	POR
072609	Assy - Lamp Green LED 12V	1	N	40	$ 37.17
616198	Assy - Lamp License Plate LED 12 - 24V	1	Y	LTOR	POR
052949	Assy - Mark Lamp AMB LED	4	Y	5	$ 13.96
052947	Assy - Mark Lamp Red LED	2	Y	5	$ 15.87
545083	Assy - Valve Brake Modulator	2	N	LTOR	POR
217917	ASSY-AMBER 2.5" LED	1	Y	30	$ 14.17
393842	Assy-Drag Link Disc 4" Jounce	1	Y	30	$ 538.59
754135	ASSY-EXT MIRROR,LH	1	Y	30	$ 295.10
780773	ASSY-EXT MIRROR,RH	1	N	35	$ 673.70
266142	ASSY-LAMP LED 45 X 10	1	Y	30	$ 53.16
481014	ASSY-LAMP STRIP LED RED 18 INCH	1	Y	30	$ 61.20
276779	ASSY-LED STRIP LIGHT	2	Y	30	$ 153.66
405264	ASSY-LINK, LVLNG RRRH	2	Y	15	$ 33.38
405265	ASSY-LINK,LVLNG RRLH	2	Y	15	$ 33.38
425708	ASSY-MARK LAMP AMB LED	1	Y	LTOR	POR
495287	Bellow-Exhaust Duraflex Braided	1	Y	85	$ 336.56
633191	BELLOWS-POLY CORD 1T15LAZ-5	1	Y	40	$ 127.77
6401325	BELT - WATER PUMP	1	N	20	$ 79.08
393314	Breather - Membrane Rear Axle	1	Y	LTOR	POR
435254	Bumper - Front	1	N	LTOR	POR
574713	Bumper - Rear	1	N	LTOR	POR
633316	BUMPER-FRONT XCELSIOR 40FT	1	Y	25	$ 1,223.60
529520	BUMPER-RR XCEL W/NOTCH-SPLGRD	1	Y	25	$ 1,270.19
487716	Cap - Washer Bottle Fill	2	N	50	$ 71.07
590112	CAP-RADIATOR 18 PSIG LEV-R-VENT	1	Y	50	$ 7.95
656667	Chmbr-Frt Disc Cs Sst Rod 24L	1	Y	25	$ 170.73
656668	Chmbr-Frt Disc Ss Sst Rod 24L	1	Y	25	$ 170.73
483320	Chmbr-Rr Disc 24"	2	Y	20	$ 398.77
6309292	Cylinder - Gas (tip-in)	2	Y	30	$ 25.65
553320	Cylinder - Gas 20 lbs (Front Destination Sign)	2	Y	LTOR	POR
359218	Cylinder - Gas 60 lbs	2	Y	5	$ 21.86
336047	Damper - Short Steering W/Sleeve	1	Y	60	$ 395.94
6388470	ENGINE OIL FILTER	1	Y	25	$ 10.77
097626	Filter - 1/8" PT Air Intake	1	N	20	$ 7.11
6461750	Filter - 40 Micron DEF Tank	1	Y	5	$ 50.97
6447284	Filter - Heater / Defroster	1	Y	30	$ 43.47
6400534	Filter - Oil ACTM	1	N	55	$ 37.23
406694	Filter-Fresh Air Polyester	1	N	LTOR	POR
018994	Fuse - Limiter 130 AMP	2	N	30	$ 7.84
017532	Fuse - Limiter 150 AMP	2	Y	5	$ 7.84
017533	Fuse - Limiter 200 AMP	2	N	30	$ 7.84
472079	Fuse - Limiter 400 AMP	2	N	LTOR	POR
523876	Glass - Destination Sign	1	N	LTOR	POR
332957	Glass - Entrance AFT Full GEN4	1	Y	LTOR	POR
332958	Glass - Entrance FWD Full GEN4	1	Y	LTOR	POR
847397	GLASS-BOTT LAM 44% WIDE OSSP	2	N	80	$ 284.69
853059	GLASS-ENTR BOT AFT 1/2 GEN3	1	N	80	$ 119.41
853060	GLASS-ENTR BOT FWD 1/2 GEN3	1	N	80	$ 99.66
853058	GLASS-ENTR TOP AFT 1/2 GEN3	1	N	80	$ 106.39
853054	GLASS-ENTR TOP FWD 1/2 GEN3	1	N	80	$ 164.07
847396	Glass-Top Lam 44% Wide Ossp	2	N	LTOR	$ 632.39
6313937	Handle - Emergency	2	Y	5	$ 61.79
709140	HORN-DUAL	1	Y	35	$ 18.77
6484840	Kit - Brake Pad N2G Low Copper	4	N	LTOR	POR

