

THIS PRINT COVERS CALENDAR ITEM NO.: 12

**SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY**

DIVISION: Transit

BRIEF DESCRIPTION:

Authorizing the Director of Transportation to execute Contract No. SFMTA-2025-21-FTA with Gillig LLC to procure five 40-foot battery-electric transit buses, along with associated spare parts, special tools, and training through a Cooperative Purchasing Agreement established by the State of Washington for an amount not to exceed \$7,703,705 and a term not to exceed five years.

SUMMARY:

- In 2013, the SFMTA began a transformative fleet replacement program by purchasing 112 40-ft diesel-electric hybrid buses which will be reaching the end of their 12-year useful life.
- On November 7, 2023, the SFMTA Board of Directors approved the revised Zero Emission Vehicle Policy, which allows for the acquisition of battery-electric buses as part of the Zero Emission Rollout Plan.
- In 2015, the Federal Transit Administration (FTA) began allowing transit agencies to buy buses using pre-negotiated cooperative purchasing agreements issued by State governments and San Francisco Administrative Code Section 21.16 permits the SFMTA to make purchases under the terms established by another agency's competitive procurement process.
- On April 1, 2021, Washington awarded to Gillig LLC the State Cooperative Purchasing Schedule Master Contract No. 06719-01, which included 40-foot battery-electric transit buses.
- SFMTA staff has negotiated an agreement with Gillig using the Washington State cooperative purchasing agreement to purchase five 40-ft battery-electric transit buses and related spare parts, special tools, and training.
- The project funding is provided by Federal Formula Funds, MTC Regional Measure 3, Capital Project Savings, FY24-25 operating funds, Community Facilities District Funds, Transit Sustainability Fees (TSF) and Low Carbon Fuel Standard (LCFS).

ENCLOSURES:

1. SFMTA Board Resolution
2. January 15, 2025 SF Admin. Code § 21.16 Finding by Acting Director of Transportation
3. Contract No. SFMTA-2025-21-FTA with Gillig LLC

APPROVALS:

DATE

DIRECTOR



December 11, 2025

SECRETARY



December 11, 2025

ASSIGNED SFMTAB CALENDAR DATE: December 16, 2025

PURPOSE

The purpose of this calendar item is to authorize the Director of Transportation to execute Contract No. SFMTA-2025-21-FTA with Gillig LLC to procure five 40-foot battery-electric transit buses, along with associated spare parts, special tools, and training through a Cooperative Purchasing Agreement established by the State of Washington for an amount not to exceed \$7,703,705 and a term not to exceed five years.

STRATEGIC PLAN GOALS AND TRANSIT FIRST POLICY PRINCIPLES

- Goal 5: Deliver reliable and equitable transportation services.
- Goal 6: Eliminate pollution and greenhouse gas emissions by increasing use of transit, walking, and bicycling.
- Goal 8: Deliver quality projects on-time and on-budget.
- Goal 9: Fix things before they break and modernize systems and infrastructure.
- Goal 10: Position the agency for financial success.

This action supports the following SFMTA Transit First Policy Principles:

1. To ensure quality of life and economic health in San Francisco, the primary objective of the transportation system must be the safe and efficient movement of people and goods.
2. Public transit, including taxis and vanpools, is an economically and environmentally sound alternative to transportation by individual automobiles. Within San Francisco, travel by public transit, by bicycle and on foot must be an attractive alternative to travel by private automobile.
8. New transportation investment should be allocated to meet the demand for public transit generated by new public and private commercial and residential developments.
10. The City and County shall encourage innovative solutions to meet public transportation needs wherever possible and where the provision of such service will not adversely affect the service provided by the Municipal Railway.

DESCRIPTION

The SFMTA has been a leader in supporting sustainable, reduced, or zero-emission revenue transit vehicles. The agency currently operates the largest fleet of zero-emission electric trolley vehicles in North America, running on 100% greenhouse gas-free (GHG) electricity, and has replaced 100% of its older diesel buses with cleaner, more efficient diesel-electric hybrid vehicles fueled with renewable diesel. These hybrid vehicles offer lower fuel consumption, decreased engine idling time while in service, and a substantial reduction in emissions.

On November 7, 2023, the SFMTA Board of Directors approved Resolution No. 231107-092 which established an updated Zero Emission Vehicle Policy which commits to procure zero-emissions vehicles to replace the SFMTA's diesel-electric hybrid buses with battery-electric buses, with a goal of achieving a 100% zero-emission fleet in compliance with the Innovative

Clean Transit (ICT) regulation of the California Air Resource Board (CARB).

The SFMTA began a transformative fleet replacement program by purchasing 112 40-ft hybrid buses in 2013. These buses are reaching the end of their 12 years of useful life. The original intention was to replace these vehicles with zero-emission vehicles, but project complexities, such as funding and PG&E coordination, delayed progress on the facility upgrades required to charge zero-emissions vehicles. As a result, the SFMTA needs to purchase 18 battery-electric vehicles along with the 94 hybrid vehicles in order to keep the fleet in an overall state of good repair during the transition to a 100% zero-emission fleet. The 18 battery-electric vehicle procurement will consist of 12 40-foot battery-electric buses (five from Gillig, four from New Flyer, and three from Solaris) and six 60-foot battery-electric buses (three from New Flyer, and three from Solaris). The SFMTA intends to incorporate lessons learned from these articulated battery-electric buses in future large-scale procurements. We anticipate procuring a combination of low- and zero-emissions vehicles through 2031.

The Federal Transit Administration permits a transit agency to use out-of-state cooperative purchasing agreements under Section 3019 of the 2015 Fixing America's Surface Transportation Act. In April 2021, the State of Washington's Department of Enterprise Services entered into cooperative purchasing agreements with qualified bus vendors that allow authorized users, including public transit agencies outside of Washington State, to purchase buses using those agreements at prices established by a competitive procurement. The State of Washington cooperative procurement complied with the third-party procurement requirements of the FTA.

Washington State awarded State Cooperative Purchasing Schedule Master Contract No. 06719-01 for Transit Buses: Heavy Duty to Gillig LLC (Gillig). The Master Contract included multiple types of buses, including 40-ft battery-electric transit buses. The specifications of the buses in the Washington State cooperative purchasing agreement are broad enough to allow the SFMTA to use it to purchase vehicles that meet the agency's needs.

Under Section 21.16 of the San Francisco Administrative Code, 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 procurement process and as agreed upon by the city and the procuring agency, upon making a determination that the other agency's procurement process was competitive and the use of the other agency's procurement process would be in the city's best interests. On January 15, 2025, the Director of Transportation signed a memorandum determining that the procurement of the Washington State cooperative purchasing agreement with Gillig was competitive, and that its use is in the best interests of the city. In essence, the Director concluded that the Washington State procurement achieved a competitive price for the buses, and using Washington's cooperative purchasing agreement would significantly reduce the SFMTA's administrative costs for the acquisition by avoiding the cost in money and time of issuing a stand-alone request for proposals for the SFMTA's requirements.

Staff entered into negotiations with Gillig and is now recommending award of the contract to the bus manufacturer for five 40-foot battery-electric transit buses along with spare parts, special tools, and training. The negotiations included various enhancements to the basic bus, including SFMTA's technology package (e.g., signal priority, video cameras, passenger counters), flush

mounted and tinted window, USB charging ports, an enhanced operator safety barrier, and an upgraded wheelchair ramp. The inclusion of these enhancements did not impact the SFMTA's ability to take advantage of the competitive price for the base model bus established through the State of Washington's competitive procurement.

STAKEHOLDER ENGAGEMENT

Within the SFMTA, Fleet Engineering staff worked with Transit Operators and Union Leadership, Vehicle Maintenance Personnel, Accessible Services, IT, and Transit Planning. The SFMTA received positive feedback from various stakeholders with new flush mounted and tinted windows, spacious seating configuration, operator barrier, and upgraded wheelchair ramp.

ALTERNATIVES CONSIDERED

The alternative to purchasing new buses would be to rehabilitate the existing fleet to extend the lives of those buses beyond their 12-year useful life. However, this would lead to additional breakdowns and a poorer customer experience, along with higher maintenance costs to maintain the equipment. Replacing the buses with zero-emission battery-electric buses also reduces emissions and provides a quiet riding experiences for customers.

In view of the above, the best alternative available to the SFMTA is to purchase new battery-electric transit buses to replace its fleet of aging buses.

SFMTA staff considered the alternative of conducting an independent procurement for the battery-electric buses. After weighing the benefits and costs of a separate procurement compared to those of placing an order under the Washington State cooperative purchasing agreement, the Director of Transportation determined in January 2025 that using the Washington State agreement is in the best interests of the SFMTA, as described above.

FUNDING IMPACT

A budget of \$30.2M has been allocated for this bus procurement project, which includes the previously-approved New Flyer procurement, and is being funded by a combination of federal, state, regional, and local sources as outlined in the Financial Plan table below. The budget includes the cost of the buses, spare parts, special tools, training, and telematics licenses, taxes, project engineering, maintenance support, and consultant support.

Following is the detailed project budget and funding sources for both New Flyer and Gillig procurements:

Gillig Contract	Cost
Vehicles (Five 40-ft Battery-Electric Transit Buses)	\$ 7,178,705
Spare Parts	\$ 150,000
Training & Training Kits	\$ 150,000
Special Tools	\$ 100,000

Gillig Contract	Cost
Allowance for potential regulatory changes and other vehicle enhancements	\$ 125,000
Subtotal Gillig Contract	\$ 7,703,705

Gillig Other Associated Cost Items (estimated)	Cost
Tax (8.625%)	\$ 651,507
Planning & Preliminary Engineering	\$ 191,253
Detail Design	\$ 1,147,521
Construction Management including Onsite Support	\$ 2,764,151
Other Gillig Subtotal Associated Cost	\$ 4,754,434

Gillig Total Cost	\$ \$12,458,138

This MTAB Calendar Item is only for the Gillig bus procurement. For reference, below is the cost for the New Flyer procurement project and the total cost of the FT110 project.

New Flyer Contract (Previously Approved)	Cost
Vehicle Procurement Contract (Four 40-ft and Three 60-ft Battery-Electric Transit Buses, plus spare parts, special tools, manuals, and training)	\$ 13,424,511

New Flyer Other Associated Cost Items (Previously Approved)	Cost
Tax (8.625%)	\$ 1,121,207
Planning & Preliminary Engineering	\$ 191,253
Detail Design	\$ 1,147,521
Construction Management including Onsite Support	\$ 1,901,631
Other New Flyer Subtotal Associated Cost	\$ 4,361,615

New Flyer Total Cost (Previously Approved)	\$ \$17,786,126.

Total FT110 Project Cost (New Flyer and Gillig)	\$ \$30,244,265

The total amount of funding for this project is outlined in the table below.

Financial Plan

Project Funding Source	Amount
FTA Formula Funds FY25	\$ 15,133,796
MTC Regional Measure 3 FY24	\$ 11,051,604
Capital Project Savings	\$ 2,205,095
Community Facilities District Funds	\$ 700,000
Operating Funds FY25	\$ 641,242
Transportation Sustainability Fee (TSF) FY22	\$ 387,862
Low Carbon Fuel Standard (LCFS) FY22	\$ 124,666
Total Funding for this Project	\$ 30,244,265

Fund Source Abbreviations:

- FTA – Federal Transit Administration
- MTC – Metropolitan Transportation Commission
- RM3 – Regional Measure 3 Bridge Tolls
- CFD – Community Facilities District

ENVIRONMENTAL REVIEW

On March 26, 2025, the SFMTA, under authority delegated by the Planning Department, determined that Contract No. SFMTA-2025-21-FTA is not a “project” under the California Environmental Quality Act (CEQA) pursuant to Title 14 of the California Code of Regulations Sections 15060(c) and 15378(b).

A copy of the CEQA determination is on file with the Secretary to the SFMTA Board of Directors and is incorporated herein by reference.

OTHER APPROVALS RECEIVED OR STILL REQUIRED

The Contract Compliance Office has waived the Small Business Enterprise goal for this project due to the specialized nature of the work and lack of subcontracting opportunities.

The City Attorney's Office has reviewed this calendar item.

RECOMMENDATION

Staff recommends that the SFMTA Board of Directors approve the request to authorize the Director of Transportation to execute Contract No. SFMTA-2025-21-FTA with Gillig LLC to procure five 40-foot battery-electric transit buses, along with associated spare parts, special tools, and training through a Cooperative Purchasing Agreement established by the State of Washington for an amount not to exceed \$7,703,705 and a term not to exceed five years.

SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY
BOARD OF DIRECTORS

RESOLUTION No. _____

WHEREAS, In 2013, the SFMTA began a transformative fleet replacement program by purchasing 112 40-ft diesel-electric hybrid buses. These buses are reaching the end of their 12 years of useful life; and,

WHEREAS, On November 7, 2023, the SFMTA Board of Directors approved Resolution No. 231107-092 which established an updated Zero Emission Vehicle Policy that commits to procure zero-emissions vehicles to replace the SFMTA's hybrid buses, with a goal of achieving a 100% zero-emission fleet in compliance with the Innovative Clean Transit (ICT) regulation of the California Air Resource Board (CARB); and,

WHEREAS, In 2021, Washington State completed a competitive procurement to award cooperative purchasing agreements that allow public transit agencies outside of Washington State to purchase Low Floor Battery-Electric Buses in compliance with the requirements of the Federal Transit Administration, and on April 1, 2021, Washington State announced the award under that procurement to Gillig LLC (Gillig) of State Cooperative Purchasing Schedule Master Contract No. 06719-01 for Transit Buses: Heavy Duty, including 40-foot battery-electric buses; and,

WHEREAS, Under S.F. Administrative Code Section 21.16, 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, and the Director of Transportation made that finding about the Washington State cooperative purchasing agreement on January 15, 2025; and,

WHEREAS, SFMTA staff has negotiated an agreement with Gillig under the Washington State cooperative purchasing agreement to purchase five 40-foot battery-electric transit buses and related spare parts, special tools, and training; and,

WHEREAS, Funding for this project will be provided by Regional Measure 3 (bridge toll), Federal Formula Funds, Low Carbon Fuel Standard (LCFS), City Transit Sustainability Fees (TSF), Capital Project Savings, and prior year operating funds; and,

WHEREAS, On March 26, 2025, the SFMTA, under authority delegated by the Planning Department, determined that Contract No. SFMTA-2025-21-FTA, is not a "project" under the California Environmental Quality Act (CEQA) pursuant to Title 14 of the California Code of Regulations Sections 15060(c) and 15378(b); and,

WHEREAS, A copy of the CEQA determination is on file with the Secretary to the SFMTA Board of Directors, and is incorporated herein by reference; and,

WHEREAS, The Contract Compliance Office (CCO) reviewed the RFP for this Project; due to the specialized nature of the work and lack of subcontracting opportunities, CCO waived the SBE goal; now, therefore, be it

RESOLVED, That the San Francisco Municipal Transportation Agency Board of Directors authorizes the Director of Transportation to execute Contract No. SFMTA-2025-21-FTA with Gillig LLC to procure five 40-foot battery-electric transit buses, along with associated spare parts, special tools, and training through a Cooperative Purchasing Agreement established by the State of Washington for an amount not to exceed \$7,703,705 and a term not to exceed five years.

I certify that the foregoing resolution was adopted by the San Francisco Municipal Transportation Agency Board of Directors at its meeting of December 16, 2025.

Secretary to the Board of Directors
San Francisco Municipal Transportation Agency

Memorandum

Cooperative Purchase Justification



To: Julie Kirschbaum, Acting Director of Transportation, SFMTA
From: Janet Gallegos, Chief Program Manager, Transit Division
CC: Joseph Tabora, Marley Miller, Bhavin Khatri, Moiz Mansuri, Donnie Wong
Date: January 13, 2025
Subject: Procurement of four 40' and three 60' Battery-Electric Buses from New Flyer of America, Inc. and five 40' Battery-Electric Buses from Gillig using the Washington State Cooperative Purchasing Contract: Justification and Request for Determination

Executive Summary

The SFMTA intends to purchase four 40' and three 60' battery-electric buses from New Flyer of America (New Flyer) and five 40' battery-electric buses from Gillig to replace diesel-hybrid buses that have reached the end of their useful lives. The SFMTA intends to make this purchase from New Flyer and Gillig 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 the San Francisco Administrative Code 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 Regulation:

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 buses 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 bus that meets the specification. Enterprise Services evaluated all responses to the Competitive Solicitation and identified both New Flyer and Gillig as successful bidders. Once the responses were evaluated, the Washington State Department of Enterprise Services awarded the contracts to the qualified contractors. Under the Cooperative Purchasing Schedule, both New Flyer and Gillig offer 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 benefit 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 buses. This gives the Washington State Department of Enterprise Services great purchasing power. SFMTA Transit Program Delivery determined that there are pricing benefits offered by the Washington State contract, compared to preparing a City RFP. These included:
 - a. A pre-negotiated, lower bus price achieved by seeking a larger number of buses.
 - b. Although the bus 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 especially when procuring a small quantity of vehicles.
3. An assessment of whether utilizing a Cooperative Contract will materially hinder the City’s ability to meet its LBE participation goals: In the case of low floor battery-electric transit buses both 40’ and 60’, 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 bus prices from the State of Washington Cooperative Purchasing Contract are deemed to be a fair market price if the SFMTA would have issued its own RFP. The SFMTA Transit Program Delivery evaluated the administrative costs and fees to purchase the low floor battery-electric transit buses both 40’ and 60’ 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 Cooperative Contract 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:* The SFMTA Transit Program Delivery researched available cooperative agreements and identified those that offered low floor battery-electric transit buses meeting the specification requirements of the agency. They concluded that a procurement using the proposed purchasing agreement was best since it had low floor battery-electric buses 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 buses.
 - b. *Reviewing the contract for conformance with applicable laws and best practices:* The cooperative agreement selected meets all the FTA requirements and offers low floor battery-electric transit bus designs from established and reputable manufacturers that the SFMTA has experience with 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 battery-electric transit buses offered were selected because they met all the requirements of the SFMTA's specification. Pricing, availability, terms, conditions, delivery, and warranty were competitive with the same factors on other available state cooperative purchasing agreements. The use of the Washington State Cooperative Purchasing Schedule to procure these buses is ideal as it saves the agency time and money by simplifying contracting.
- 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 the SFMTA meets all conformance and eligibility requirements. The contract administrator determined that the SFMTA is eligible to purchase low floor battery-electric transit buses 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 Transit Program Delivery staff request that you make those determinations based on the justifications presented in this memo. Overall, procuring low floor battery-electric transit buses 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 low floor battery-electric transit buses that meet all SFMTA specifications from a reputable manufacturer at a reasonable cost based on a fair competition.

Thank you,



Janet Gallegos
Chief Program Manager, Transit Division

Director of Transportation Determination

I determine that, in connection with the SFMTA's proposed purchase of four 40' and three 60' battery-electric buses from New Flyer and five 40' battery-electric buses from Gillig, (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.



Julie Kirschbaum
Acting 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
Gillig LLC
(Through the State of Washington)
For Procurement of Five 40-Foot Battery Electric Coaches
Contract No. SFMTA-2025-21-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
Gillig LLC
Contract No. SFMTA-2025-21-FTA**

This Agreement is made as of _____, in the City and County of San Francisco (City), State of California, by and between Gillig LLC (Contractor), a California limited liability company, 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 five (5) 40-foot, battery electric buses, and associated spare parts, special tools, manuals, training, and ViriCiti licenses, from Contractor through the Washington State Transit Bus Cooperative with Gillig LLC, Contract Number 06719-01.

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 2020, the State of Washington Enterprise Services (Washington) issued a Competitive Solicitation for a cooperative procurement for Low Floor Transit Buses. The Washington procurement complies with the third-party procurement requirements of the Federal Transit Administration (FTA).

D. On June 18, 2020, Contractor submitted a bid in response to the Competitive Solicitation. Washington accepted the proposal and issued Notification of Contract Award for Contract Number 06719-01 to Contractor on April 1, 2021 ("Washington Contract No. 06719-01").

E. Under the authority of Administrative Code Section 21.16, the SFMTA now wishes to obtain the services of a qualified firm to procure five (5) 40-foot, battery electric buses, and associated spare parts, special tools, manuals, training, and ViriCiti licenses, from Contractor through the Washington procurement, and as superseded or amended by the provisions of this Agreement.

F. The SFMTA has requested various optional features for the coaches and has negotiated with the Contractor the price for these features in accordance with Washington Contract No. 06719-01. Contractor has also agreed to additional terms and conditions as consideration for this Agreement.

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

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

I. 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 Gillig LLC, located at 451 Discovery Dr., Livermore, California 94551.

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 Vehicles, 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 3.1.

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 under the line item for Training in Appendix B, including all services, labor, supervision, materials, equipment, actions and other requirements to be performed and furnished by Contractor under that line item.

1.32 “Subconsultant”, “Subcontractor” or “Supplier” means any firm under contract to the Contractor for Services or Goods related to Contractor’s performance 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: Proposal for Gillig Vehicles
- Appendix A: IFB Attachment G – APTA Standard Bus Procurement Guideline (Dec. 2020), Reference Sections 6 and 7 only
- Appendix G: SFMTA’s Additional Technical Specifications
- Appendix H: Gillig 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

3.1.1 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 is 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.

3.1.2 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”.

3.2 Authorization to Commence Work. Contractor shall not commence any work under this Agreement until City has issued Contractor a prior formal written authorization to proceed, such as a Purchase Order, task order or notice to proceed. City shall not issue Contractor a prior formal written authorization if the funding for the Goods and Services ordered under the authorization have not been duly appropriated. Such authorization may be for a partial or full scope of work, but will not be less than the full contract price for any buses ordered under the authorization.

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 the 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 Seven Million Seven Hundred Three Thousand Seven Hundred Five Dollars (\$7,703,705.00). 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) an increase in the performance bond in conformance with Section 3.3.2(b). Progress payments for which an increase in the performance bond shall be required are as follows: Milestone set forth in Item 1(a) in Appendix J (authorization of shipment) for each Vehicle.

(b) Contractor is required 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 Price Adjustments. The City will negotiate in good faith 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. If any tariffs, duties or similar governmental charges are imposed or increased by any governmental authority (individually and collectively, "Tariff") after the date on which agreement was reached on the price in Schedule 1 – Schedule of Prices (for the vehicles), Appendix 1A (for spare parts) or Appendix 1B (for special tools) of this Agreement, and such Tariffs directly result in an increase in Contractor's cost of performing this Agreement, Contractor may submit a request for a price adjustment seeking reimbursement of the additional incurred costs. The request must be supported by the submission of reasonable documentation, as required by the SFMTA. Required

documentation may include, but is not limited to, bills of sale, invoices, supplier quotations, receipts, evidence that the materials will be incorporated into the Goods (if applicable), and commercially reasonable evidence that no other materials with the same form, fit, function, quality, and interoperability, domestic or otherwise, are available at a lower cost of goods which allows Contractor to meet its obligations under the Agreement in a timely manner. Based on the information provided by Contractor, and subject to any policies announced by the United States Department of Transportation related to the reimbursement of the cost of tariff increases, the SFMTA and Contractor will enter into good faith negotiations to agree on a price adjustment that compensates Contractor for actual demonstrable increases in its costs of performance directly resulting from a Tariff. The parties may agree to (i) a change in the price of Goods, (ii) a reduction in the number of vehicles or spare parts or special tools to be delivered, or (iii) a combination of both (i) and (ii). If the SFMTA seeks to reduce the number of vehicles to be delivered, it must submit a written request no later than the acceptance of the prototype vehicle. Any price adjustment will be implemented through a modification under Section 11.5, Modification of this Agreement. If the Parties are unable to reach an agreement on a price adjustment under this section within sixty (60) days of Contractor's request, the City will terminate this contract for convenience under the provisions of Section 8.1, Termination for Convenience. Under Section 8.1, Contractor shall not be required to absorb or perform work at a loss during such period of negotiation due to the Tariff.

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 or repair 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 Contract No. 06719-01, which is attached and incorporated into this Agreement through Appendix A, SFMTA's Additional Technical Specifications in Appendix G, and the Gillig Option Proposals Accepted by the SFMTA in Appendix H. This Agreement is subject to the terms and conditions of Washington 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 \$150,000 for spare parts. The parties will negotiate the price of spare parts for certain serviceable components after the parties agree on the spare parts to be listed in Appendix 1A. The negotiated prices will be governed by the requirements of Washington Master Contract No. 06719-01, Sections 3.7, Pricing of Goods and Service Additions, and 5.13, Parts Availability Guarantee. The spare parts price list will be added to this Agreement as Appendix 1A through a modification under this Agreement's Section 11.5, Modification of this Agreement ("Appendix 1A Amendment"). The prices for spare parts (or parts with the same or materially the same form, fit, functionality, performance) included in the Appendix 1A Amendment shall be valid for at

least 6 months from the date of the Appendix 1A Amendment. Thereafter, the parties shall negotiate prices in good faith, which prices shall not exceed Contractor's then-current published catalog prices and where Contractor does not have published catalog prices, then the prices shall not exceed the lowest price offered to any other customer with equivalent or less volume than City. The City reserves the right to purchase spare parts that are not included in Appendix 1A from Contractor at prices negotiated based on based on the requirements of Washington Master Contract No. 06719-01 Section 3.7, Pricing of Goods and Services Additions. SFMTA shall not place orders for spare parts until 120 days after the City Accepts the first Vehicle.

4.4.2 Special Tools. The total Contract amount includes an allowance of \$100,000 for special tools, as per Schedule 1 of Appendix B. The special tools price list will be added to this Agreement as Appendix 1B through a modification under this Agreement's Section 11.5, Modification of this Agreement ("Appendix 1B Amendment"). The prices for special tools (or tools with the same or materially the same form, fit, functionality, performance) included in the Appendix 1B Amendment shall be valid for at least 6 months from the date of the Appendix 1B Amendment. The City reserves the right to purchase special tools that are not included in Appendix 1B from the Contractor at prices negotiated based on the requirements of Washington Contract No. 06719-01, Master Contract Section 3.7, Pricing of Goods and Service Additions.

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 the failure to deliver is not cured within 10 Days after written notice thereof from the SFMTA to Contractor. 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 then current 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. This Agreement may not be directly or indirectly assigned, novated, or otherwise transferred by either party, unless first approved by the non-assigning Party by written instrument executed and approved in the same manner as this Agreement in accordance with Section 21.22 of the San Francisco Administrative Code. 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. Contractor agrees that the sums listed below per calendar day 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 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.

Item No.	Milestone	Amount Per Day
1.	Delivery of Lead Coach	\$100
2.	Delivery of 1st Production Coach	\$100
3.	Delivery of Last Production Coach	\$100

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 the required bonds as outlined below

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 20 percent of the total Contract amount 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) One year 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. 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 10 percent of the Contract price 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. 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. The City will issue a letter releasing the warranty bond upon expiration of the two-year warranty period.

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 Reserved. (Requirements for Letter of Credit)

4.9 Reserved. (Fidelity Bond)

4.10 Reserved. (Emergency - Priority 1 Service)

4.11 Reserved. (Usage Reports by Contractor)

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 of \$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 of \$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 of \$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. Risk of Loss passes to the City upon delivery of the Coach in accordance with Section 12.2.3 below.

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 The Contractor shall, to the extent permitted by law: (1) protect, indemnify and save the City and its officers, employees and agents, including consultants, harmless from and against any and all liabilities, damages, claims, demands, liens, encumbrances, judgments, awards, losses, costs, expenses and suits, actions, or proceedings, including reasonable expenses, costs and attorneys' fees incurred by the City and its officers, employees and agents, including consultants, in the defense, settlement or satisfaction thereof, for any injury, death, loss or damage to persons or property of any kind whatsoever, arising out of or resulting from the intentional misconduct or negligent acts, errors or omissions of the Contractor in the performance of the Agreement, including intentional misconduct, negligent acts, errors or omissions of its officers, employees, servants, agents, Subcontractors and Suppliers; and (2) upon receipt of notice and if given authority, shall settle at its own expense or undertake at its own expense the defense of any such suit, action or proceeding, including appeals, against the City and its officers, employees and agents relating to such injury, death, loss or damage. Each Party shall promptly notify the other in writing of the notice or assertion of such claim, demand, lien, encumbrance, judgment, award, suit, action or other proceeding hereunder. The Contractor shall have sole charge and direction of the defense of such suit, action or proceeding, only if Contractor accepts the defense and hold harmless requirements without reservation, and provided, however, that Contractor shall not agree to any injunctive relief or settlement that obligates City to perform any obligation, make an admission of guilt, fault or culpability or incur any expense, without City's prior written consent, which shall not be unreasonably withheld or delayed. The City shall not make any admission that might be materially prejudicial to the Contractor unless the Contractor has failed to take over the conduct of any negotiations or defense within a reasonable time after receipt of the notice and authority above provided. The City shall at the request of the Contractor furnish to the Contractor all reasonable assistance that may be necessary for the purpose of defending such suit, action or proceeding, and shall be repaid all reasonable costs incurred in doing so. The City shall have the right to be represented therein by advisory council of its own selection at its own expense.

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

5.2.3 The City shall advise Contractor of any impending patent suit related to this Agreement against the City and provide all information available. Contractor shall defend any suit or proceeding brought against the City based on a claim that any equipment, or any part thereof, furnished under this Agreement constitutes an infringement of any patent, and Contractor shall pay all damages and costs awarded therein, excluding incidental and consequential damages against the City. In case said equipment, or any part thereof, is in such suit held to constitute infringement and use of said equipment or parts is enjoined, the Contractor shall, at its own expense and at its option, either procure for the City the right to continue using said equipment or part, or replace same with non-infringing equipment, or modify it so that it becomes non-infringing. Contractor's obligations under this Section are discharged and the City shall hold the Contractor harmless with respect to the equipment (or part) if it was specified by the City and all requests for substitutes were rejected, and Contractor advised the Agency of a potential infringement, in which case Contractor shall be held harmless.

5.2.4 Under no circumstances will City indemnify or hold harmless Contractor, except under Section 5.2.3.

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 The 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. The City shall exercise this option by giving Contractor written notice of termination (Notice of Termination). The Notice of Termination shall specify the date on which termination of the Agreement shall become effective (Termination Date)

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 Termination Date and to minimize the liability of Contractor and the City to third parties as a result of the termination. All such actions shall be subject to the prior approval of the City. Such actions may include any or all of the following, without limitation:

(a) Halting the performance of all obligations under this Agreement on and after the Termination Date.

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

(c) At the SFMTA's direction, assigning to the 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. SFMTA acknowledges that any such assignments may require the consent of the respective Supplier or Subcontractor subject to the terms of Contractor's agreements with such parties.

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

(e) Completing performance of any obligations that City requires Contractor to complete prior to the Termination Date.

(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 thirty (30) Days after the Termination Date, Contractor shall submit to the SFMTA an invoice, which shall set forth the cost of all Goods and Services delivered prior to City's Notice of Termination. City's obligation pursuant to this Subsection 8.1.3 shall be subject to Section 3.3.4 of this Agreement.

8.1.4 In no event shall City be liable for costs incurred by Contractor or any of its subcontractors after the Termination Date.

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 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 City, the cost of any Goods or Services delivered by Contractor under this Agreement is excessively high due to costs incurred to remedy or replace defective or rejected Goods, the difference between the invoiced amount and City's estimate of the reasonable cost of delivering the invoiced Goods or 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 material 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 reasonable 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
8.2.2	Default Remedies
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 remain the property of Contractor. However, City may retain and use copies of Deliverables in order to operate and maintain the Vehicles, which copies are subject to the confidentiality obligations under this Agreement.

9.2 Works for Hire. The parties agree that the Deliverables and Services are not works for hire as defined under Title 17 of the United States Code, and that no copyrights or other intellectual property rights in such Deliverables or Services shall be the property of the City or SFMTA.

9.3 Licenses Granted

9.3.1 Computerized Software and Systems. To the extent Contractor has title to or the authority to grant, assign or otherwise transfer software, firmware, systems designs, computerized manuals, training modules, or other such Deliverables 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 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, assign or otherwise transfer licenses of such Deliverables to the City.

9.3.2 Reserved. (IP Transfer)

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 extent 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, to the extent Contractor has title to or the authority to grant, assign or otherwise transfer, 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, assign or otherwise transfer 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 that are proprietary to Contractor. 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 Chapter 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 Reserved. (Minimum Compensation Ordinance)

10.8 Reserved. (Health Care Accountability Ordinance)

10.9 Reserved. (First Source Hiring Program)

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 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 Nonprofit Contractor Requirements

10.15.1 Good Standing. If Contractor is a nonprofit organization, Contractor represents that it is in good standing with the California Attorney General’s Registry of Charitable Trusts and will remain in good standing during the term of this Agreement. Contractor shall immediately notify City of any change in its eligibility to perform under the Agreement. Upon City’s request, Contractor shall provide documentation demonstrating its compliance with applicable legal requirements. If Contractor will use any subcontractors to perform the Agreement, Contractor is responsible for ensuring they are also in compliance with the California Attorney General’s Registry of Charitable Trusts for the duration of the Agreement. Any failure by Contractor or its subcontractors to remain in good standing with applicable requirements shall be a material breach of this Agreement.

10.15.2 Public Access to Nonprofit Records and Meetings. If Contractor is a nonprofit organization, provides Services that do not include services or benefits to City employees (and/or to their family members, dependents, or their other designated beneficiaries); and receives a cumulative total per year of at least \$250,000 in City or City-administered funds, Contractor must comply with the City’s Public Access to Nonprofit Records and Meetings requirements, as set forth in Chapter 12L of the San Francisco Administrative Code, including the remedies provided therein.

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: Marley Miller, Project Manager
marley.miller@sfmta.com

To Contractor: Gillig LLC
451 Discovery Dr., Livermore, CA 94551
Attention: Clint Gibson, Senior Project Sales Manager
clint.gibson@gillig.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 Laws Requiring Access for People with Disabilities

11.2.1 Contractor acknowledges that, pursuant to the Americans with Disabilities Act (ADA), programs, services and other activities provided by a public entity to the public, whether directly or through a contractor, must be accessible to people with disabilities. Contractor shall provide the services specified in this Agreement in a manner that complies with

the ADA and all other applicable federal, state and local disability rights legislation. Contractor agrees not to discriminate against people with disabilities in the provision of services, benefits or activities provided under this Agreement and further agrees that any violation of this prohibition on the part of Contractor, its employees, agents or assigns will constitute a material breach of this Agreement.

11.2.2 Contractor shall adhere to the requirements of the Americans with Disabilities Act of 1990, as amended (42 U.S.C. Sec. 1201 et seq.), Section 508 of the Rehabilitation Act of 1973, as amended (29 U.S.C. Sec. 794d), Section 255 of the Communications Act Guidelines, the applicable Revised Section 508 Standards, and Web Content Accessibility Guidelines 2.1, Level AA, as amended from time to time. Contractor shall ensure that all information content and technology provided under this Agreement fully conforms to the applicable Revised 508 Standard, as amended from time to time, prior to delivery and before the City's final acceptance of the Services and/or Deliverables.

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 §7920 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 20% (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. Disputes will not be subject to binding arbitration. 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)

11.7 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. If the Appendices to this Agreement include any standard printed terms from the Contractor, Contractor agrees 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, Contractor's bid and/or proposal, and Contractor's printed terms, respectively.

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 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 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 Battery 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.

(e) The date of Conditional Acceptance, or Acceptance (whichever occurs first), shall be the "In-Service Date" that establishes a warranty start date for each Coach delivered under this Contract.

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 each Coach is delivered, 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 all reasonable care, prudence, foresight, and diligence. Such delays include, and are limited to, acts of God; floods; earthquakes; windstorms; tornadoes; wars; riots; terrorist attacks, civil unrest; insurrections; epidemics; pandemics; quarantine restrictions; strikes and lockouts; fires or explosions; caused by a failure of a Supplier or Subcontractor to provide supplies or services necessary to continue or complete the Deliverables, where the failure was beyond the control of both the Contractor and Supplier or Subcontractor and without fault or negligence of either, and the supplies or services were not reasonably available from another source ; 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 within 14 days.

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/largevehicletainingstandards. 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.

14.1.3 Protection of Confidential Information Provided by Contractor. The City shall employ sound business practices no less diligent than those used for the City's own confidential information to protect the confidence of all licensed or owned technology, software, documentation, drawings, schematics, manuals, data and other information and material provided by Contractor that contain confidential commercial or financial information, trade secrets or proprietary information against disclosure of such information and material to third parties, except as permitted by the Contract

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

14.3 Reserved. (Business Associate Agreement)

14.4 Management of City Data

14.4.1 Use of City Data. 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 by Contractor or its authorized subcontractors using, or sharing or storage of, City Data outside the United States is prohibited, absent prior written authorization by the City. 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. City Data shall not be distributed, repurposed or shared

across other applications, environments, or business units of Contractor. 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, 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 and/or machine learning from the data, stored or transmitted by the service, for commercial purposes, advertising or advertising-related purposes, or for any purpose that is not explicitly authorized other than security or service delivery analysis.

14.4.2 Disposition of City Data. Upon request of City or termination or expiration of this Agreement, Contractor shall promptly, but in no event later than 30 Days, return all City Data given to, or collected or created 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. Notwithstanding anything to the contrary, Contractor shall not be required to delete or destroy any electronic back-up tapes or other electronic back-up files, provided that any such Confidential Information so retained will remain subject to the confidentiality obligations and restrictions contained in this Agreement, regardless of any termination or expiration of this Agreement or any related confidentiality survival period.

14.4.3 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 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.

14.6 Loss or Unauthorized Access to City's Data; Security Breach Notification. Contractor shall comply with all applicable laws that require the notification to individuals in the event of unauthorized release (or other security event requiring notification) of PII or PHI processed or maintained by Contractor. Contractor shall notify City of any discovered disclosure or misappropriation of City Data (any "Leak") in Contractor's control or possession within twenty-four (24) hours of the discovery of such, but within twelve (12) hours of discovery if the Data Leak involved PII or PHI. Contractor, at its own expense, will reasonably cooperate with City and law enforcement authorities in the investigation of any such Leak and with the City's notification of injured or potentially injured parties where the Data Leak involved PII or PHI.

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 San Francisco Municipal Transportation Agency Julie Kirschbaum Director of Transportation Authorized By: Municipal Transportation Agency Board of Directors Resolution No: _____ Adopted: _____ Attest: _____ Christine Silva, Secretary Approved as to Form: David Chiu City Attorney By: _____ David F. Innis Deputy City Attorney	CONTRACTOR Gillig LLC William F. Fay, Jr. Vice President, Sales 451 Discovery Drive, Livermore, CA 94551 <u>Acknowledgement of Large Vehicle Driver Safety Training Requirements:</u> By signing this Agreement, Contractor acknowledges that it has read and understands Section 13.3: Large Vehicle Driver Safety Training Requirements. City Supplier Number: 0000041920

Appendices:

- A: Washington State Cooperative Purchasing Schedule Master Contract No. 06719-01
Transit Buses: Heavy Duty, 30-Ft Diesel, 35-Ft Diesel, 40-Ft Diesel 35-Ft Hybrid, 40-Ft Hybrid, 30-Ft CNG, 35-Ft CNG, 40-Ft CNG, 35-Ft Electric, 40-Ft Electric Categories
For Use by Washington State Transit Bus Cooperative Participants By and Between State of Washington Department of Enterprise Services and Gillig LLC
- 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 Additional Technical Specifications
- H: Gillig Option Proposals accepted by the SFMTA
- I: Project Delivery Schedule
- J: Payment Milestones

Appendix A

Incorporates the attached documents:

- A1: Washington State Cooperative Purchasing Schedule Master Contract No. 06719-01 Transit Buses: Heavy Duty, 30-Ft Diesel, 35-Ft Diesel, 40-Ft Diesel 35-Ft Hybrid, 40-Ft Hybrid, 30-Ft CNG, 35-Ft CNG, 40-Ft CNG, 35-Ft Electric, 40-Ft Electric Categories For Use by Washington State Transit Bus Cooperative Participants By and Between State of Washington Department of Enterprise Services and Gillig LLC
- A2: Exhibit B-1 – State of Washington Technical Specification
- A3: Price Sheet
- A4: Amendment #1
- A5: Amendment #2
- A6: Amendment #3
- A7: Amendment #4

SFMTA-2025-21-FTA

Agreement

Appendix A, Item A1

Washington State Cooperative Purchasing Schedule Master Contract No.
06719-01 Transit Buses: Heavy Duty, 30-Ft Diesel, 35-Ft Diesel, 40-Ft
Diesel 35-Ft Hybrid, 40-Ft Hybrid, 30-Ft CNG, 35-Ft CNG, 40-Ft CNG,
35-Ft Electric, 40-Ft Electric Categories For Use by Washington State
Transit Bus Cooperative Participants By and Between State of Washington
Department of Enterprise Services and Gillig LLC

WASHINGTON STATE TRANSIT BUS COOPERATIVE

STATE COOPERATIVE PURCHASING SCHEDULE

MASTER CONTRACT

No. 06719-01

TRANSIT BUSES: HEAVY DUTY

**30 Ft DIESEL, 35 Ft DIESEL, 40 Ft DIESEL 35 Ft HYBRID, 40 Ft HYBRID, 30 Ft CNG, 35 Ft, CNG, 40 Ft
CNG, 35 Ft ELECTRIC, 40 Ft ELECTRIC CATEGORIES**

For Use by Washington State Transit Bus Cooperative Participants

By and Between

STATE OF WASHINGTON

DEPARTMENT OF ENTERPRISE SERVICES

and

GILLIG LLC

Dated April 1, 2021

WASHINGTON STATE TRANSIT BUS COOPERATIVE

STATE COOPERATIVE PURCHASING SCHEDULE

MASTER CONTRACT

No. 06719

TRANSIT BUS – HEAVY DUTY

30 FT DIESEL, 35 FT DIESEL, 40 FT DIESEL 35 FT HYBRID, 40 FT HYBRID, 30 FT CNG, 35 FT, CNG, 40 FT CNG, 35 FT ELECTRIC, 40 FT ELECTRIC 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 Gillig LLC, a California company (“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 its 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 1 each year. Prices shall be adjusted on June 1. 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:

$$\text{New Price} = \text{Old Price} \times (\text{Current Period Index} / \text{Base Period Index}).$$

- 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 delivery.
- 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.

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.
 - 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.

- 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 REPAIRS 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.
- 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.
- 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 0.10% for payments within 20 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

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

Contractor

Attn: Lee Petersen, Regional Sales Manager
 and Maribel Gonzalez-Becerra, Bid & Contract
 Specialist
 GILLIG LLC
 451 Discovery Drive
 Livermore, CA 94551
 Tel: (800) 785-1500
 Email: sales@gillig.com

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

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

Contractor

Attn: William F. Fay, Jr.
 Vice President Sales
 GILLIG LLC
 451 Discovery Drive
 Livermore, CA 94551
 Email: sales@gillig.com

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.
- 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 $\$500 \times 1.25 = \$625$).