Recommended Stocking List (Prices effective for 15 days from Report Date)

Part Number	Part Description	Total Qty per Bus	Stock Item	Lead Time (Business Days)	Unit Price (USD)
936090	Kit - Filter Element (Power Streering Reservoir)	1	N	60	$ 97.33
6361371	Kit - Guide Pin w/Lubricant - (Calipers)	2	Y	LTOR	POR
6361373	Kit - Multi-Purpose Cap - (Calipers)	2	Y	LTOR	POR
6314879	Kit - Roller Service (Accelerator)	1	Y	5	$ 15.45
6361372	Kit - Tappet and Boot - (Calipers)	2	Y	LTOR	POR
6351084	Kit - Treadle Pin (Accelerator)	1	Y	5	$ 22.75
351515	Knob - .251 I.D. with Set Screws	3	Y	5	$ 13.01
5955564	Knob - Master Switch	1	Y	LTOR	POR
089170	Lamp - Side Turn LED 18	2	Y	5	$ 23.46
217164	LAMP-WHITE LED 12V	1	N	30	$ 49.14
8110775	Latch - LH (Power Steering / Radius Rod Access)	2	Y	5	$ 17.30
594819	LIGHT-SERVICE, LED	2	N	90	$ 20.22
489761	Louver - 3.00 IN DIA	2	Y	LTOR	POR
468229	Louver - 4 " Dia. (Entrance Door)	1	Y	LTOR	POR
6310737	Louver - Lower Dash Panel	1	Y	40	$ 3.08
274556	Mirror - Interior 12" Convex	2	Y	LTOR	POR
461458	Mirror - Interior Rear View Convex	1	Y	LTOR	POR
071735	Mirror-6" Dia Flat Spot	1	Y	15	$ 23.41
474783	MIRROR-FRONT DOOR, STEPWELL	1	Y	30	$ 68.17
430884	MIRROR-INTERIOR, 12" CVX	1	Y	15	$ 116.39
790677	MIRROR-RR VIEW CVX W/ MONITOR	1	N	35	$ 827.74
503672	Mud Flap - Rear Center	1	N	30	$ 17.18
902067	Pump - Power Steering	1	N	LTOR	$ 7,271.76
340955	Quad - Panel Latch Short Wing	2	Y	LTOR	POR
581665	Reflector-Amber Decal	6	Y	25	$ 2.11
581664	Reflector-Red Decal	4	Y	25	$ 2.04
715553	Rod-Lower Rear Radius Windowed	2	Y	70	$ 185.41
344499	ROD-RADIUS LOWER FRONT	1	Y	70	$ 401.61
574169	ROD-RADIUS UPPER FRONT	1	Y	65	$ 362.88
598218	Rod-Radius Upper Front	2	Y	40	$ 437.40
715555	Rod-Upper Rear Radius Windowed	2	Y	70	$ 261.40
6347297	Rotor - Brake Front 17"	2	Y	5	$ 191.06
6359347	Rotor - Brake Rear 17"	2	Y	5	$ 191.06
664246	SELECTOR-SHIFT P/BUTTON	1	N	65	$ 949.05
6392084	Sensor - ABS Curbside	1	Y	5	$ 165.48
6392083	Sensor - ABS Streetside	1	Y	5	$ 165.48
081337	Sensor Mod Fire	1	Y	35	$ 1,087.82
717968	SENSOR-LOW COOLANT FOZMULA M20	1	Y	65	$ 63.20
701750	SENSOR-LOW COOLANT, FOZMULA	1	Y	35	$ 47.57
599086	SENSOR-PROXIMITY SWITCH	1	N	LTOR	POR
498170	Shock-Koni, Fr	2	Y	20	$ 137.49
498171	Shock-Koni, Rr	4	Y	20	$ 137.49
449845	Speaker - Interior	2	Y	LTOR	POR
598467	Switch - Assembly, Panel Light Dimmer	1	Y	5	$ 47.68
5951270	Switch - Master Run	1	Y	5	$ 28.05
217023	SWITCH-WIPER CNTRL 24V	1	Y	130	$ 292.87
6344765	Tie Rod End	2	N	80	$ 296.93
430027	Valve - Modulator 24V	1	Y	40	$ 135.37
228742	VALVE-LEVELING 8.00 ARM	2	Y	40	$ 60.38
823261	WASHER PUMP 24V	1	N	LTOR	POR
066017	Wheel-Powder Coated White	1	Y	50	$ 217.86
8112552NFA	Wiper Blade 26"	2	Y	LTOR	POR
86238	WIPER-ARM ASSY 34.0 WET	2	Y	LTOR	POR