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	3 years, 100,000 miles
Energy Storage System	traction battery, Battery Management System, and any other ESS-related replacement component	6 years, 300,000 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. ** Warranty of One Year/Unlimited Miles
- Air compressor.
- Air dryer. ** Warranty of One Year/Unlimited Miles
- 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 two 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 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 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.
- 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. 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.

- 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

GILLIG LLC

a California company

By: William F. Fay, Jr.
William F Fay, Jr.
Its: Vice President Sales

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]

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]

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 with 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.

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 Buy 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 loading 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.

Federal Transit Administration Certifications

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

SFMTA-2025-21-FTA Agreement

Appendix A, Item A2

Exhibit B-1 – State of Washington Technical
Specification

Exhibit B-1 Specifications

Heavy Duty Bus

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TECHNICAL SPECIFICATIONS

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 either 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 # OD1014 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 °F to 115 °F, 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

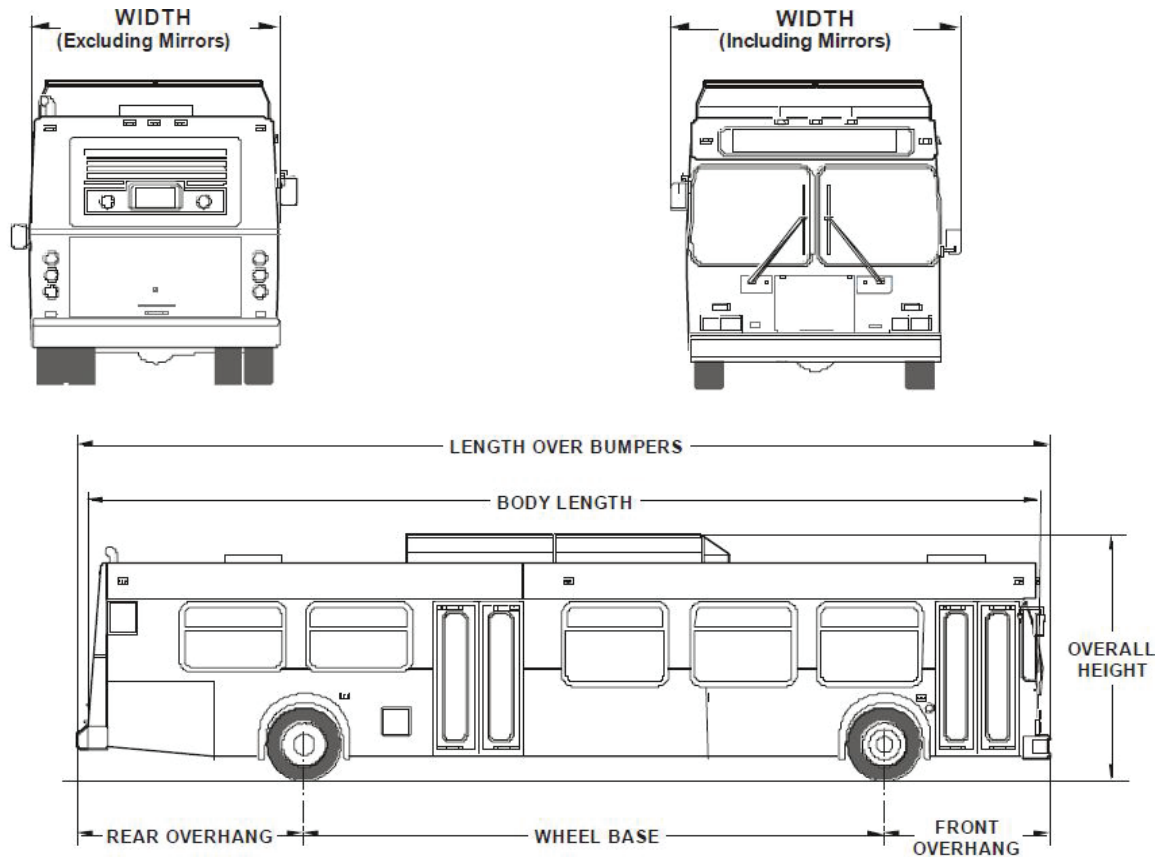
In the design and manufacture of the bus, the Contractor shall make every effort to reduce the amount of potentially hazardous waste. In accordance with Section 6002 of the Resource Conservation and Recovery Act, the Contractor shall use, whenever possible and allowed by the specifications, recycled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

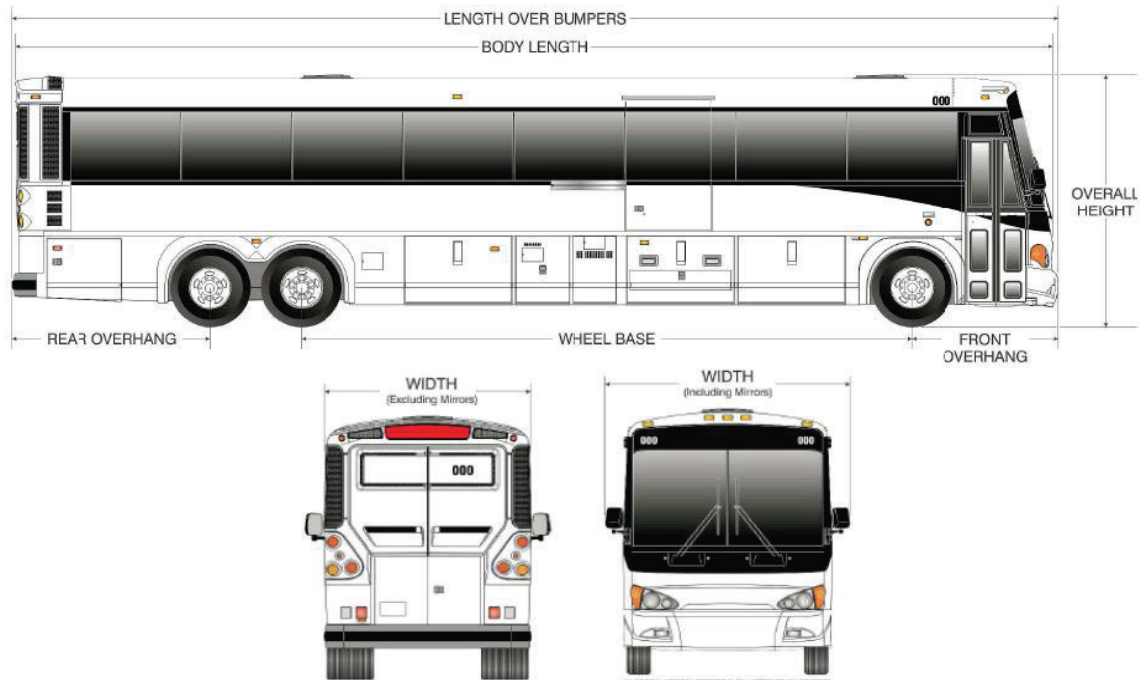
3 DIMENSIONS

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

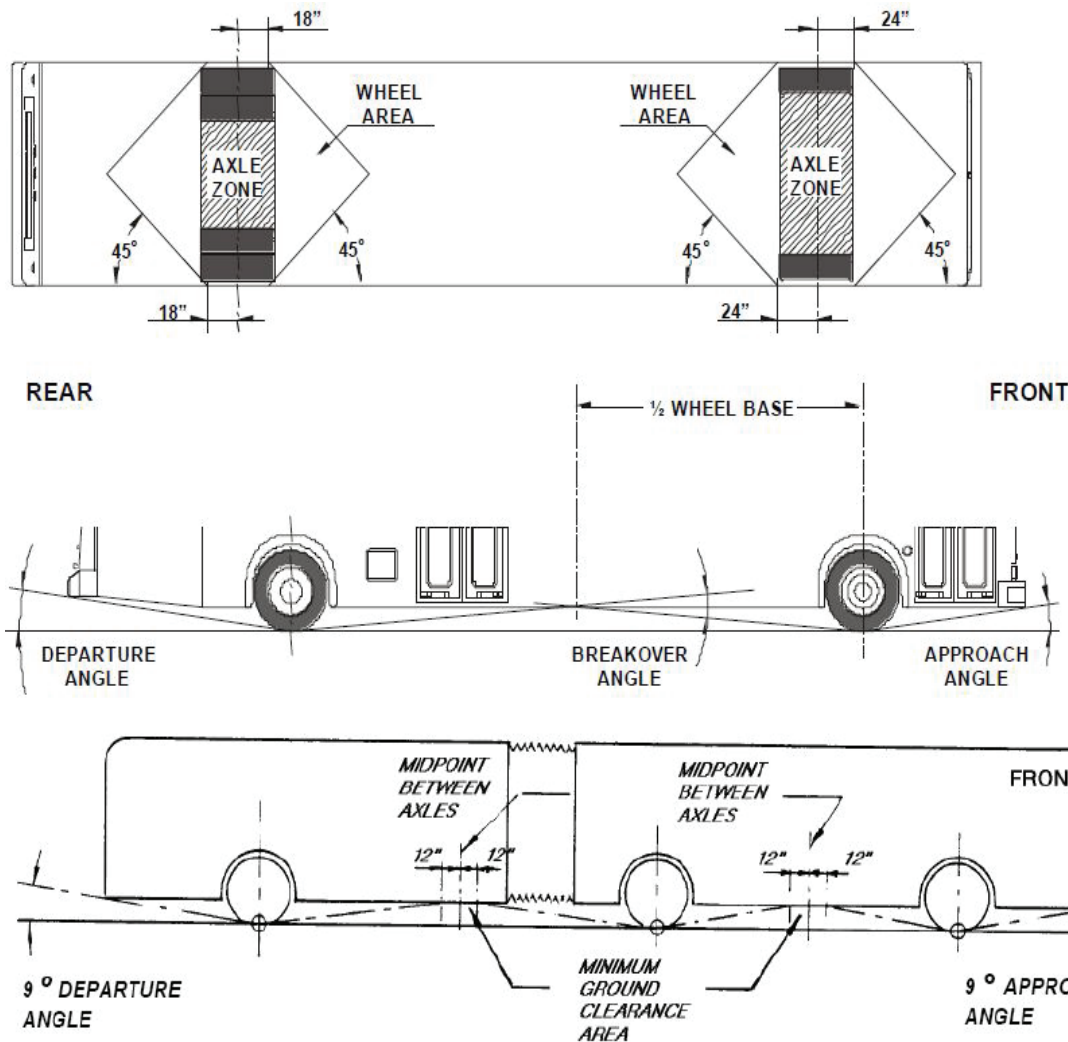
Ground clearance shall be no less than 9 in., (8 in. at jacking pad) except within the axle zone and wheel area.

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 Surface¹ 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 be 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.

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- 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.

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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 apply 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 $\frac{3}{8}$ -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 NO_x 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 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 deflection of no more than 0.375 in. (10 mm) from the normal plane. The floor shall withstand the application of 3.0 times gross load weight without permanent detrimental deformation.

15 Platforms

15.1 Driver's Area

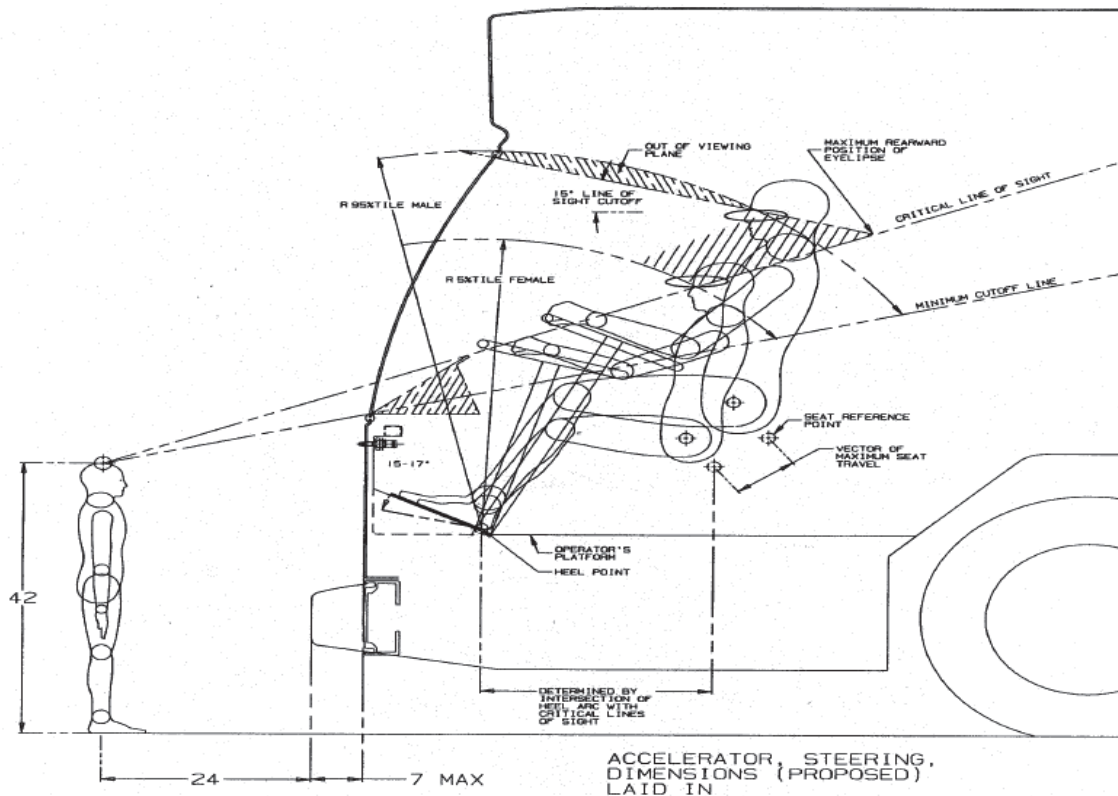
The covering of platform surfaces and risers, except where otherwise indicated, shall be the same material as specified for floor covering. Trim shall be provided along top edges of platforms unless integral nosing is provided.

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

Steering wheel spokes and wheel thickness shall ensure visibility of the dashboard so that vital instrumentation is clearly visible at center neutral position (within the range of a 95th-percentile male, as described in SAE 1050a, Sections 4.2.2 and 4.2.3). Placement of steering column must be as far forward as possible, but either in line with or behind the instrument cluster. 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 Height¹ Relative to Angle of Slope

At Minimum Telescopic Height Adjustment (29 in.)		At Maximum Telescopic Height Adjustment (5 in.)	
Angle of Slope	Height	Angle of Slope	Height
0 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.

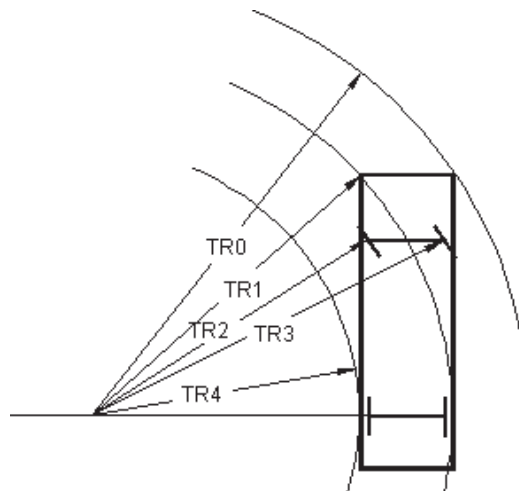
19.3 Turning Radius

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.

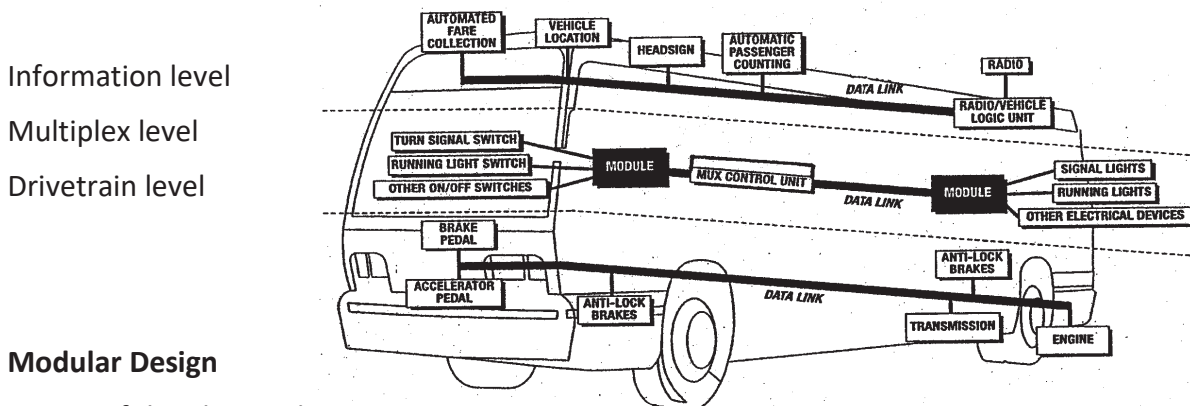
Information level systems that require vehicle information for their operations or provide information shall adhere to J1939 data standard.

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 switch ¹	Side console or Dash right wing	Permits operation of ramp and kneel operations at each door remote panel	Amber light
Front door ramp/kneel enable	Two-position keyed switch ¹	Front door remote or Dash right wing	Permits ramp and kneel activation from front door area, key required ¹	Amber light
Front door ramp	Three- position momentary switch	Right side of steering wheel	Permits deploy and stow of front ramp	Red light
Front kneel	Three- position momentary switch	Front door remote	Permits kneeling activation and raise and normal at front door remote location	Amber or red dash indicator. Ext alarm and Amber light
Rear door ramp/kneel enable if applicable	Two-position keyed switch ¹	Rear door remote	Permits ramp and kneel activation from rear door area, key required ¹	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% LEL 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 regeneration	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

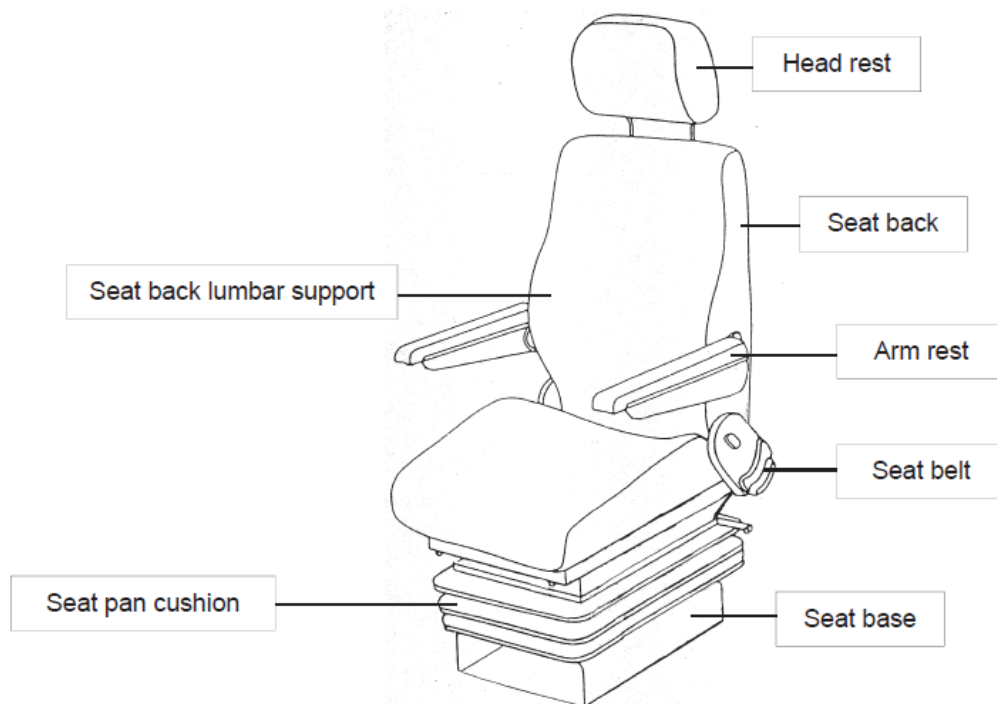
The windshield washer system, when used with the wipers, shall deposit washing fluid evenly and completely wet the entire wiped area. The windshield washer system shall have a minimum 2.5-gallon reservoir, located for easy refilling from outside of the bus.

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.

31.15.2Commuter 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 devices 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., $\pm$ 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 appliques. All decals shall be installed per the decal Supplier recommendations. Signs shall be provided in compliance with the ADA requirements defined in 49 CFR Part, 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.

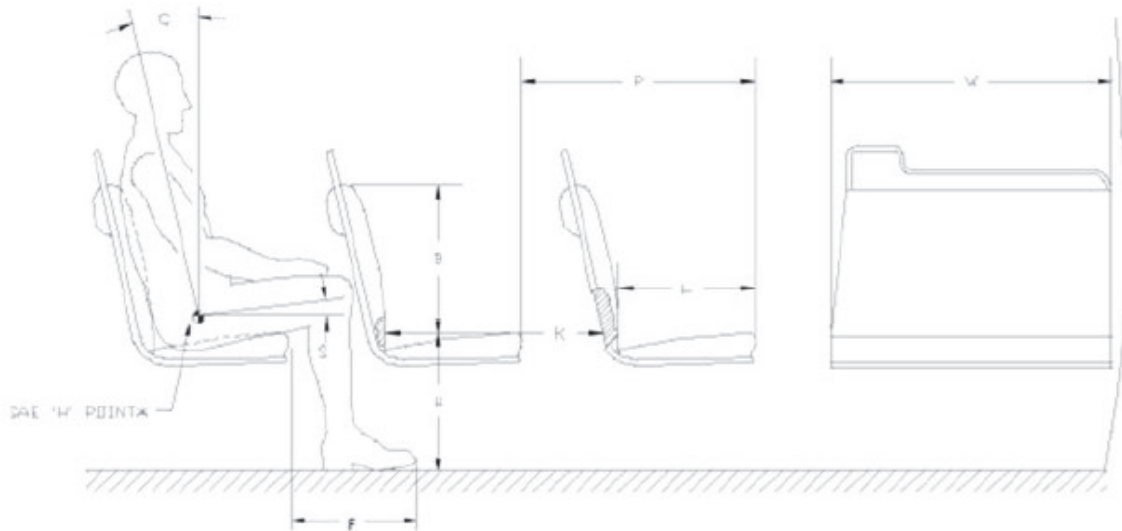
37.4 Aisles

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.

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- 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.

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- 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 AlInGaP II, superior UV resistant Epoxy lens and superior resistance to the effects of moisture. Each pixel shall have a dedicated LED for illumination of that pixel in all lighting conditions. The sign system shall have multi-level intensity changes, which adjust automatically as a function of ambient lighting conditions. There shall be no requirement for any fan or any specialized cooling or air circulation.

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 handheld 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.

SFMTA-2025-21-FTA Agreement

Appendix A, Item A3

Price Sheet

Delivery Costs by Sub-Category

note: does not include the software and diagnostic cables from specification 31.1 (diagnostic software is included in the option sheets)

[illegible]

Parts	
Category	Rate %
General Parts List	0%
Engine	0%
Transmission	0%
Electrical	0%
HVAC	0%
etc	

Volume Discount	
# of buses ordered	Discount offered
NA	NA

Category		Item #	Description	Diesel	CNG	Hybrid	Electric	Fuel Cell	Price	6/1/22 Price Change	4/1/2023 Price Change	4/1/2024 Price Change	4/1/2025 Price Change
Body BRT STYLING													
Body - BRT STYLING		1	Standard Styling Package 29 passenger seats	Standard	Option	Standard	Standard		Included	Included	Included	Included	Included
Body - BRT STYLING		2	BRT Exterior Styling Package (Front & Rear) with One or Two Piece Windshield	Option	Option	Option	Not Applicable		\$13,950.00	\$15,593.31	\$17,592.31	\$19,214.47	\$19,947.69
Body - BRT STYLING		3	BRT Roof Fairings, Front	Option	Option	Option	Not Applicable		\$1,250.00	\$1,397.25	\$1,606.84	\$1,721.73	\$1,786.98
Body - BRT STYLING		4	Curbide A Painted Blue	Option	Option	Option	Option		\$86.00	\$96.13	\$110.55	\$118.45	\$122.94
Body - BRT STYLING		5	BRT Roof Fairing, Rear	Option	Option	Not Applicable	Not Applicable		\$1,250.00	\$1,397.25	\$1,606.84	\$1,721.73	\$1,786.98
Body - BRT STYLING		6	BRT Exterior Styling Package (Front CNG Only) with One or Two Piece Windshield	Option	Option	Option	Not Applicable		\$97,900.00	\$10,943.26	\$12,584.75	\$13,484.56	\$13,995.63
Body - BRT STYLING		7	BRT Plus Exterior Styling Package (Front, Rear & continuous roof line) with One or Two Piece Windshield	Option	Option	Option	Not Applicable		\$18,950.00	\$21,182.31	\$24,359.66	\$26,101.37	\$27,090.61
BODY - PASSENGER SEATS													
BODY - PASSENGER SEATS		1	35 Passenger Seating	Standard	Standard	Standard	Standard		Included	Included	Included	Included	Included
BODY - PASSENGER SEATS		2	ADD additional double flip seat in lieu of fixed seat	Option	Option	Option	Option		QUOTE	QUOTE	QUOTE	QUOTE	QUOTE
BODY - PASSENGER SEATS		3	Remove one set of fixed seats	Option	Option	Option	Option		QUOTE	QUOTE	QUOTE	QUOTE	QUOTE
BODY - PASSENGER SEATS		4	remove individual seat	Option	Option	Option	Option		QUOTE	QUOTE	QUOTE	QUOTE	QUOTE
Engine													
Engine		1	Cummins ISL-G 320 HP	Not Applicable	Not Applicable	Not Applicable	Not Applicable		NA	NA	NA	NA	NA
Engine		2	Cummins ISX-G 12 400 HP	Not Applicable	Not Applicable	Not Applicable	Not Applicable		NA	NA	NA	NA	NA
Engine		3	Cummins ISL-G 320 HP	Not Applicable	Not Applicable	Not Applicable	Not Applicable		NA	NA	NA	NA	NA
Engine		4	Cummins ISX-G 12 400 HP	Not Applicable	Not Applicable	Not Applicable	Not Applicable		NA	NA	NA	NA	NA
Engine		5	Cummins ISB 6.7 280 HP	Not Applicable	Not Applicable	Not Applicable	Not Applicable		NA	NA	NA	NA	NA
Engine		6	Cummins ISN 280 HP	Standard	Standard	Standard	Standard		Included	Included	Included	Included	Included
Engine		7	Cummins I9 280 HP	Option	Option	Not Applicable	Not Applicable		\$2,413.00	\$2,697.25	\$3,101.84	\$3,323.62	\$3,449.59
Engine		8	Cummins I9 330 HP	Option	Option	Not Applicable	Not Applicable		Included	Included	Included	Included	Included
Engine		9	Cummins B6.7 280HP	Not Applicable	Not Applicable	Standard	Not Applicable						
Exhaust													
Exhaust		1	none	Not Applicable	Not Applicable	Not Applicable	Not Applicable		NA	NA	NA	NA	NA
Exhaust		2	Diesel Particulate Filter (Active)	Standard	Standard	Standard	Standard		Included	Included	Included	Included	Included
Exhaust		3	none	Not Applicable	Not Applicable	Not Applicable	Not Applicable		NA	NA	NA	NA	NA
Exhaust		4	Diesel Particulate Filter (Active)	Standard	Standard	Standard	Standard		Included	Included	Included	Included	Included
Exhaust		5	none	Not Applicable	Not Applicable	Not Applicable	Not Applicable		NA	NA	NA	NA	NA
Exhaust		6	Electric	Not Applicable	Not Applicable	Not Applicable	Standard		Included	Included	Included	Included	Included
Exhaust		7	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Standard		Included	Included	Included	Included	Included
Fuel													
Fuel		1	Fuel Gauge on Dash	Option	Option	Option	Not Applicable		\$134.00	\$149.79	\$172.25	\$184.57	\$191.56
Fuel		2	NGV2-3 Type 3 Complete CNG Cylinder (Vendor will list GGE)	Not Applicable	Not Applicable	Not Applicable	Not Applicable		NA	NA	NA	NA	NA
Fuel		3	NGV2-4 Type 4 Complete CNG Cylinder (Vendor will list GGE)	Not Applicable	Not Applicable	Not Applicable	Not Applicable		NA	NA	NA	NA	NA
Fuel		4	Hexagon Lincoln's TUFFSHELL Roof Mount Package	Not Applicable	Not Applicable	Not Applicable	Not Applicable		NA	NA	NA	NA	NA
Fuel		5	EMCO - WHEATON Posi/Lock 105 (Flip Cap and Twist Cap)	Standard	Standard	Standard	Standard		Included	Included	Included	Included	Included
Fuel		6	EMCO - Posi/Lock Blue Urea Dispensing System	Not Applicable	Not Applicable	Not Applicable	Not Applicable		NA	NA	NA	NA	NA
Fuel		7	Standard Gravity Fill	Deduction	Deduction	Deduction	Deduction		(\$265.00)	(\$296.22)	(\$340.65)	(\$385.01)	(\$378.84)
Fuel		8	Fuel Gauge on Dash	Option	Option	Option	Not Applicable		\$134.00	\$149.79	\$172.25	\$184.57	\$191.56
Fuel		9	Dual Fill (Curbide and Streetside) w/ Standard Gravity Fill	Option	Option	Option	Not Applicable		\$84.00	\$92.25	\$107.08	\$1148.74	\$1192.27
Fuel		10	80 Gallon Net Usable Split Fuel Tanks	Option	Option	Option	Not Applicable		NA	NA	NA	NA	NA
Fuel		11	EMCO - WHEATON Posi/Lock 105 (Flip Cap and Twist Cap)	Standard	Standard	Standard	Standard		Included	Included	Included	Included	Included
Fuel		12	EMCO - Posi/Lock blue Urea Dispensing System	Not Applicable	Not Applicable	Not Applicable	Not Applicable		NA	NA	NA	NA	NA
Fuel		13	Standard Gravity Fill	Deduction	Deduction	Deduction	Deduction		NA	NA	NA	NA	NA
Fuel		14	Fuel Gauge on Dash	Option	Option	Option	Not Applicable		NA	NA	NA	NA	NA
Fuel		15	Dual Fill (Curbide and Streetside) w/ Standard Gravity Fill	Option	Option	Option	Not Applicable		NA	NA	NA	NA	NA
Fuel		16	80 Gallon Net Usable Split Fuel Tanks for ADX Each Side	Option	Option	Option	Not Applicable		\$134.00	\$149.79	\$172.25	\$184.57	\$191.56
Fuel		17	NGV 2-4 Type 4 Complete CNG Cylinder (20,000 SCF)	Not Applicable	Not Applicable	Not Applicable	Not Applicable		NA	NA	NA	NA	NA
Fuel		18	NGV 2-4 Type 4 Complete CNG Cylinder (10,000 SCF)	Not Applicable	Option	Not Applicable	Not Applicable		Included	Included	Included	Included	Included
Fuel Filter													
Fuel Filter		1	Low Fuel Alarm	Standard	Standard	Standard	Not Applicable		Included	Included	Included	Included	Included
Fuel Filter		2	Low Fuel Alarm	Standard	Standard	Standard	Not Applicable		Included	Included	Included	Included	Included
Fuel Filter		3	Spin on Primary and Secondary Fuel Filters	Standard	Standard	Standard	Not Applicable		Included	Included	Included	Included	Included
Fuel Filter		4	Racor 490130 Filter W/Thumpump	Option	Option	Option	Not Applicable		\$959.00	\$957.28	\$983.40	\$957.28	\$993.56
Fuel Filter		5	Dexco Fuel Pro 384, Heated	Option	Option	Option	Not Applicable		\$530.96	\$530.96	\$610.60	\$624.26	\$679.05
Fuel Filter		6	Low Fuel Alarm	Standard	Standard	Standard	Not Applicable		Included	Included	Included	Included	Included
Fuel Filter		7	Spin on Primary and Secondary Fuel Filters	Standard	Standard	Standard	Not Applicable		Included	Included	Included	Included	Included
Fuel Filter		8	Dexco Fuel Pro 384, Heated	Option	Option	Option	Not Applicable		\$959.00	\$957.28	\$983.40	\$957.28	\$993.56
Fuel Filter		9	Racor 490130 Filter W/Thumpump	Option	Option	Option	Not Applicable		\$475.00	\$530.96	\$610.60	\$624.26	\$679.05
Hybrid													
Hybrid		1	none	Not Applicable	Not Applicable	Not Applicable	Not Applicable		NA	NA	NA	NA	NA
Hybrid		2	none	Not Applicable	Not Applicable	Not Applicable	Not Applicable		NA	NA	NA	NA	NA
Hybrid		3	Auxiliary Coolant Heater	Not Applicable	Not Applicable	Not Applicable	Not Applicable		NA	NA	NA	NA	NA
Hybrid		4	Allison EP40 Electric Drive System	Not Applicable	Not Applicable	Not Applicable	Not Applicable		NA	NA	NA	NA	NA
Hybrid		5	Allison EP50 Electric Drive System	Not Applicable	Not Applicable	Not Applicable	Not Applicable		NA	NA	NA	NA	NA
Hybrid		6	BAE Hybrid System HD5 200 - APS1-01K (11kwh Battery w/Ultracaps)	Not Applicable	Not Applicable	Standard	Not Applicable		Included	Included	Included	Included	Included
Hybrid		7	BAE Hybrid System HD5 200 - APS2-3.2K (32kwh Battery)	Not Applicable	Not Applicable	Option	Not Applicable		\$25,000.00	\$27,945.00	\$32,136.75	\$34,434.53	\$35,739.60
Hybrid		8	BAE Hybrid System HD5 300 - APS1-01K (11kwh Battery w/Ultracaps)	Not Applicable	Not Applicable	Standard	Not Applicable		Included	Included	Included	Included	Included
Hybrid		9	BAE Hybrid System HD5 300 - APS3-3.2K (32kwh Battery)	Not Applicable	Not Applicable	Not Applicable	Not Applicable		NA	NA	NA	NA	NA
Passenger Seat Options													
Passenger Seat Options		1	29 Passenger Seating - Citeat	Option	Option	Option	Option		\$326.00	\$364.40	\$419.06	\$449.03	\$466.04
Passenger Seat Options		2	AMSECO - 6468	Standard	Standard	Standard	Standard		NA	NA	NA	NA	NA
Passenger Seat Options		3	AMSECO - Insight	Standard	Standard	Standard	Standard		Included	Included	Included	Included	Included
Passenger Seat Options		4	AMSECO - Metropolitan	Not Applicable	Not Applicable	Not Applicable	Not Applicable		NA	NA	NA	NA	NA
Passenger Seat Options		5	AMSECO - 6466	Option	Option	Option	Option		\$2,388.00	\$2,669.31	\$3,069.70	\$3,289.19	\$3,413.85
Passenger Seat Options		6	AMSECO - 6566	Option	Option	Option	Option		\$6,051.00	\$6,763.81	\$7,778.38	\$8,334.53	\$8,650.41

Passenger Seat Options	7	AMSECO - 2005/6466 Suburbans	Option	Option	Option	\$3,418.00	\$3,820.64	\$4,393.74	\$4,707.89	\$4,886.32
Passenger Seat Options	8	AMSECO - Innovator 850	Option	Option	Option	\$1,678.00	\$1,875.67	\$2,157.02	\$2,311.25	\$2,398.84
Passenger Seat Options	9	AMSECO - Premier	Not Applicable	Not Applicable	Not Applicable	NA	NA	NA	NA	NA
Passenger Seat Options	10	AMSECO - 2000 Series Recliners	Not Applicable	Not Applicable	Not Applicable	NA	NA	NA	NA	NA
Passenger Seat Options	11	AMSECO - VRS0 Seat Inserts	Standard	Standard	Standard	Included	Included	Included	Included	Included
Passenger Seat Options	12	AMSECO - CR50 Seat Inserts	Option	Option	Option	\$1,778.00	\$1,987.45	\$2,448.98	\$2,541.80	\$2,541.80
Passenger Seat Options	13	4 One - Angel	Not Applicable	Not Applicable	Not Applicable	NA	NA	NA	NA	NA
Passenger Seat Options	14	4 One Aries	Option	Option	Option	\$5,384.00	\$6,020.97	\$7,415.82	\$7,696.88	\$7,696.88
Passenger Seat Options	15	4 One Brasil	Not Applicable	Not Applicable	Not Applicable	NA	NA	NA	NA	NA
Passenger Seat Options	16	4 One - Clisset	Option	Option	Option	\$326.00	\$364.40	\$419.06	\$449.03	\$466.04
Passenger Seat Options	17	4 One - Clitrop	Option	Option	Option	\$4,768.53	\$5,483.82	\$5,875.91	\$6,098.60	\$6,098.60
Passenger Seat Options	18	4 One - Diablo	Option	Option	Option	\$9,635.00	\$10,770.00	\$12,385.50	\$13,271.07	\$13,774.04
Passenger Seat Options	19	4 One - Parlot	Not Applicable	Not Applicable	Not Applicable	NA	NA	NA	NA	NA
Passenger Seat Options	20	4 One Gemini Seating	Option	Option	Option	(\$57.00)	(\$63.71)	(\$73.27)	(\$78.51)	(\$81.49)
Passenger Seat Options	21	4 One Torino G	Option	Option	Option	NA	NA	NA	NA	NA
Passenger Seat Options	22	Kiel Ideo	Not Applicable	Not Applicable	Not Applicable	NA	NA	NA	NA	NA
Passenger Seat Options	23	Kiel Eios	Not Applicable	Not Applicable	Not Applicable	NA	NA	NA	NA	NA
Passenger Seat Options	24	Add (3) Passenger Seats to Curbside Wheelwell	Not Applicable	Not Applicable	Not Applicable	NA	NA	NA	NA	NA
Passenger Seat Options	25	Add (2) Passenger Seats to Curbside Wheelwell	Not Applicable	Not Applicable	Not Applicable	NA	NA	NA	NA	NA
Passenger Seat Options	26	110 v outlets with USB charging throughout seating layout	Option	Option	Option	\$220.00	\$245.92	\$282.80	\$303.02	\$314.51
Passenger Seat Options	27	Hinged Rear Settee	Option	Option	Option	NA	NA	NA	NA	NA
Passenger Seat Options	28	Dual USB charging station throughout seating layout	Option	Option	Option	\$1,900.00	\$2,123.82	\$2,442.39	\$2,617.02	\$2,716.21
Passenger Seat Options	29	Cup holders for each seat (available on select seats only)	Option	Option	Option	QUOTE	QUOTE	QUOTE	QUOTE	QUOTE
Passenger Seat Options	30	Self-storing footrests for each seat (available on select seats only)	Option	Option	Option	QUOTE	QUOTE	QUOTE	QUOTE	QUOTE
Passenger Seat Options	31	Expanding mesh magazine holder on seat back (available on select seats only)	Option	Option	Option	QUOTE	QUOTE	QUOTE	QUOTE	QUOTE
Passenger Seat Options	32	Three (3) point passenger restraint belts for each seat (available on select seats only)	Option	Option	Option	QUOTE	QUOTE	QUOTE	QUOTE	QUOTE
Passenger Seat Options	33	AMSECO - Right Prime	Option	Option	Option	\$1,599.00	\$1,787.36	\$2,055.47	\$2,202.43	\$2,285.90
Passenger Seat Options	34	AMSECO - Insight Prime	Option	Option	Option	(\$860.00)	(\$1,073.08)	(\$1,334.05)	(\$1,572.28)	(\$1,372.40)
Passenger Seat Options	35	AMSECO - Insight Prime+	Option	Option	Option	(\$367.00)	(\$410.23)	(\$471.77)	(\$505.50)	(\$524.66)
Passenger Seat Options	36	Classic San Francisco	Option	Option	Option	\$84,969.00	\$84,978.35	\$109,225.10	\$117,034.70	\$121,470.31
Trolley Styling Package	1	Wood Seats	Option	Option	Option	\$17,629.00	\$19,705.70	\$22,661.55	\$24,281.85	\$25,202.13
Trolley Styling Package	1.1	Wood Trimmed Drivers Barrier	Option	Option	Option	\$400.00	\$447.12	\$514.19	\$550.95	\$571.83
Trolley Styling Package	1.2	Wood Trimmed Electrical Box	Option	Option	Option	\$400.00	\$447.12	\$514.19	\$550.95	\$571.83
Trolley Styling Package	1.3	Brass Powder coated Stanchions & Grab Rails	Option	Option	Option	\$600.00	\$671.28	\$771.28	\$826.43	\$857.75
Trolley Styling Package	1.4	Adi Vinyl Seat Cushions	Option	Option	Option	\$4,836.00	\$5,403.68	\$6,216.53	\$6,661.02	\$6,913.47
Trolley Styling Package	2	Adi Low Catcher	Option	Option	Option	\$3,349.00	\$3,745.51	\$4,305.84	\$4,612.85	\$4,787.88
Trolley Styling Package	3	Adi Rope Lights	Option	Option	Option	\$3,611.00	\$4,036.36	\$4,641.83	\$4,973.72	\$5,140.63
Trolley Styling Package	4	Add Vinyl Graphics Package	Option	Option	Option	NA	NA	NA	NA	NA
Trolley Styling Package	5	Add Vinyl Graphics Package	Option	Option	Option	NA	NA	NA	NA	NA
Trolley Styling Package	6	Add for Hard Backrestability	Not Applicable	Not Applicable	Not Applicable	\$8,869.00	\$9,913.77	\$11,400.83	\$12,215.99	\$12,678.98
Trolley Styling Package	7	3 Color Custom Paint for Trillity	Option	Option	Option	Included	Included	Included	Included	Included
Trolley Styling Package	8	Brown Leather Overhead Grab Straps- Each	Option	Option	Option	\$30.00	\$33.53	\$38.56	\$41.32	\$42.89

All options listed below are the same for each bus length worksheet.