Tab 17, Testing Requirements

Solicitation Requirements:

N/A

New Flyer Response:

As per SFMTA's request, New Flyer has included 3 weeks of acceptance testing in our proposal.

The following tests are accounted for:

- Noise Test, including:
    - Jerk test
    - Braking test
    - Air compressor recovery rate
- Duty Cycle, including:
    - Gradeability test
    - Acceleration test
    - Parking brake
    - Hill holder
- Water Test

Appendix I
Project Delivery Schedule

Item	Days after Notice-to-Proceed
1) Submittal of Baseline Schedule and Management Work Plan	30
2) Submittal of Vehicle drawings, control, Reliability Program Plan and test plans	60
3) Submittal of training program (including lesson plans)	60
4) Delivery of the prototype Coach[1]	430
5) Submittal of draft operations, maintenance, parts manuals, recommended spare parts	430
6) Submittal of Test Results	575
7) Approval of the Prototype Coaches (estimated)	475

Item	Days after Approval of Prototype
7a) Production starts	7
7b) Beginning of Coach delivery[2]	80
8) Submittal of final operations, maintenance, and parts manual	170
9) Delivery of special tools (estimated)[3]	200
10) Completion of Coach delivery	360

[1] Approval to deliver the prototype will not be granted until after receipt and approval of all Vehicle drawings, controls and test plans.

[2] Approval to deliver production Vehicles will not be granted until after submittal of a satisfactory training plan; draft operations, maintenance, and parts manuals; all computer software, manuals, document and demonstrate their operation and after successful completion of all appropriate tests as described in Section 12.2, TEST REQUIREMENTS of the Technical Specification.

[3] The delivery of the special tools is dependent on the shipping lead times agreed upon with the Suppliers after the SFMTA selects the final tool list.

Appendix J

Payment Milestones

The City will make progress payments for the Buses upon satisfactory completion of each milestone in accordance with the percentage allocation below.

Item 1a & 1b - Coach Price

Milestone	Maximum Percent of Line Item 1 of Schedule 1 as applicable
(a) After engine installed onto the vehicle chassis	40% of Unit Price
(b) Authorization by the SFMTA to ship each Vehicle and authorization by Contractor to release each Vehicle for shipment to the SFMTA, as described in Sections 12.2.3 'Pre-Delivery Tests' of the Technical Specifications	20% of Unit Price
(c) Conditional Acceptance of each Vehicle by SFMTA	23% of Unit Price
(d) Full Acceptance of each Vehicle by SFMTA	15% of Unit Price
(e) All Contract Deliverables have been received and Accepted as satisfactory (except for Items 2, 3 and 5 in the Schedule 1 – Schedule of Prices)	2%

Item 2 - Spare Parts

The City will make payments for spare parts once they have been delivered and accepted.

Item 3 – Training

The City shall pay for training when all training sessions have been satisfactorily completed and accepted.

Item 5 – Special Tools Separate from Coach

The City shall pay for special tools and other maintenance equipment upon their Acceptance by the SFMTA.