Category	Item #	Description	Designation	Propulsion (if applicable)	Price	6/1/28 Price Change	4/1/23 Price Change	4/1/24 Price Change	4/1/25 Price Change
Air									
Air	1	Shop Air Connection (Milton 7790)	Standard	Included	NA				
Air	2	Bendix AD9, (300 g Purge)	Not Applicable						
Air	3	Bendix Adip, Heated	Option		\$752.28	\$865.12	\$926.98	\$962.11	
Air	4	Bendix Puraguard Air/Oil Separator	Option		\$543.25	\$624.74	\$669.41	\$694.78	
Air	5	Wabco SS 1800 Air Dryer, Heated	Option		\$543.00	\$606.97	\$688.01	\$747.92	
Air	6	Chicago Rawhide T2000	Not Applicable		NA				
Air	7	Chicago Rawhide Dual Turbo 2000	Standard	Included					
Air	8	Graham White QBA 15 "Sludge Buster", Heated	Option		\$754.52	\$867.69	\$929.73	\$964.97	
Air	9	Kington Auto Drain Valve At Ping Tank	Standard	Included					
Air	10	Terminate Knelling Operation Sensor	Standard	Included					
Air	11	Wabco 37.4 cfm twin cylinder air compressor (ISB 6.7 engine only)	Standard	Included					
Air	12	Electric Air Compressor & Hydraulic Pump (BAE & Allison eGenFlex Hybrid buses only)	Option		\$	17,436.00	\$19,489.96	\$22,413.45	\$24,936.22
Body - Bike Rack									
Body - Bike Rack	1	Sportworks Apex 3 - 3 Position Bike, Stainless Steel	Not Applicable		NA				
Body - Bike Rack	2	Sportworks - 2 Position Bike, Black Powder Coated	Option		\$499.00	\$557.78	\$641.45	\$687.31	\$713.36
Body - Bike Rack	3	Sportworks - 2 Position Bike, Stainless Steel	Option		\$869.65	\$1,000.10	\$1,071.60	\$1,112.22	
Body - Bike Rack	4	Sportworks - 3 Position Bike, Black Powder Coated	Not Applicable		NA				
Body - Bike Rack	5	Sportworks - Trifligy 3 Position Bike, Stainless Steel	Option		\$900.95	\$1,036.09	\$1,110.17	\$1,152.24	
Body - Bike Rack	6	Midwest Bus - BYK RYK (Stainless Steel)	Option		\$200.00	\$227.09	\$275.48	\$285.92	
Body - Bike Rack	7	Bike Rack Deployed Lamp on Dash	Option		\$36.00	\$46.28	\$49.59	\$51.47	
Body - Bike Rack	8	Bike Rack 5" Spot Mirror	Option		\$306.00	\$342.05	\$421.48	\$437.45	
Body - Bike Rack	9	Bike Rack Mounted Advertising Frame, 14"X 44"	Option		Included				
Body - Bike Rack	10	Sportworks - Mounting Bracket Only	Standard						
Body - Driver's Barrier									
Body - Driver's Barrier	1	Wrap Around Fiberglass with Schedule Rack Cutouts	Option		\$61.00	\$68.19	\$84.02	\$87.20	
Body - Driver's Barrier	2	Wrap Around Fiberglass W/O Schedule Rack Cutouts	Standard	Included					
Body - Driver's Barrier	3	Plexiglass Drivers Security Enclosure	Option		\$875.00	\$978.08	\$1,124.79	\$1,205.21	\$1,250.89
Body - Driver's Barrier	4	Flat Melamine, Two Piece	Not Applicable		NA				
Body - Driver's Barrier	5	Flat Melamine, Two Piece, w/(4) Schedule Holders	Not Applicable		NA				
Body - Driver's Barrier	6	Plexiglass Drivers Security Enclosure, two pieces	Not Applicable		NA				
Body - Driver's Barrier	7	Arowguard Driver Protection Shield w/Standard Glass	Option		\$4,988.00	\$5,575.59	\$6,411.92	\$6,870.38	\$7,130.76
Body - Driver's Barrier	8	Arowguard Driver Protection Shield w/extended Glass	Option		\$5,240.00	\$5,857.27	\$7,217.48	\$7,491.02	

Body - Driver/Seat			
Body – Driver Seat	1	Recaro Ego Metro w/Fabric Seat and Back w/Gray Fabric Boxing	Standard
Body – Driver Seat	2	Recaro MGI	Included
Body – Driver Seat	3	USSC 9100 ALX w/Fabric Seat and Back w/Gray Fabric Boxing	Option
Body – Driver Seat	4	USSC 9100 ALX - 3 w/Fabric Seat and Back w/Gray Fabric Boxing	Option
Body – Driver Seat	5	Add Headrest (USSC)	Option
Body – Driver Seat	6	Add Arm Rest (Right Side Only, USSC)	Option
Body – Driver Seat	7	Add Shoulder Belt (Recaro)	Option
Body – Driver Seat	8	Add 3 - Point, Horizontally Adjustable D - Loop (Recaro)	Option
Body – Driver Seat	9	Safety Orange Shoulder Belt (US SC ALX)	Option
Body – Driver Seat	10	Silicon Foam At Lower Seat Cushion (USSC)	Option
Body – Driver Seat	11	Holdsworth Fabric	Option
Body – Driver Seat	12	FR Treated Foam (Recaro)	Option
Body – Driver Seat	13	USSC G2A –opt Drivers Seat (Includes headrest)	Option
Body – Driver Seat	14	Recaro M84 Seat	Option
Body – Driver Seat	15	Add Armrest (per side, Recaro)	Option
Body – Driver Seat	16	Ready Reach Adjustable D - Loop (USSC)	Option
Body – Driver Seat	17	Full Docket 90 FR Seat (USSC)	Option
Body – Driver Seat	18	Add Liquidell Seat at Cushion (Recaro)	Option
Body – Driver Seat	19	Add Heated Seat Feature (Recaro)	Option
Body – Driver Seat	20	Add Drivers Seat Belt Alarm	Option
Body – Driver Seat	21		
Body – Driver Seat	22		
Body – Driver Seat	23		
Body - Exit Door			
Body – Exit Door	1	Standard Melamine Panels on Lower Section Both Sides of Rear Exit Door	Standard
Body – Exit Door	2	Upper Clear Plexiglas Modesty Panels Both Sides of Rear Exit Door (each)	Option
Body – Exit Door	3	Accelerator Interlock when doors are open	Standard
Body - Floor Covering			
Body – Floor Covering	1	Greenwood ACQ Plywood W/RCA Rubber	Deduction
Body – Floor Covering	2	Altro Meta/Chroma Transfloor	Standard
Body – Floor Covering	3	Altro wood safety (vinyl simulated woodgrain)	Option
Body – Floor Covering	4	Gerflor Tarabus Gaya Wood (vinyl simulated woodgrain)	Option
Body – Floor Covering	5	Composite Sub Floor	Option
Body – Floor Covering	6	Rear Seat Riser for Forward Facing Seats	Standard
Body – Floor Covering	7	Front Seat Riser for Forward Facing Seats (Each Side)	Option
Body – Floor Covering	8	Pressure-preservative treated plywood	Standard
Body – Floor Covering	9	Gerflor Tarabus Sirius/Helios	Option
Body - Mirror, Exterior			
Body – Mirror, Exterior	1	Safe Fleet One Piece 8" x 8" Flat Glazing W/Stainless Steel Arms, Remote Both Sides	Standard
Body – Mirror, Exterior	2	Safe Fleet One Piece 8" x 8" Flat Glazing W/S.S. Arms, Manual W/6" Spot Mirror	Option
Body – Mirror, Exterior	3	Safe Fleet 8" x 15", 2 Piece, Heated, Remote Both Sides	Option
Body – Mirror, Exterior	4	Safe Fleet 9" x 11", 2 Piece, Heated, Remote Both Sides	Not Applicable
Body – Mirror, Exterior	5	Safe Fleet 9" x 13", Class "A", 2 Piece, Heated, Remote Both Sides	Option
Body – Mirror, Exterior	6	Safe Fleet 10" x 13", 2 Piece (Flat & Convex), Heated, Remote Both Sides	Option
Body – Mirror, Exterior	7	Safe Fleet 10" x 11", 1 Piece, Heated, Remote Both Sides	Option
Body – Mirror, Exterior	8	Rosco 8" x 15", 1 Piece, Heated Remote Both Sides	Deduction
Body – Mirror, Exterior	9	Lucerix Metagel 7" x 15", 2 Piece, Heated Remote Both Sides	Option
Body – Mirror, Exterior	10	Velvac View-All System (Camera Mounted in Exterior Mirror W/LCD Screen in Driver Area)	Not Applicable
Body – Mirror, Exterior	11	Velvac Hyperion Lane Change Guardian	Not Applicable
Body - Mirror, Interior			
Body – Mirror, Interior	1	Mirror - 8 1/2" x 16"	Standard
Body – Mirror, Interior	2	Mirror - 4.75" x 15"	Option
Body – Mirror, Interior	3	Mirror - Front Door Mirror of Header Door	Standard
Body – Mirror, Interior	4	Mirror - Rear Exit Door Step Well 12" Convex	Standard
Body – Mirror, Interior	5	Mirror - 8 1/2" x 12" Center	Not Applicable
Body – Mirror, Interior	6	Mirror 5" Flat	Option
Body - Paint & Decal			
Body – Paint & Decal	1	One Color w/Roof Numbers	Standard
Body – Paint & Decal	2	(2) Colors, with and without Black Mask At Windows	Option
Body – Paint & Decal	3	(3) Colors, with and without Black Mask At Windows	Option
Body – Paint & Decal	4	Basic Decal Package (Up to Three Strips and Equivalent Design)	Option
Body – Paint & Decal	5	Custom Paint/Decal Design (Per Purchasers Spec)	Option
Body – Paint & Decal	6	Clear Coat Complete Bus	Not Applicable
Body – Paint & Decal	7	Remove Roof Numbers	Deduction
Body – Paint & Decal	8	Add Clear Coat (per Paint Pass)	Option
Body - Passenger Signal			
Body – Passenger Signal	1	Standard Melamine Panels on Lower Section Both Sides of Rear Exit Door	Standard
Body – Passenger Signal	2	Upper Clear Plexiglas Modesty Panels Both Sides of Rear Exit Door (each)	Option
Body – Passenger Signal	3	Accelerator Interlock when doors are open	Standard
Body - Floor Covering			
Body – Floor Covering	1	Greenwood ACQ Plywood W/RCA Rubber	Deduction
Body – Floor Covering	2	Altro Meta/Chroma Transfloor	Standard
Body – Floor Covering	3	Altro wood safety (vinyl simulated woodgrain)	Option
Body – Floor Covering	4	Gerflor Tarabus Gaya Wood (vinyl simulated woodgrain)	Option
Body – Floor Covering	5	Composite Sub Floor	Option
Body – Floor Covering	6	Rear Seat Riser for Forward Facing Seats	Standard
Body – Floor Covering	7	Front Seat Riser for Forward Facing Seats (Each Side)	Option
Body – Floor Covering	8	Pressure-preservative treated plywood	Standard
Body – Floor Covering	9	Gerflor Tarabus Sirius/Helios	Option
Body - Mirror, Exterior			
Body – Mirror, Exterior	1	Safe Fleet One Piece 8" x 8" Flat Glazing W/Stainless Steel Arms, Remote Both Sides	Standard
Body – Mirror, Exterior	2	Safe Fleet One Piece 8" x 8" Flat Glazing W/S.S. Arms, Manual W/6" Spot Mirror	Option
Body – Mirror, Exterior	3	Safe Fleet 8" x 15", 2 Piece, Heated, Remote Both Sides	Option
Body – Mirror, Exterior	4	Safe Fleet 9" x 11", 2 Piece, Heated, Remote Both Sides	Not Applicable
Body – Mirror, Exterior	5	Safe Fleet 9" x 13", Class "A", 2 Piece, Heated, Remote Both Sides	Option
Body – Mirror, Exterior	6	Safe Fleet 10" x 13", 2 Piece (Flat & Convex), Heated, Remote Both Sides	Option
Body – Mirror, Exterior	7	Safe Fleet 10" x 11", 1 Piece, Heated, Remote Both Sides	Option
Body – Mirror, Exterior	8	Rosco 8" x 15", 1 Piece, Heated Remote Both Sides	Deduction
Body – Mirror, Exterior	9	Lucerix Metagel 7" x 15", 2 Piece, Heated Remote Both Sides	Option
Body – Mirror, Exterior	10	Velvac View-All System (Camera Mounted in Exterior Mirror W/LCD Screen in Driver Area)	Not Applicable
Body – Mirror, Exterior	11	Velvac Hyperion Lane Change Guardian	Not Applicable
Body - Mirror, Interior			
Body – Mirror, Interior	1	Mirror - 8 1/2" x 16"	Standard
Body – Mirror, Interior	2	Mirror - 4.75" x 15"	Option
Body – Mirror, Interior	3	Mirror - Front Door Mirror of Header Door	Standard
Body – Mirror, Interior	4	Mirror - Rear Exit Door Step Well 12" Convex	Standard
Body – Mirror, Interior	5	Mirror - 8 1/2" x 12" Center	Not Applicable
Body – Mirror, Interior	6	Mirror 5" Flat	Option
Body - Paint & Decal			
Body – Paint & Decal	1	One Color w/Roof Numbers	Standard
Body – Paint & Decal	2	(2) Colors, with and without Black Mask At Windows	Option
Body – Paint & Decal	3	(3) Colors, with and without Black Mask At Windows	Option
Body – Paint & Decal	4	Basic Decal Package (Up to Three Strips and Equivalent Design)	Option
Body – Paint & Decal	5	Custom Paint/Decal Design (Per Purchasers Spec)	Option
Body – Paint & Decal	6	Clear Coat Complete Bus	Not Applicable
Body – Paint & Decal	7	Remove Roof Numbers	Deduction
Body – Paint & Decal	8	Add Clear Coat (per Paint Pass)	Option

Body – Passenger Signal	1	Pullcords - Above Windows (Neutral Or Yellow) w/Touch Pad At W/C Positions	Standard	Included		
Body – Passenger Signal	2	Touch Tape (At Window Mullions)	Option	\$1,116.00	\$1,247.46	\$1,537.16
Body – Passenger Signal	3	Button at Exit Door Vertical Stanchion	Option	\$68.00	\$76.01	\$93.66
Body – Passenger Signal	4	Additional Amber Stop Request Lamp Mounted on Driver's Dash	Option	\$38.00	\$42.48	\$52.34
Body – Passenger Signal	5	Button in the Parcel Rack	Not Applicable	NA		
Other Option - Specify						
Body - Rear Door						\$0.00
Body – Rear Door	1	34" Wide Rear Door w/Full Driver Control (Air Open/Spring Close)	Standard	Included		
Body – Rear Door	2	48" Wide Rear Door w/Full Driver Control (Air Open/Air Close)	Option	\$2,821.00	\$3,153.31	\$3,885.59
Body – Rear Door	3	56" Wide Rear Door w/Full Driver Control (Air Open/Air Close)	Option	\$2,821.00	\$3,153.31	\$3,885.59
Body – Rear Door	4	Electric Operated Front/Rear Door Motor and Control	Option	\$4,012.00	\$4,484.61	\$5,526.05
Body – Rear Door	5	Passenger Open (Push Open/Spring Close)	Not Applicable	NA		
Body – Rear Door	6	Touch Bars (Air Open/Spring Close)	Option	\$553.00	\$618.14	\$790.86
Body – Rear Door	7	Touch Bars w/Driver Override	Option	\$553.00	\$618.14	\$790.86
Body – Rear Door	8	Touch Tape in Place of Touch Bars	Not Applicable	NA		
Body – Rear Door	9	Vapor Class Acoustic (Photo Sensor)	Option	\$3,292.00	\$3,679.80	\$4,534.34
Body – Rear Door	10	Vapor V Touch (Electronic Touch Bar)	Option	\$553.00	\$618.14	\$790.86
Body – Rear Door	11	Vapor Electric Transit Operator	Not Applicable	NA		
Body – Rear Door	12	Vapor Electric Door Control / 1939 Interface	Option	\$575.00	\$642.74	\$791.99
Body – Rear Door	13	Vapor Optical Pressure Wave Switch	Option	\$391.23	\$449.91	\$560.35
Body – Rear Door	14	Exterior Air Release (Front Door Control Valve)	Option	\$162.00	\$181.08	\$223.14
Body – Rear Door	15	Driver Push Button Door Controls	Option	\$220.00	\$245.92	\$303.02
Body – Rear Door	16	Bode CADS All electric doors	Not Applicable	NA		
Body – Rear Door	17	Remove Rear Door, Add Two Seats	Deduction	(\$1,300.00)	(\$1,453.14)	(\$1,858.46)
Body – Rear Door	18	Ventura electric rear door	Not Applicable	NA		
Body – Rear Door	19	Add Center Door (Articulated bus only)	Not Applicable	NA		
Other Option - Specify						
Body - Roof Hatch						\$0.00
Body – Roof Hatch	1	Manual Hatch At Front and Rear Positions	Option	\$317.00	\$354.34	\$436.63
Body – Roof Hatch	2	One (1) Roof Hatch Position - Rear	Standard	Included		
Body – Roof Hatch	3	Electric Hatch with Driver Control (per Position)	Option	\$494.00	\$552.19	\$680.43
Body – Roof Hatch	4	Glass Hatch in Lieu of Standard	Option	\$103.00	\$115.13	\$141.87
Body – Roof Hatch	5	Additional Roof Hatch Position	Option	\$354.34	\$407.49	\$503.18
Other Option - Specify						
Body - Schedule Rack						
Body – Schedule Rack	1	none	Standard	Included		
Body – Schedule Rack	2	Innocom Schedule Racks 3.75" x 7" x 1.5"	Option	\$30.12	\$33.14	\$41.79
Body – Schedule Rack	3	Innocom Schedule Racks 3.62" x 1.1" x 1"	Option	\$38.00	\$42.24	\$52.38
Body – Schedule Rack	4	21" x 21" Black Panel Over Rack	Option	\$180.00	\$201.20	\$249.38
Body – Schedule Rack	5	Transit Information Products - 19" x 21" OBC 19/21APL/THMC	Option	\$265.00	\$296.72	\$365.01
Body – Schedule Rack	6	Transit Information Products - 19" x 21" OBC T10P21 THMC	Option	\$480.00	\$536.54	\$661.14
Other Option - Specify						
Body - Stanchions/Grab Rails						\$0.00
Body – Stanchions/Grab Rails	1	Stainless Steel Stanchions and Grab Rails and Modesty Panel Tubes	Option	\$0.00	\$0.00	\$0.00
Body – Stanchions/Grab Rails	2	Powder Coated Vertical Stanchions, Grab Rails and Modesty Panel Tubes	Standard	Included		
Body – Stanchions/Grab Rails	3	Powder Coated Vertical Stanchions only	Option	\$0.00	\$0.00	\$0.00
Body – Stanchions/Grab Rails	4	Forebow Guard Rail	Standard	Included		
Body – Stanchions/Grab Rails	5	Grab Rail Forward Wheel Housing	Option	\$50.00	\$55.89	\$68.87
Body – Stanchions/Grab Rails	6	Luggage Rack 68" Two-Tier with Fixed Shelf's	Option	\$3,566.00	\$3,986.07	\$4,911.74
Body – Stanchions/Grab Rails	7	Vinyl Coated Nylon Grab Straps (Cost per Handle)	Option	\$25.00	\$27.95	\$34.43
Body – Stanchions/Grab Rails	8	SSTL Spring Loaded Grab Handle (Cost per Handle)	Option	\$123.00	\$137.49	\$169.42
Body – Stanchions/Grab Rails	9	non-vinyl-coated nylon grab straps (per handle, color to be chosen by agency)	Option	\$25.00	\$27.95	\$34.43
Other Option - Specify						
Cooling System						
Cooling System	1	Modine Side By Side Flat Plate Fin Radiator	Not Applicable	NA		
Cooling System	2	Modine Electric Cooling Fan System	Standard	Included		
Cooling System	3	EMP Electric Cooling Fan System	Option	\$1,256.00	\$1,403.96	\$1,729.99
Cooling System	4	Electric Fan Cooling System (Non EMP - Specify OEM)	Not Applicable	NA		
Cooling System	5	Grayson Electric Cooling Fan System	Not Applicable	NA		
Cooling System	6	Hydraulic Cooling Fan	Not Applicable	NA		
Cooling System	7	L&M Radiator	Not Applicable	NA		
Cooling System	8	Misabi Radiator	Not Applicable	NA		
Cooling System	9	E - Coat Radiator, CAC & Hydraulic Cooler	Not Applicable	NA		
Cooling System	10	Radiator Tank Guard	Option	\$272.00	\$304.04	\$374.65
Cooling System	11	Double Breeze Constant Tension Clamps	Option	\$175.00	\$195.73	\$242.17
Cooling System	12	Officer Constant Torque Clamps	Standard	Included		
Cooling System	13	Gates - Greenstripe Hose	Option	\$198.00	\$221.32	\$272.72
Cooling System	14	Webasto Model Thermo 300 (104,000 btu) Coolant Heater	Not Applicable	NA		
Cooling System	15	Webasto Model Thermo 230 (80,000 btu) Coolant Heater	Not Applicable	NA		
Cooling System	16	ProHeat Model X120 (120,000 btu) Coolant Heater	Not Applicable	NA		

Cooling System	17	Proheat Model X80 (80,000 btu) Coolant Heater	Not Applicable	NA	
Cooling System	18	Proheat Model X50 (50,000 btu) Coolant Heater	Not Applicable	NA	
Cooling System	19	Proheat Model X45 (45,000 btu) Coolant Heater	Not Applicable	NA	
Cooling System	20	Electric Coolant Auxiliary Heater	Not Applicable	NA	
Cooling System	21	Espar Model Hydronic #4	Not Applicable	NA	
Cooling System	22	Espar Model Hydronic #5	Not Applicable	NA	
Cooling System	23	Articulated Only?	Not Applicable	NA	
Cooling System	24	EMP Electric Cooling Fan System	Not Applicable	NA	
Cooling System	25	Electric Fan Cooling System (Non EMP - Specify OEM)	Not Applicable	NA	
Cooling System	26	Double Breeze Constant Tension Clamps	Not Applicable	NA	
Cooling System	27	Oetliker Constant Torque Clamps	Not Applicable	NA	
Cooling System	28	Grayson Electric Cooling Fan System	Not Applicable	NA	
Cooling System	29	Valeo (formerly Webasto) Thermo Plus 300	\$2,967.00	\$3,316.51	\$4,086.69
Cooling System	30	Valeo (formerly Webasto) Thermo Plus 230	\$2,696.00	\$3,465.63	\$3,713.42
Cooling System	31	Proheat Model X30 Coolant Heater	\$2,796.00	\$2,901.81	\$3,337.08
Cooling System	32	Proheat Model M50 Coolant Heater	\$2,796.00	\$3,125.37	\$3,594.17
Cooling System	33	E - Coat Radiator, CAC & Hydraulic Cooler (DIESEL OR ONG)	\$904.00	\$1,010.49	\$1,245.15
Cooling System	34	E - Coat Radiator, CAC & Hydraulic Cooler (HYBRID)	\$1,485.00	\$1,659.93	\$2,045.41
Electrical					
Electrical	1	Voltage Spike Arrestor, S.K.I. Products SK0241 -101445, or Approved Equal	Not Applicable	NA	
Electrical	2	24 Volt to 13.5 Volt DC - DC Converter, 30 Ampere Output, Model 1645 - 24 - 12 - 30, Manufactured By Winmore Electronics Co., Inc. or Equivalent	Not Applicable	NA	
Electrical	3	Battery Voltage Equalizer	Included		
Electrical	4	24V battery isolation system (keeps house batteries from being drained by cameras, recorders, etc.)	Not Applicable	NA	
Electrical - Accessories					
Electrical - Accessories	1	12 V Cigarette-Style Light Adaptor for PC Auxiliary Power - Drivers Area	Option	\$75.00	\$96.41
Electrical - Accessories	2	12 V Cigarette-Style Light Adaptor for PC Auxiliary Power - Rear Air Return Grille Area	Option	\$75.00	\$96.41
Electrical - Alternator					
Electrical - Alternator	1	Not for Electric		\$0.00	\$0.00
Electrical - Alternator	3	Delco 50 DN (270 AMP)	Not Applicable	NA	
Electrical - Alternator	4	Peritex P6833 Alternator	Not Applicable	\$0.00	\$0.00
Electrical - Alternator	5	Neilhoff C - 701 (300 AMP)	Not Applicable	NA	
Electrical - Alternator	6	Neilhoff C - 703 (330 AMP)	Not Applicable	NA	
Electrical - Alternator	7	Neilhoff C - 803 (500 AMP) Air Cooled	Included	\$0.00	\$0.00
Electrical - Alternator	8	EMP POWER 450 AMP Business Alternator	Option	\$0.00	\$0.00
Electrical - Alternator	9	K4500 HIPC0 (HPF 300-000) (475 AMP)	Not Applicable	NA	
		Marine Cabling for Charging System	\$993.00	\$1,147.92	\$1,230.00
		Other Option - Specify			\$1,276.62
Electrical - Automatic Passenger Counter					
Electrical - Automatic Passenger Counter	1	none	Standard	Included	
Electrical - Automatic Passenger Counter	2	UTA Automatic Passenger Counter System with GPS, WLAN Capabilities	Option	\$5,709.00	\$6,381.52
Electrical - Automatic Passenger Counter	3	UTA APC Sensors, Cabling, CPU only	Option	\$1,800.00	\$2,012.04
Electrical - Automatic Passenger Counter	4	Wiring provisions IAW APC manufacture	Not Applicable	NA	
Electrical - Automatic Passenger Counter	5	Strategic Mapping APC system	Not Applicable	NA	
Electrical - Automatic Passenger Counter	6	UTA Driver Seat Occupancy Monitor	Option	\$365.52	\$420.35
Electrical - Automatic Passenger Counter	7	UTA Multi-Slot Bike Rack Monitoring	Option	\$595.79	\$685.16
		Other Option - Specify			\$734.14
					\$761.97
Electrical - Auxiliary Lights					
Electrical - Auxiliary lights	1	Four (4) 4" Diameter LED Auxiliary Brake Lights	Option	\$100.00	\$111.78
Electrical - Auxiliary lights	2	Two (2) 4" Diameter LED Auxiliary Brake Lights	Standard	Included	
Electrical - Auxiliary lights	3	Two (2) DiaLight 7" Diameter LED Auxiliary Brake Lights	Option	\$0.00	\$0.00
Electrical - Auxiliary lights	4	4 LED Brake Strip Lamps	Option	\$300.00	\$385.64
Electrical - Auxiliary lights	5	JVA Enterprises LED "Stop" Light	Option	\$470.00	\$525.37
Electrical - Auxiliary lights	6	Exterior Cub Lamps, Front & Rear - DiaLight	Standard	Included	
Electrical - Auxiliary lights	7	Triangle Amber LED Yield Sign - DiaLight	Option	\$640.00	\$822.70
Electrical - Auxiliary lights	8	Two (2) Red LED Brake Strip Lamps	Option	\$100.00	\$111.78
					\$137.74
					\$142.96

Electrical – Auxiliary lights	9	Remove LED Auxiliary Brake Lights (DEDUCT)	Deduction	-\$138.55	(\$111.78)	(\$100.00)	(\$137.74)	(\$142.96)
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	Option	\$88.00	\$98.37	\$88.00	\$121.21	\$125.80
Electrical – Auxiliary lights	11	Service Compartment Lights - LED	Standard	Included				
Electrical – Auxiliary lights	12	LED Beacon Light	Not Applicable	NA				
Electrical – Auxiliary lights	13	LED Diesel Lights (2) - Non - Flashing only (Per NHTSA)	Option	\$200.00	\$223.56	\$200.00	\$275.48	\$285.92
Other Option - Specify								
Electrical - Battery & Battery Chargers								
Electrical – Battery & Battery Chargers	1	Polyethylene battery tray and enclosure	Not Applicable	NA				
Electrical – Battery & Battery Chargers	2	(2) DEKA BD Side and Top Post Connections (Standard for Diesel Bus)	Standard	Included				
Electrical – Battery & Battery Chargers	3	(4) DEKA Group 32 Top Post	OPTION	\$223.00	\$249.27	\$286.66	\$307.16	\$318.80
Electrical – Battery & Battery Chargers	4	DEKA AGM Type BD Group 32	Option	\$511.00	\$571.20	\$656.88	\$703.84	\$730.52
Electrical – Battery & Battery Chargers	5	(4) Odyssey Group 32	Standard	Included				
Electrical – Battery & Battery Chargers	6	(4) Trojan Group 32	Not Applicable	NA				
Electrical – Battery & Battery Chargers	7	Ultra Capacitors - KBI kAPower	Option	\$3,818.00	\$4,267.76	\$4,907.92	\$5,258.84	\$5,458.15
Electrical – Battery & Battery Chargers	8	Anderson 350 Jump Start Connector Located in Battery Compartment	Option	\$95.00	\$106.19	\$122.12	\$130.85	\$135.81
Electrical – Battery & Battery Chargers	9	Remove Anderson 350 Jump Start (Located in engine compartment)	Deduction	(\$140.00)	(\$156.49)	(\$192.83)		(\$200.14)
Electrical – Battery & Battery Chargers	10	En-route Battery Charging system (ABB HVC-450PD Pantograph, 450kW) ***Subject to production availability***	Option	\$436,732.00	\$488,179.03	\$561,405.88	\$601,546.40	\$624,345.01
Electrical – Battery & Battery Chargers	11	Inductive charging system for depot charging	See Item 24 below					
Electrical – Battery & Battery Chargers	12	Cable "Pigtail" Chargers	Not Applicable	NA				
Electrical – Battery & Battery Chargers	13	Battery Chargers	Not Applicable	NA				
Electrical – Battery & Battery Chargers	14	60 kW Charger and Dispenser (ChargePoint CP250, 62.5kW) ***Subject to production availability***	Option	\$60,919.00	\$68,095.26	\$78,309.55	\$83,908.68	\$87,088.82
Electrical – Battery & Battery Chargers	15	80 kW Charger and Dispenser	Not Applicable	NA				
Electrical – Battery & Battery Chargers	16	100 kW Charger and Dispenser (ABB HVC-100 Depot, 100kW) ***Subject to production availability***	Option	\$116,484.00	\$132,441.42	\$152,307.63	\$163,197.62	\$169,382.81
Electrical – Battery & Battery Chargers	17	125 kW Charger and Dispenser (ChargePoint CP250, 125kW) ***Subject to production availability***	Option	\$113,238.00	\$126,577.44	\$145,564.05	\$155,971.88	\$161,883.22
Electrical – Battery & Battery Chargers	18	250 kW Inductive Charging in Route Pad	Not Applicable	NA				
Electrical – Battery & Battery Chargers	19	250 kW Inductive Charging On-Board Receiver	Not Applicable	NA				
Electrical – Battery & Battery Chargers	20	350 kW on-route Charger	Not Applicable	NA				
Electrical – Battery & Battery Chargers	21	Wave Wireless Inductive chargein Equipment in Route Pad	Not Applicable	NA				
Electrical – Battery & Battery Chargers	22	Wave Wireless Inductive Charging Equipment Depot Level Pad	Not Applicable	NA				
Electrical – Battery & Battery Chargers	23	Momentum Dynamics Wireless Inductive Charging Equipment in Route Pad ***Subject to production availability***	Option	75 kW: \$74,206 150 kW: \$144,412 300 kW: \$259,295				
Electrical – Battery & Battery Chargers	24	Momentum Dynamics Wireless Inductive Charging Equipment Depot Level Pad ***Subject to production availability***	Option	75 kW: \$74,206 150 kW: \$144,412 300 kW: \$259,295				
Electrical – Battery & Battery Chargers	25	Momentum Dynamics Wireless Inductive Charging Equipment On Bus Receiver ***Subject to production availability***	Option	75 kW: \$37,300 150 kW: \$52,150 300 kW: \$79,150				
Electrical – Battery & Battery Chargers	26	Momentum Dynamics/Princeton power Wayside Battery storage-one megawatt with optional 500 kW ***Subject to production availability***	Not Applicable	NA				
Electrical – Battery & Battery Chargers	27	Electrical Management Software from Viricti	Not Applicable	NA				
Electrical – Battery & Battery Chargers	28	Energy Storage System = Battery Picks	Not Applicable	NA				
Electrical – Battery & Battery Chargers	29	260 kWh	Not Applicable	NA				
Electrical – Battery & Battery Chargers	30	320 kWh	Not Applicable	NA				
Electrical – Battery & Battery Chargers	31	440 kWh	Not Applicable	NA				
Electrical – Battery & Battery Chargers	32	500 kWh	Not Applicable	NA				
Electrical – Battery & Battery Chargers	33	660 kWh	Not Applicable	NA				

Electrical – Battery & Battery Chargers	34	800 kWh	Not Applicable	(electric only)	NA	
Electrical - Battery & Battery Chargers	35	Electric Trolley Bus Package	Not Applicable	(electric only)	NA	
Electrical – Battery & Battery Chargers	36	150 kW Charger and Dispenser (ChargePoint PowerBlock, 150kW) ***Subject to production availability***	Option	(electric only)	\$118,716.00	\$163,517.18
Electrical – Battery & Battery Chargers	37	150 kW Charger and Dispenser (ABB HVC-150 Depot, 150kW) ***Subject to production availability***	Option	(electric only)	\$127,213.00	\$175,220.78
Electrical – Battery & Battery Chargers	38	En-route Battery Charging system (ABB HVC-300PD Pantograph, 300kW) ***Subject to production availability***	Option	(electric only)	\$347,385.00	\$478,481.54
Electrical - Battery & Battery Chargers	39	(2) DEKA 8D Side and Top Post Connections (Standard for Diesel Bus)	Deduction	CNG & Hybrid	(\$683.00)	\$496,615.99
Electrical – Battery & Battery Chargers	40	(4) Odyssey Group 32	Option	Diesel Only	\$741.10	(\$947.81)
Electrical - Communication/Radio						
Electrical – Communication/Radio	1	Pre - Wire12V/40A Direct Battery & 12V/10A Ignition (Route to RH Dash & Etc. Equip. Box) and Install Roof Mount RF/GPS/Cellular Antenna	Standard	Included		
Electrical – Communication/Radio	2	Motorola XLT 2500, 10- 35 W, 800MHz W/DEC Box and Silent Alarm Switch	Not Applicable	NA		
Electrical – Communication/Radio	3	Motorola XLT 5000	Not Applicable	NA		
Electrical – Communication/Radio	4	Motorola APX4500	Option		\$4,135.86	\$5,289.46
Electrical – Communication/Radio	5	Motorola CM300 and CM300, 45W, 439- 470- MHz	Option		\$910.00	\$1,253.42
Electrical – Communication/Radio	6	Motorola CDM 1250	Not Applicable	NA		\$1,300.92
Electrical – Communication/Radio	7	Harris Mobile XG-75M Radio	Option		\$3,896.00	\$5,366.28
Electrical – Communication/Radio	8	DC Power Filter for Radio Wiring	Option		\$384.00	\$5,569.66
Electrical – Communication/Radio	9	Hand - Held Microphone	Standard	Included	\$429.24	\$548.96
Electrical – Communication/Radio	10	Public Address System with Boom Mic	Standard	Included		
Electrical – Communication/Radio	11	Additional Flush Mounted Speakers (per Pair)	Option		\$120.00	\$171.55
Electrical – Communication/Radio	12	ASP930T Radio Antenna with RG58 Coax Cable and TNC Connector	Option		\$130.00	\$185.85
Electrical – Communication/Radio	13	Antenna Specialist ASP- 572	Option		\$130.00	\$185.85
Electrical – Communication/Radio	14	Customer Specified Two Way Radio and Installation	Option	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 XTU	Option		\$611.44	\$781.98
Electrical – Communication/Radio	16	customer specific antenna, ground plane, and cable runs installation	Option	Quote		
Electrical – Communication/Radio	17	Motorola APX4500 (Wifi capable version)	Option		\$4,613.00	\$6,594.67
Electrical – Communication/Radio	18	Motorola APX6500	Option		\$4,799.00	\$6,860.57
Electrical – Communication/Radio	19	Motorola APX6500 (Wifi capable version)	Option		\$5,985.00	\$8,556.06
Electrical – Communication/Radio	20	Motorola XPRS550e	Option		\$1,660.00	\$2,373.11
Electrical – Communication/Radio	21	Harris Mobile XG-75M Radio	Option		\$4,730.00	\$6,761.93
Electrical – Communication/Radio	22	Harris Mobile XL-185M Radio	Option		\$7,158.00	\$10,232.96
Electrical - Destination Sign						
Electrical – Destination Sign	1	Twin Vision Silver Series Sign (16 X160) Front & Side	Deduction	(\$380.00)	(\$495.86)	(\$514.65)
Electrical – Destination Sign	2	Twin Vision Silver Series Sign (24 X 200) Front & Side	Option		\$313.10	\$426.02
Electrical – Destination Sign	3	Twin Vision Smart Series II (16X160) Front & Side	Not Applicable	NA		
Electrical – Destination Sign	4	Twin Vision Smart Series II (24X 200) Front & Side	Not Applicable	NA		
Electrical – Destination Sign	5	Twin Vision 100% Amber LED, Front, Curb Side, Rear	Standard	Included		
Electrical – Destination Sign	6	Twin Vision 100% Amber LED, Rear	Standard	Included		
Electrical – Destination Sign	7	Twin Vision Chroma I Color LED Front	Not Applicable	NA		
Electrical – Destination Sign	8	Twin Vision Chroma IV 100% Color LED	Not Applicable	NA		
Electrical – Destination Sign	9	Twin Vision 24 X 200 Front Amber LED Sign	Option		\$603.61	\$771.98

Electrical – Destination Sign	10	Luminator SMT Horizon 100% Amber LED Front, CurbSide, Rear	Option	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Electrical – Destination Sign	11	AXION with WiFi and Time and Date Time Stamp	Not Applicable	NA				
Electrical – Destination Sign	12	Luminator Spectrum 100% Amber LED Front, CurbSide, Rear	Option	\$7,048.00	\$7,878.25	\$9,059.99	\$9,707.78	\$10,075.71
Electrical – Destination Sign	13	Luminator White LED Front, Curb-side and Rear	Option	\$78.00	\$869.65	\$1,000.10	\$1,071.60	\$1,112.22
Electrical – Destination Sign	14	Add Twin Vision Smart Series II w/ rear Camera, Rear Sign	Not Applicable	NA				
Electrical – Destination Sign	15	Add Street Side Sign (Twin Vision Amber LED)	Option	\$1,230.00	\$1,374.89	\$1,581.13	\$1,694.18	\$1,758.39
Electrical – Destination Sign	16	Add Street Side Sign (Twin Silver Series LED)	Option	\$1,250.00	\$1,397.25	\$1,606.84	\$1,721.73	\$1,786.98
Electrical – Destination Sign	17	Remove Rear Sign (DEDUCT)	Deduction	(\$700.00)	(\$782.46)	-\$899.83	(\$964.17)	(\$1,000.71)
Electrical – Destination Sign	18	Program Software (Twin Vision)	Option	\$379.00	\$423.65	\$487.19	\$522.03	\$541.81
Electrical – Destination Sign	19	Luminator Programming Software USB Wireless	Option	\$1,000.00	\$1,117.80	\$1,285.47	\$1,377.38	\$1,429.58
Electrical – Destination Sign	20	Transign Curtain Front and Side Sign	Not Applicable	NA				
Electrical – Destination Sign	21	Heated Front Sign Glazing	Option	\$2,14.00	\$239.21	\$275.09	\$294.76	\$305.93
Electrical – Destination Sign	22	Transign, (4) Character, Metal Housing	Standard	Included				
Electrical – Destination Sign	23	Transign, (8) Character, Metal Housing	Option	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Electrical – Destination Sign	24	Transign, (2) Character, D - 1 853, Metal Housing	Option	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Electrical – Destination Sign	25	Twin Vision Electronic Front Dash Sign	Option	\$750.00	\$838.35	\$964.10	\$1,033.04	\$1,072.19
Electrical – Destination Sign	26	Hanover Display LED Amber Destination Signs (model# OLO28, OLO54 & OLO64).	Option	\$231.00	\$258.21	\$296.94	\$318.18	\$330.23
Electrical – Destination Sign	27	Luminator Electronic Front Dash Sign	Option	\$750.00	\$838.35	\$964.10	\$1,033.04	\$1,072.19
Electrical – Destination Sign	28	I/O controls Destination sign Amber (Front, Side & Rear & Dash)	Option	\$1,125.00	\$1,257.53	\$1,446.15	\$1,549.55	\$1,608.28
Electrical – Destination Sign	29	DELETE Twin Vision Rear Sign	Deduction	(\$700.00)	(\$782.46)	-\$899.83	(\$964.17)	(\$1,000.71)
Electrical – Destination Sign	30	ADD Twin Vision Rear Sign with built in Camera	Option	\$1,250.00	\$1,397.25	\$1,606.84	\$1,721.73	\$1,786.98
Electrical – Destination Sign	31	Hanover Amber Front Sign size 200x24 (price on top of Hanover option)	Option	\$719.00	\$803.70	\$924.25	\$990.34	\$1,072.87
Electrical – Destination Sign	32	Hanover dash sign	Option	\$688.00	\$769.05	\$884.40	\$947.64	\$983.55
Electrical – Destination Sign	33	DELETE Transign, (4) Character, Metal Housing	Deduction	(\$475.00)	(\$530.96)	-\$610.60	(\$654.26)	(\$679.05)
Electrical – Destination Sign	34	I/O controls Destination sign White LED (Front, Side & Rear & Dash)	Option	\$1,606.00	\$1,795.19	\$2,064.46	\$2,212.07	\$2,295.91
Electrical - Destination Sign Programming								
Electrical – Destination Sign Programming	1	Luminator USB & Integrated Programming Software	Option	\$414.00	\$462.77	\$532.18	\$570.24	\$591.85
Electrical – Destination Sign Programming	2	Twin Vision Elyse 2 USB	Option	\$350.00	\$391.23	\$449.91	\$482.08	\$500.35
Electrical – Destination Sign Programming	3	Twin Vision Software Package	Option	\$64.00	\$71.54	\$82.27	\$88.15	\$91.49
Electrical - Other Option - Specify								
Electrical - Diagnostics								
Electrical – Diagnostics	1	Set of Multiplexing Diagnostics (Includes the 7 Following Items)	Option	\$8,893.00	\$9,940.60	\$11,431.68	\$12,249.05	\$12,713.29
Electrical – Diagnostics	2	Incl w/set - Circuit Tester	Incl with set					
Electrical – Diagnostics	3	Incl w/set - Program Loader	Incl with set					
Electrical – Diagnostics	4	Incl w/set - Program	Incl with set					
Electrical – Diagnostics	5	Incl w/set - ID Writer/Verification	Incl with set					
Electrical – Diagnostics	6	Incl w/set - RS232/RS485 Converter	Incl with set					
Electrical – Diagnostics	7	Incl w/set - Software, Real Time Ladder Logic	Incl with set					
Electrical – Diagnostics	8	Incl w/set - Hand - Held Computer	Incl with set					
Electrical - Other Option - Specify								
Electrical - Equipment Storage Box								
Electrical – Equipment Storage Box	1	none	Deduction	(\$400.00)	(\$447.12)	-\$514.19	(\$550.95)	(\$571.83)
Electrical – Equipment Storage Box	2	UTA/APC Sensors, Cabling, CPU only	Option	\$1,800.00	\$2,012.04	\$2,313.85	\$2,479.29	\$2,573.25
Electrical – Equipment Storage Box	3	33" H X 20" D X 22.5" W, 13 - 42920P006	Not Applicable	NA				
Electrical – Equipment Storage Box	4	33" H X 20" D X 22.5" W, 13 - 42920P006, w/2 - Doors	Not Applicable	NA				

Electrical – Equipment Storage Box	5	33" H X 20"D X 22.5" W, 13 - 4292J0014, w/Lowered Back Panel	Not Applicable	NA					
Electrical – Equipment Storage Box	6	Strategic Mapping sensors, cabling, CPU only	Not Applicable	NA					
Electrical – Equipment Storage Box	7	44" H X 20"D X 22.5" W	Standard	Included					
Electrical – Equipment Storage Box	8	44" H X 20"D X 22.5" W, w/2 - doors	Option	\$130.00	\$145.31	\$167.11	\$179.06	\$185.85	
Electrical - Lights, Exterior									
Electrical – Lights, Exterior	1	All Exterior Lights LED - Type Lamps	Standard	Included					
Electrical – Lights, Exterior	2	Headlight LED Dailight - Low Beam only	Deduction	(\$250.00)	(\$279.45)	-\$321.37	(\$344.35)	(\$357.40)	
Electrical – Lights, Exterior	3	Headlight LED Dailight - High Beam only	Deduction	(\$250.00)	(\$279.45)	-\$321.37	(\$344.35)	(\$357.40)	
Electrical – Lights, Exterior	4	Halogen Sealed Beam Headlights	Deduction	(\$500.00)	(\$558.90)	-\$642.74	(\$688.69)	(\$714.79)	
Electrical – Lights, Exterior	5	Tail Lights - Manufacturer Dailite LED, Fixture Size - 7" Diameter	Option	\$90.00	\$100.60	\$115.69	\$123.96	\$128.66	
Electrical – Lights, Exterior	6	Tail Lights - Manufacturer Dailite LED, Fixture Size - 4" Diameter	Standard	Included					
Electrical - Intelligent Vehicle Network									
Electrical – Intelligent Vehicle Network	1	none	Standard	Included					
Electrical – Intelligent Vehicle Network	2	Clever Devices IVN III W/Voice Annunciation, APC, Wireless LAN	Option	Quote					
Electrical – Intelligent Vehicle Network	3	AVAIL IVN W/MDC, GPS, APC, WLAN	Option	Quote					
Electrical – Intelligent Vehicle Network	4	Int Voice Enunciator/AVL/GPS/APC/WLAN	Option	Quote					
Electrical – Intelligent Vehicle Network	5	Siemens Transit Master	Option	Quote					
Electrical – Intelligent Vehicle Network	6	Transloc Transit Visualization System AVL	Option	Quote					
Electrical – Intelligent Vehicle Network	7	Orbital TMS CAD/AVL System W/Voice Annunciation, APC	Option	Quote					
Electrical – Intelligent Vehicle Network	8	Intelligent Vehicle System Prewire only	Option	Quote					
Electrical – Intelligent Vehicle Network	9	Mapping and Database Setup for GPS per Customer Requirement	Option	Quote					
Electrical – Intelligent Vehicle Network	10	Trimble "Button" Antenna	Option	\$130.00	\$145.31	\$167.11	\$179.06	\$185.85	
Electrical – Intelligent Vehicle Network	11	Low Profile Blade Antenna	Option	\$130.00	\$145.31	\$167.11	\$179.06	\$185.85	
Electrical – Intelligent Vehicle Network	12	Strategic Mapping IVN	Option	Quote					
Electrical – Intelligent Vehicle Network	13	Complete INIT on-board ITS system, Copilot PC, APC, CAD/AVL, Visual/Voice Stop Enunciator, Emergency button	Option	Quote					
Electrical - Multiplexing									
Electrical – Multiplexing	1	Dinex, I/O Controls G3 System	Not Applicable	NA					
Electrical – Multiplexing	2	I/O Controls Wireless RF Module	Option	\$139.00	\$1340.24	\$1,541.28	\$1,651.48	\$1,714.07	
Electrical – Multiplexing	3	I/O Controls, Gateway Module (Included in the ITS Prewire Option)	Option	Quote					
Electrical – Multiplexing	4	Vimeo	Not Applicable	NA					
Electrical – Multiplexing	5	VDO	Not Applicable	NA					
Electrical – Multiplexing	6	Dinex, I/O Controls G4 System	Standard	Included					
Electrical - Pleasure									
Electrical – Pleasure	1	none	Standard	Included					
Electrical – Pleasure	2	Radio Tacho Link Event Data Recorder	Option	\$8,030.00	\$8,975.93	\$10,322.32	\$11,060.37	\$11,479.56	
Electrical – Pleasure	3	Radio	Not Applicable	NA					
Electrical – Pleasure	4	Radio Am/FM/CD	Option	\$380.00	\$424.76	\$488.48	\$523.40	\$543.24	
Electrical – Pleasure	5	On-Board entertainment system including 6 video screen DVD CD-ROM player	Not Applicable	NA					
Electrical – Pleasure	6	On-Board entertainment system including 2 video screen DVD CD-ROM player	Option	\$8,680.00	\$9,702.50	\$11,157.88	\$11,955.67	\$12,408.79	
Electrical - Public Announcement									
Electrical – Public Announcement	1	Drivers Speaker W/Separate Volume Control	Option	\$80.00	\$89.42	\$102.84	\$110.19	\$114.37	
Electrical – Public Announcement	2	REI Model 750040 PA W/Handheld Mic W/(6) Flush Mounted Speakers	Option	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	
Electrical – Public Announcement	3	Luminator IVS W/GPS Capability, w/LED Sign, W/O Mapping	Not Applicable	NA					
Electrical – Public Announcement	4	DR700 Vehicle Logic Unit W/GPS Capability, w/LED Sign, W/O Mapping	Option	Quote					
Electrical – Public Announcement	5	Clever Devices - SpeakEasy II	Option	\$2,330.00	\$2,604.47	\$2,995.15	\$3,209.30	\$3,330.93	

Electrical – Public Announcement	6	Rel Echo PA System	Not Applicable	NA		
Electrical – Public Announcement	7	Shure Brothers Lapel Microphone w/REI PA System	Option	\$220.00	\$245.92	\$314.51
Electrical – Public Announcement	8	Midwest Lapel Microphone (Use w/Voice Annunciation System)	Option	Quote		
Electrical – Public Announcement	9	Interior LED Sign (part of ITS/AVA system)	Option	Quote		
Electrical – Public Announcement	10	One Additional Pair of Interior Speakers	Option	\$100.00	\$111.78	\$142.96
Electrical – Public Announcement	11	One Additional exterior Speaker Each	Option	\$50.00	\$55.89	\$71.48
Electrical – Public Announcement	12	REI w/switch mounted in Driver's Area	Standard	Included		
Electrical – Public Announcement	13	Hanover HTC AVA system including interior LED sign	Option	\$6,533.00	\$7,302.59	\$9,339.47
Electrical - Video Surveillance						
Electrical – Video Surveillance	1	none	Base	Included		
Electrical – Video Surveillance	2	Apollo RoadRunner DVR 2TB 4 Camera System w/Audio	Option	\$4,399.00	\$4,917.20	\$6,288.74
Electrical – Video Surveillance	3	Apollo RoadRunner DVR 2TB 8 Camera System w/Audio	Option	\$5,575.00	\$6,231.74	\$7,969.93
Electrical – Video Surveillance	4	Apollo RoadRunner DVR 2TB 12 Camera System w/Audio	Option	\$7,464.00	\$8,343.26	\$10,670.41
Electrical – Video Surveillance	5	Apollo RoadRunner DVR 2TB 16 Camera System w/Audio	Option	\$8,547.00	\$9,553.84	\$12,218.65
Electrical – Video Surveillance	6	Apollo RoadRunner HDR DVR 2TB 4 Camera System & Audio	Option	\$5,512.00	\$6,161.31	\$7,879.87
Electrical – Video Surveillance	7	Apollo RoadRunner HDR DVR 2TB 8 Camera System & Audio	Option	\$8,547.00	\$9,553.84	\$12,218.65
Electrical – Video Surveillance	8	Apollo RoadRunner HDR DVR 2TB 12 Camera System & Audio	Option	\$10,939.00	\$12,227.61	\$15,638.22
Electrical – Video Surveillance	9	Apollo RoadRunner HDR DVR 2TB 16 Camera System & Audio	Option	\$13,783.00	\$15,406.64	\$19,703.95
Electrical – Video Surveillance	10	Apollo Wireless Data Download capable	Not Applicable	NA		
Electrical – Video Surveillance	11	Apollo Cellular "Live Look Through" Capable	Not Applicable	NA		
Electrical – Video Surveillance	12	Apollo Vehicle Information Management System (VIM)	Not Applicable	NA		
Electrical – Video Surveillance	13	Apollo video 4K DVR w/9 camera system w/ Audio	Option	\$9,767.00	\$10,917.55	\$13,962.75
Electrical – Video Surveillance	14	Cole Hersee 12063 Electrical Tow Connector	Option	\$183.00	\$204.56	\$261.61
Electrical – Video Surveillance	15	(4) Camera Pre Wire Package	Option	\$0.00	\$0.00	\$0.00
Electrical – Video Surveillance	16	SEON TX8 8 channel w/1 TB hard drive	Not Applicable	NA		
Electrical – Video Surveillance	17	SEON DX-HD 13 channel w/1 TB hard drive	Not Applicable	NA		
Electrical – Video Surveillance	18	SEON 2 TB hard drive upgrade	Not Applicable	NA		
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 Applicable	NA		
Electrical – Video Surveillance	20	SEON CD363A integrated IR Dome day/Night 600TVL interior camera, audio, 2.9 mm lens.	Option	\$251.00	\$280.57	\$358.83
Electrical – Video Surveillance	21	SEON CA904EI Day/Night 600TVL camera, exterior (w/infrared, no audio), 3.6 mm lens.	Option	\$251.00	\$280.57	\$358.83
Electrical – Video Surveillance	22	SEON C904A Dome Day/Night 600TVL camera, audio, 3.6mm lens w/mount	Option	\$371.00	\$414.70	\$530.38
Electrical – Video Surveillance	23	SEON CHW702EI HD progressive scan camera, 16mm lens, exterior (no audio) and APPINI POE Injector w/mount.	Option	\$527.00	\$589.08	\$753.39
Electrical – Video Surveillance	24	SEON SRLGA07 Smart-Reach Lite, 2.4GHz Wireless bridge w/antenna	Option	\$629.00	\$703.10	\$899.21
Electrical – Video Surveillance	25	SEON HDD-STB Vmax View software, docking station & handheld mouse.	Option	\$393.00	\$439.30	\$561.83
Electrical – Video Surveillance	26	SEON LMK LCD monitor, 5.6 inch, AC charger, battery pack	Option	\$333.00	\$372.23	\$476.05
Electrical – Video Surveillance	27	Safety Vision RH6000 Pro w/(4) Digital Color Cameras, 120 GB DVR, w/Audio	Not Applicable	NA		
Electrical – Video Surveillance	28	Angel Trax - 6 HD/IR Camera System - 500 G HD Storage with SD Card Backup and Wi-Fi ready	Not Applicable	NA		
Electrical – Video Surveillance	29	Angel Trax - 8 HD/IR Camera System - 500 G HD Storage with SD Card Backup and Wi-Fi ready	Not Applicable	NA		
Electrical – Video Surveillance	30	Angel Trax - 12 HD/IR Camera System - 750 G HD Storage with SD Card Backup and Wi-Fi ready	Not Applicable	NA		
Electrical – Video Surveillance	31	Angel Trax - 16 HD/IR Camera System - 750 G HD Storage with SD Card Backup and Wi-F- ready	Not Applicable	NA		
Electrical – Video Surveillance	32	Angel Trax Upgrade to 1 Tb- Double Stacked 500 G HD	Not Applicable	NA		
Electrical – Video Surveillance	33	Angel Trax Live View, Live GPS, and System Health Notification option	Option	\$2,100.00	\$2,347.38	\$3,002.13

Electrical – Video Surveillance	34	March Network (8) Camera System	Not Applicable	NA					
Electrical – Video Surveillance	35	REI Bus Watch Digital	Not Applicable	NA					
Electrical – Video Surveillance	36	TVSS Claim Safe III w/4 Digital Cameras	Not Applicable	NA					
Electrical – Video Surveillance	37	Mobileview IV Digital (5) Cameras, 250 GB DVR, w/Audio	Not Applicable	NA					
Electrical – Video Surveillance	38	Mobileview PENTA DVR	Not Applicable	NA					
Electrical – Video Surveillance	39	Mobileview MV3000 DVR	Not Applicable	NA					
Electrical – Video Surveillance	40	Rear View Camera System	Option	\$1,280.00	\$1,430.78	\$1,645.40	\$1,763.05	\$1,829.87	
Electrical – Video Surveillance	41	Add Additional Color Camera	Option	\$520.00	\$581.26	\$668.44	\$716.24	\$743.38	
Electrical – Video Surveillance	42	Central Station Mobileview (Katalai)	Not Applicable	NA					
Electrical – Video Surveillance	43	Verint 4 Camera System	Not Applicable	NA					
Electrical – Video Surveillance	44	Verint 5 Camera System	Not Applicable	NA					
Electrical – Video Surveillance	45	Video Test Kit Mobileview IV - Katalai	Not Applicable	NA					
Electrical – Video Surveillance	46	Desk Top Viewing Station (REI)	Not Applicable	NA					
Electrical – Video Surveillance	47	Velvac Hyperion Virtual DVR (up to 7 camera views through dash mounted tablet)	Not Applicable	NA					
Electrical – Video Surveillance	48	Apollo Embedded WIFI for DVR	Option	\$424.00	\$473.95	\$545.04	\$584.01	\$606.14	
Electrical – Video Surveillance	49	Apollo Wireless LAN Router/Antenna	Option	\$769.00	\$859.59	\$988.53	\$1,059.21	\$1,099.35	
Electrical – Video Surveillance	50	Apollo LTE Cellular/WiFi Router/Antenna	Option	\$1,564.00	\$1,748.24	\$2,010.48	\$2,154.22	\$2,235.87	
Electrical – Video Surveillance	51	Additional storage 4.0TB HDD IPO 2TB	Option	\$373.00	\$416.94	\$479.48	\$513.76	\$533.23	
Electrical – Video Surveillance	52	Additional storage 8.0TB HDD IPO 2TB	Option	\$653.00	\$729.92	\$839.41	\$899.43	\$933.52	
Electrical – Video Surveillance	53	Additional storage 10.0TB HDD IPO 2TB	Option	\$793.00	\$886.42	\$1,019.38	\$1,092.26	\$1,133.66	
Electrical – Video Surveillance	54	Apollo Monitor 8"	Option	\$599.00	\$669.56	\$770.00	\$825.05	\$856.32	
Electrical – Video Surveillance	55	Apollo Monitor 10"	Option	\$649.00	\$725.45	\$834.27	\$893.92	\$927.80	
Electrical – Video Surveillance	56	Apollo Monitor 15"	Option	\$849.00	\$949.01	\$1,091.36	\$1,169.40	\$1,213.72	
Electrical – Video Surveillance	57	Apollo Monitor 17"	Option	\$1,099.00	\$1,228.46	\$1,412.73	\$1,513.74	\$1,571.11	
Electrical – Video Surveillance	58	Apollo Vehicle Information Management System (VIM) Base Software Single Server License	Option	\$5,599.00	\$6,258.56	\$7,197.35	\$7,711.96	\$8,004.24	
Electrical – Video Surveillance	59	Apollo Vehicle Information Management System (VIM) Health Single Server License	Option	\$5,599.00	\$6,258.56	\$7,197.35	\$7,711.96	\$8,004.24	
Electrical – Video Surveillance	60	Apollo Vehicle Information Management System (VIM) Location Software Single Server License	Option	\$5,599.00	\$6,258.56	\$7,197.35	\$7,711.96	\$8,004.24	
Electrical – Video Surveillance	61	Apollo Vehicle Information Management System (VIM) Smartclip Software Single Server License	Option	\$8,999.00	\$9,388.40	\$10,796.66	\$11,568.62	\$12,007.07	
Electrical – Video Surveillance	62	Apollo Vehicle Information Management System (VIM) Streaming Video Software Single Server License	Option	\$5,599.00	\$6,258.56	\$7,197.35	\$7,711.96	\$8,004.24	
Electrical – Video Surveillance	63	Apollo Vehicle Information Management System (VIM) Health Single Vehicle License	Option	\$279.00	\$311.87	\$358.65	\$384.29	\$398.85	
Electrical – Video Surveillance	64	Apollo Vehicle Information Management System (VIM) Location Single Vehicle License	Option	\$279.00	\$311.87	\$358.65	\$384.29	\$398.85	
Electrical – Video Surveillance	65	Apollo Vehicle Information Management System (VIM) Smartclip Single Vehicle License	Option	\$419.00	\$468.36	\$538.61	\$577.12	\$599.00	
Electrical – Video Surveillance	66	Apollo Vehicle Information Management System (VIM) Streaming Video Single Vehicle License	Option	\$279.00	\$311.87	\$358.65	\$384.29	\$398.85	
Electrical – Video Surveillance	67	SEON TH6 8 channel w/2 TB hard drive	Option	\$10,341.00	\$11,559.17	\$13,293.05	\$14,243.50	\$14,783.33	
Electrical – Video Surveillance	68	Angel Trax - 6 HD/IR Vulcan series 6MDVR Camera System - 2.0TB HD Storage with SD Card Backup and Wi-Fi ready	Option	\$3,513.00	\$3,936.83	\$4,515.86	\$4,838.74	\$5,022.13	
Electrical – Video Surveillance	69	Angel Trax - 8 HD/IR Vulcan NVR Camera System - 2.0TB HD Storage with SD Card Backup and Wi-Fi ready	Option	\$6,546.00	\$7,428.90	\$8,543.23	\$9,154.07	\$9,501.01	
Electrical – Video Surveillance	70	Angel Trax - 12 HD/IR Vulcan Hybrid NVR-1200 Camera System - 2.0TB HD Storage with SD Card Backup and Wi-Fi ready	Option	\$8,841.00	\$9,658.91	\$11,107.75	\$11,901.95	\$12,353.03	
Electrical – Video Surveillance	71	Angel Trax -16 HD/IR Vulcan Hybrid NVR-1600 Camera System - 2.0TB HD Storage with SD Card Backup and Wi-Fi ready	Option	\$11,317.00	\$12,650.14	\$14,547.66	\$15,587.82	\$16,178.60	
Electrical – Video Surveillance	72	March Networks - RideSafe GT08: 8 Standard (Analog) Definition Color Camera System, 1TB SSD, Wireless, Accelerometer/Impact Sensor	Option	\$4,151.00	\$4,639.99	\$5,335.99	\$5,717.51	\$5,934.20	
Electrical – Video Surveillance	73	March Networks - RideSafe GT12: 4 High (IP) & 8 Standard (Analog) Definition Color Camera System, 2TB SSD, Wireless, Accelerometer/Impact Sensor	Option	\$6,273.00	\$7,123.74	\$8,192.30	\$8,778.05	\$9,110.74	
Electrical – Video Surveillance	74	March Networks - RideSafe GT16: 8 High (IP) & 8 Standard (Analog) Definition Color Camera System, 2TB SSD, Wireless, Accelerometer/Impact Sensor	Option	\$7,107.00	\$7,944.20	\$9,135.84	\$9,789.05	\$10,160.05	

Electrical – Video Surveillance	75	March Networks - RideSafe GT20-12 High IP) & 8 Standard (Analog) 2TB SSD, Wireless, Accelerometer/Impact Sensor	Option	\$7,813.00	\$8,733.37	\$10,043.38	\$10,761.48	\$11,169.34
Electrical – Video Surveillance	76	March Networks - Add (1) High IP) Definition 360 Interior Camera	Option	\$616.00	\$688.56	\$791.85	\$848.47	\$880.62
Electrical – Video Surveillance	77	REI Bus Watch Digital HD5-120012 CH WIFI GPS with 10 camera# 2.0TB HD, G-Force Sensor	Option	\$7,941.00	\$8,876.45	\$10,207.92	\$10,937.78	\$11,352.33
Engine - Accessories								
Engine – Accessories	1	Cummins Compumatch Fittings for (Air, Oil, Fuel & Coolant Testing)	Option	\$94.00	\$105.07	\$120.83	\$129.47	\$134.38
Engine – Accessories	2	Williams Controls 45 Degree Throttle Pedal	Standard	Included				
Engine – Accessories	3	Williams Controls 45 Degree Throttle Pedal	Standard	Included				
Engine – Accessories	4	Tiefel's (Kongsberg) Adjustable Throttle and Brake Pedal	Option	\$1,130.00	\$1,263.11	\$1,452.58	\$1,556.44	\$1,615.43
Engine – Accessories	5	STD Donaldson (R6X00-2277) - Air Intake Restriction	Standard	Included				
Engine – Accessories	6	Ashcraft (25-1494021) - Air Intake Restriction	Option	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Engine – Accessories	7	Filterminder II 3P - 3832 - Air Intake Restriction	Option	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Engine – Accessories	8	Donaldson Informer-Air Intake Restriction	Option	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Engine – Accessories	9	Spin on Filters Supplied by Engine Manufacturer	Standard	Included				
Engine – Accessories	10	By Pass Filter - Spinner - Bypass Model 976	Option	\$1,138.98	\$1,298.32	\$1,501.15	\$1,601.55	\$1,648.88
Engine – Accessories	11	Simple Test Port - 1/2" NPT - 1/2" O.D. - 1014	Option	\$20.00	\$27.07	\$32.13	\$37.64	\$38.78
Engine – Accessories	12	FMAC Oil Drain Plug	Option	\$75.00	\$80.84	\$96.41	\$103.30	\$107.22
Engine – Accessories	13	Magnetic Drain Plug	Standard	Included				
Engine – Accessories	14	Test Ports Shall Be Provided for Commonly Checked Functions on the Bus	Standard	Included				
Engine – Accessories	16	Rear Run Box Starter - Delco MT 42 - 24v Electric	Standard	Included				
Engine – Accessories	17	Rear Run Box	Standard	Included				
Engine – Accessories	18	Rear Run Box Rear Hand Throttle	Standard	Included				
Engine – Accessories	19	Rear Run Box Engine Hour Meter	Option	\$134.00	\$149.79	\$172.25	\$184.57	\$191.56
Engine – Accessories	20	Rear Run Box A/C Hour Meter	Option	\$50.00	\$55.89	\$64.27	\$68.87	\$71.48
Engine – Accessories	21	Rear Run Box Voltage Gauge 1939	Option	\$50.00	\$55.89	\$64.27	\$68.87	\$71.48
Engine – Accessories	22	Rear Run Box Oil Pressure Gauge 1939	Option	\$50.00	\$55.89	\$64.27	\$68.87	\$71.48
Engine – Accessories	23	Rear Run Box Coolant Gauge 1939	Option	\$50.00	\$55.89	\$64.27	\$68.87	\$71.48
Engine – Accessories	24	Mechanical Gauges - Murphy Oil Pressure and Coolant Temperature	Option	\$196.00	\$219.09	\$251.95	\$269.97	\$280.20
Engine – Accessories	25	Adjustable brake and accelerator pedals (minimum 3 in.)	Option	\$1,130.00	\$1,263.11	\$1,452.58	\$1,556.44	\$1,615.43
Engine – Accessories	26	Rear Run Box Programmable Forster Gauge	Option	\$150.00	\$167.67	\$192.82	\$206.61	\$214.44
Engine - Diagnostics								
Engine – Diagnostics	1	Cummins Inline 6 Adapter Kit, Insite Basic	Option	\$1,373.00	\$1,534.74	\$1,764.95	\$1,891.14	\$1,962.82
Engine – Diagnostics	2	Cummins Quickserve Online 1 Year Subscription	Option	\$1,040.00	\$1,162.51	\$1,336.89	\$1,432.48	\$1,486.77
Engine – Diagnostics	3	Cummins Quickserve Online each Additional Year Subscription	Option	\$1,040.00	\$1,162.51	\$1,336.89	\$1,432.48	\$1,486.77
Engine – Diagnostics	4	Cummins INSITE Diagnostic Program 1 Year Subscription	Option	\$1,040.00	\$1,162.51	\$1,336.89	\$1,432.48	\$1,486.77
Engine – Diagnostics	5	Cummins INSITE Diagnostic Prog an each Additional Year Subscription	Option	\$1,040.00	\$1,162.51	\$1,336.89	\$1,432.48	\$1,486.77
Engine – Diagnostics	6	Bus Fold Up Wiring Diagram	Not Applicable	NA				
Engine - Tune Up Kit								
Engine – Tune Up Kit	1	Cummins Tune - Up Kit (Includes the Following)	Option	\$7,800.00	\$8,472.92	\$9,743.86	\$10,440.55	\$10,836.25
Engine – Tune Up Kit	2	Includes - Pressure Gauge	Incl with kit					
Engine – Tune Up Kit	3	Includes - Torque Wrench	Incl with kit					
Engine – Tune Up Kit	4	Includes - Oil Filter Wrench	Incl with kit					
Engine – Tune Up Kit	5	Includes - Engine Coolant & Fuel Wrench	Incl with kit					
Engine – Tune Up Kit	6	Includes - Belt Tension Gauge	Incl with kit					
Engine – Tune Up Kit	7	Includes - Belt Tension Gauge	Incl with kit					
Engine – Tune Up Kit	8	Includes - Charge-A/C CAC Pressure Kit	Incl with kit					
Engine – Tune Up Kit	9	Includes - Engine Barring Gear	Incl with kit					
Engine – Tune Up Kit	10	Includes - Torque Wrench	Incl with kit					
Engine – Tune Up Kit	11	Includes - Roller Follower Rem. & Installation Tool	Incl with kit					
Engine – Tune Up Kit	12	Includes - Compumatch Fitting	Incl with kit					
Fare Box								
Fare Box	1	No Fare box, Power Circuit and Ground strap only	Standard	Included				
Fare Box	2	GFI 36" Fastfare	Option	\$13,781.00	\$15,404.40	\$17,715.06	\$18,981.69	\$19,701.10
Fare Box	3	GFI 36" Odyssey	Option	\$13,781.00	\$15,404.40	\$17,715.06	\$18,981.69	\$19,701.10
Fare Box	4	GFI 41" Fast Fare	Option	\$13,781.00	\$15,404.40	\$17,715.06	\$18,981.69	\$19,701.10
Fare Box	5	GFI 41" Odyssey	Option	\$13,781.00	\$15,404.40	\$17,715.06	\$18,981.69	\$19,701.10
Fare Box	6	Diamond Model H w/ two (2) Vaults	Option	\$2,225.00	\$2,487.11	\$2,860.17	\$3,064.67	\$3,180.82
Fare Box	7	Diamond Model SV w/ two (2) Vaults	Option	\$1,325.00	\$1,481.09	\$1,703.25	\$1,825.03	\$1,894.20
Fare Box	8	Main T1 Fare box w/ two V1 Vaults in Standard Paint Colors	Not Applicable	NA				
Fare Box	9	Main M4 Fare box w/ two V4 Vaults in Standard Paint Colors	Not Applicable	NA				
Fare Box	10	Main S15 Fare box w/ two V5 Vaults in Standard Paint Colors	Not Applicable	NA				
Fare Box	11	Denominator Manual Passenger Counter (Rows X Tallies X \$32)	Option	Quote	\$35.77	\$41.14	\$44.08	\$45.75
Fare Box	12	Globe Transfer Cutter	Option	\$63.00	\$70.42	\$80.98	\$86.78	\$90.06
Fare Box	13	Add TRIM to Fast Fare	Option	\$5,644.00	\$6,308.86	\$7,255.19	\$7,773.94	\$8,068.57
Fare Box	14	Add Smart Card Reader to Fast Fare	Option	\$748.00	\$836.11	\$961.53	\$1,030.28	\$1,069.33
Fare Box	15	Add Barcode Reader to Fast Fare	Option	\$221.00	\$246.593	\$286.82	\$309.69	\$320.73
Fare Box	16	Add TRIM to Odyssey	Option	\$5,216.00	\$5,830.44	\$6,703.01	\$7,184.42	\$7,456.71
Fare Box	17	Add Smart Card Reader to Odyssey	Option	\$669.00	\$747.81	\$859.98	\$921.47	\$956.39
HVAC								
HVAC	1	Thermo King System (Per Technical Specification)	Standard	Included				
HVAC	2	TK Intelligar 3 W/X 616 Compressor, R134A, Reliance Brushless Cond. & Evap. Motors	Option	\$3,000.00	\$3,353.40	\$3,856.41	\$4,132.14	\$4,288.75
HVAC	3	TK System w/General Electric Field Wound Motors (Cond & Evap)	Deduction	(\$2,000.00)	(\$2,235.60)	-\$2,570.94	(\$2,794.76)	(\$2,859.17)

HVAC	4	TK System w/General Electric P.M. Motors	Deduction	(\$1,300.00)	(\$1,433.14)	(\$1,790.60)	(\$1,858.46)
HVAC	5	TK System w/M43 Compressor	Deduction	(\$900.00)	(\$1,006.02)	(\$1,239.64)	(\$1,286.63)
HVAC	6	TK System w/S391 Screw Compressor	Standard	Included			
HVAC	7	TK System w/S616 Screw Compressor	Option	\$3,000.00	\$3,353.40	\$4,132.14	\$4,288.75
HVAC	8	TK Electric HVAC System TEA14 (Including alternator for Diesel buses)	Option	\$14,495.00	\$16,202.51	\$18,632.89	\$20,721.82
HVAC	9	TK Pressure and Return Gauges Mounted to Unit	Option	\$356.00	\$397.94	\$457.63	\$508.93
HVAC	10	R407c Refrigerant	Option	\$322.00	\$359.93	\$413.92	\$460.33
HVAC	11	MCC Drivers Heater W/Brushless Motors	Standard	Included			
HVAC	12	MCC Drivers Heater W/Brush Motors	Deduction	(\$387.00)	(\$432.59)	(\$533.05)	(\$553.25)
HVAC	13	MCC Front Stepwell/Threshold Heater W/Brushless Motor (Each)	Option	\$324.00	\$362.17	\$416.49	\$463.19
HVAC	14	MCC Underseat/Rear Stepwell Heater W/Brushless Motor (Each)	Option	\$48.00	\$51.95	\$588.75	\$654.75
HVAC	15	MCC Underseat/Rear Stepwell Heater W/Brush Motor (Each)	Not Applicable				
HVAC	16	Surak All Electric Air Conditioning - Roof Mount	Not Applicable				
HVAC	17	Surak All Electric Air Conditioning - Rear Mount (Diesel & CNG only)	Not Applicable				
HVAC	18	ACT Connection Heater	Not Applicable				
HVAC	19	ACT Espar Fuel-Fired Supplemental Coolant Heater	Not Applicable				
HVAC	20	Warm Welcome Mat (Rear Door)	Option	\$282.00	\$315.22	\$388.42	\$403.14
HVAC	21	Warm Welcome Mat (Installed on W/C Ramp)	Not Applicable				
HVAC	22	Eberspacher AC 136 G3 AE	Not Applicable				
HVAC	23	Air Purification System (Climate Comfort Technologies CCT-24 unit)	Option	\$2,188.00	\$2,445.75	\$3,013.71	\$3,127.93
HVAC	24	TK Electric HVAC System TE14 (For Allison eGen Flex Hybrid buses only)	Option	\$2,515.00	\$2,811.27	\$3,464.11	\$3,595.40
HVAC	25	TK Electric HVAC System TE14 (For BAE Hybrid buses only)	Option	\$1,160.00	\$1,296.65	\$1,491.15	\$1,597.76
HVAC	26	TK Electric HVAC System TE18 (For BEB buses only)	Standard	Included			
HVAC	27	Surak All Electric Air Conditioning - Rear Mount (Diesel only)	Option	\$15,948.00	\$17,826.67	\$20,500.68	\$22,799.00
HVAC Special Purpose							
HVAC Special Purpose	1	TK Intelligence - Diagnostics	Option	\$1,709.00	\$1,910.32	\$2,196.87	\$2,353.94
HVAC Special Purpose	2	Carrier Micromax ATE Diagnostics	Not Applicable				
HVAC Special Purpose	3	Webasto Diagnostic Tool	Option	\$494.00	\$552.19	\$635.02	\$706.21
HVAC Special Purpose	4	Van Steenburgh Regional Recovery System (V90- 1)	Option	\$10,138.00	\$11,332.26	\$13,032.09	\$14,493.12
HVAC Special Purpose	5	Eberspacher diagnostics	Not Applicable				
Other Option - Specify							
Manuals							
Manuals	1	Drivers Handbook (1 Manual/1 CD per Bus Order)	Standard	Included			
Manuals	2	Service Manual (1 Manual/1 CD per Bus Order)	Standard	Included			
Manuals	3	Parts Manual (1 Manual/1CD per Bus Order)	Standard	Included			
Manuals	4	Electrical Schematics (1 Manual/1CD per Bus Order)	Standard	Included			
Manuals	5	Vendor Manuals (1 Manual/1 CD per Bus Order)	Standard	Included			
Manuals	6	Additional Driver's Handbook	Option	\$10.00	\$11.18	\$12.85	\$14.30
Manuals	7	Additional Parts Manual	Option	\$70.00	\$78.25	\$89.98	\$100.07
Manuals	8	Additional Electrical Schematics	Option	\$70.00	\$78.25	\$89.98	\$100.07
Manuals	9	Additional Electrical Multiplex	Option	\$15.00	\$16.77	\$19.28	\$21.44
Manuals	10	Additional Cummins ISL Manuals (4 Books)	Option	\$515.00	\$575.67	\$662.02	\$736.24
Manuals	11	Additional Allison B400 Manuals (6 Books)	Option	\$400.00	\$447.12	\$514.19	\$550.95
Manuals	12	Additional ZF 6hp594 Manuals (5 Books)	Option	\$400.00	\$447.12	\$514.19	\$550.95
Manuals	13	Additional Voith Manuals (7 Books)	Option	\$400.00	\$447.12	\$514.19	\$550.95
Manuals	14	Additional Amerex Manuals	Option	\$50.00	\$55.89	\$64.27	\$71.48
Manuals	15	Additional TRW Steering Gear Manuals	Option	\$30.00	\$33.53	\$38.56	\$42.89
Manuals	16	Additional Thermo King Manual	Option	\$30.00	\$33.53	\$38.56	\$42.89
Manuals	17	Additional Carrier HVAC Manuals (2 Books)	Option	\$30.00	\$33.53	\$38.56	\$42.89
Manuals	18	Other Option - Specify	Option	\$30.00	\$33.53	\$38.56	\$42.89
Safety							
Safety	2	Amerex V-25lb ABC System	Standard	Included			
Safety	3	Amerex VH-25lb ABC Cylinder	Not Applicable				
Safety	4	Amerex V-30lb ABC Cylinder	Not Applicable				
Amerex Fire Suppression System w/Automatic Shutdown, Programmable Heat Detectors (PHDS) and Automatic Maintenance Testing (AMT)							
Safety	5	Amerex Fire Suppression System w/Automatic Shutdown, Programmable Heat Detectors (PHDS) and Automatic Maintenance Testing (AMT)	Not Applicable				
Safety	6	Amerex Safety Net 2-Zone Fire Detection/Suppression System	Not Applicable				
Safety	7	Jonar Firestick Liquid	Not Applicable				
Safety	8	Kidde - Dual Spectrum	Option	\$333.00	\$372.23	\$428.06	\$476.05
Safety	9	Kidde - Lid Spectrum	Option	\$233.00	\$260.45	\$299.51	\$333.09
Safety	10	Kidde TLSE Spectrum	Not Applicable				
Safety	11	Fogmaker Fire Suppression System (water mist)	Option	\$1,248.00	\$1,395.01	\$1,604.27	\$1,784.12
Safety	14	Firetrace Automatic Fire Detection/Suppression System (gas detection base system)	Not Applicable				
Safety	15	Remove Amerex	Deduction	(\$2,099.00)	(\$2,346.26)	(\$2,698.20)	(\$3,000.70)
Safety	16	Fire Extinguisher and Safety Triangle Kit	Standard	Included			
Safety	17	Twenty - Four Unit First Aid Kit	Option	\$69.00	\$77.13	\$88.70	\$98.64
Safety	18	Ten Unit First Aid Kit	Not Applicable				
Safety	19	Blood Borne Pathogens Kit	Option	\$35.00	\$39.12	\$44.99	\$50.04
Safety	20	Bio - Hazard Disposal Kit	Option	\$35.00	\$39.12	\$44.99	\$50.04
Safety	21	High Temperature Protective Sleeves for Component Lines	Not Applicable				
Safety	22	(3) 20 - Minute Road Flares	Not Applicable				
Safety	23	Wheel Chocks (Per Set)	Option	\$35.00	\$39.12	\$44.99	\$50.04
Safety	24	Electric - Standard no fire suppression	Standard	Included			
Safety	25	Amerex Safety Net with Methane Detection ABC System	Standard				
Safety	26	Fogmaker Fire Suppression System w/Methane Detection (water mist)	Option	\$678.00	\$757.87	\$871.55	\$933.86
Steering							
Steering	1	Ross Model TS 65	Not Applicable				
Steering	2	Sheppard Model M110	Not Applicable				
Steering	3	TRW Electric Assisted Steering	Option	\$2,494.00	\$2,787.79	\$3,205.96	\$3,435.19
Steering	4	TRW TAS6505	Standard	Included			

Training	51	Hybrid Drive - (8 Hour Class), at Procuring Agency	Option	\$3,500.00	\$3,912.30	\$4,499.15	\$4,820.83	\$5,003.54
Training	52	Hybrid Drive - (24 Hour Class), at Procuring Agency	Option	\$10,500.00	\$11,736.90	\$13,497.44	\$14,462.50	\$15,010.63
Training	53	Hybrid Drive - (Additional hour of training per hour), at Procuring Agency	Not Applicable	NA				
Training	54	Hybrid Drive OEM Training (8 Hour Class, Per Person), at Local Dealer	Option	\$3,500.00	\$3,912.30	\$4,499.15	\$4,820.83	\$5,003.54
Training	55	Hybrid Drive OEM Training (24 Hour Class, Per Person), at Local Dealer	Option	\$10,500.00	\$11,736.90	\$13,497.44	\$14,462.50	\$15,010.63
Training	56	Hybrid Drive OEM Training (Additional hour of training per hour, Per Person), at Local Dealer	Not Applicable	NA				
Training	57	Hybrid Transmission Training - (8 Hour Class, Per Person), at Local Dealer	Option	\$3,500.00	\$3,912.30	\$4,499.15	\$4,820.83	\$5,003.54
Training	58	Hybrid Transmission Training - (24 Hour Class, Per Person), at Local Dealer	Option	\$10,500.00	\$11,736.90	\$13,497.44	\$14,462.50	\$15,010.63
Training	59	Hybrid Transmission Training - (Additional hour of training per hour, Per Person), at Local Dealer	Not Applicable	NA				
Training	60	Additional training ...						
		Other Option - Specify						
Training Equipment Modules								
Training Equipment Modules	1	Fare Collection OEM Training (up to 10), 4 Day At Local Dealer	Not Applicable	NA				
Training Equipment Modules	2	ISL/Voith DB64.5	Not Applicable	NA				
Training Equipment Modules	3	ISL/ZF 6AP1400B	Not Applicable	NA				
Training Equipment Modules	4	ISL/ZF HP594	Not Applicable	NA				
Training Equipment Modules	5	ISX12 G	Not Applicable	NA				
Training Equipment Modules	6	ISL G	Not Applicable	NA				
Training Equipment Modules	7	HVAC Training Module	Option	\$43,213.00	\$48,303.49	\$55,549.02	\$59,520.77	\$61,776.61
Training Equipment Modules	8	I/O Controls Multiplex Board	Option	\$17,750.00	\$19,840.95	\$22,817.09	\$24,448.51	\$25,375.11
Training Equipment Modules	9	Air Brake Training Board	Option	\$35,938.00	\$40,171.50	\$46,197.22	\$49,500.32	\$51,376.38
Training Equipment Modules	10	ISB 6.7	Not Applicable	NA				
Training Equipment Modules	11	ISL/B400R Power Plant	Not Applicable	NA				
Training Equipment Modules	12	L9/Voith DB64.5 Training Module	Option	\$198,114.00	\$221,451.83	\$254,669.60	\$272,878.48	\$283,220.57
Training Equipment Modules	13	L9/ZF 6AP1400B Training Module	Option	\$194,647.00	\$217,576.42	\$250,212.88	\$268,103.10	\$278,264.21
Training Equipment Modules	14	LSN (CNG)	Option	\$67,433.00	\$75,376.61	\$86,683.10	\$92,880.94	\$96,401.13
Training Equipment Modules	15	B6.7 (Hybrid engine)	Option	\$50,369.00	\$56,302.47	\$64,747.84	\$69,377.31	\$72,006.71
Training Equipment Modules	16	L9/B400R Training Module	Option	\$198,665.00	\$222,067.74	\$255,377.90	\$273,637.42	\$284,008.28
Training Equipment Modules	17	L9/B400R Power Plant	Option	\$76,136.00	\$85,551.94	\$98,384.73	\$105,419.24	\$109,414.63
Training Equipment Modules	18	L9/Voith DB64.5 Power Plant	Option	\$74,950.00	\$83,779.11	\$96,345.98	\$103,234.71	\$107,147.31
Training Equipment Modules	19	L9/ZF 6AP1400B Power Plant	Option	\$74,885.00	\$83,706.45	\$96,262.42	\$103,145.18	\$107,054.39
Training Equipment Modules	20	Fare Collection OEM Training (up to 10), 4 Day At Customer Site	Option	\$7,495.00	\$8,377.91	\$9,634.60	\$10,323.47	\$10,714.73
Transmission								
Transmission	1	Allison B- 400R, GEN IV	Standard	Included				
Transmission	2	Allison B- 500R, GEN IV	Not Applicable	NA				
Transmission	3	Allison B- 500, GEN V	Not Applicable	NA				
Transmission	4	Allison B- 500R, GEN V	Not Applicable	NA				
Transmission	5	Voith DB64.6	Option	(\$3,118.00)	(\$3,485.90)	-\$4,008.10	(\$4,294.67)	(\$4,457.44)
Transmission	6	ZF 6AP1400B	Option	(\$2,973.00)	(\$3,323.22)	-\$3,821.70	(\$4,094.95)	(\$4,250.15)
Transmission	7	ZF 6HP594	Not Applicable	NA				
Transmission	8	"" Transynd"" Synthetic	Standard	Included				
Transmission	9	Titan Probalizer OD- 1014	Option	\$34.00	\$38.01	\$43.71	\$46.83	\$48.61
Transmission	10	Dawco Electronic Fluid Level Gauge	Option	\$149.79	\$172.25	\$184.57	\$191.56	\$196.56
Transmission	11	Keyed Transmission Lockout Switch on Dash	Option	\$351.00	\$392.35	\$451.20	\$483.46	\$501.78
Transmission	12	Transmission Oil Temperature Gauge (Dash and Rear Run Box)	Option	\$100.00	\$111.78	\$128.55	\$137.74	\$142.96
Transmission	13	Electric Transmission - 2 speed	Not Applicable	NA				
Transmission	14	Electric Transmission - 4 speed	Not Applicable	NA				
		Other Option - Specify						
Transmission Diagnostics								
Transmission Diagnostics	1	Allison Cable & Software	Option	\$2,353.00	\$2,630.18	\$3,024.71	\$3,240.98	\$3,363.81
Transmission Diagnostics	2	Voith Cable & Software	Option	\$1,254.00	\$1,401.72	\$1,611.98	\$1,727.24	\$1,792.70
Transmission Diagnostics	3	Voith Service Tool Kit	Not Applicable	NA				
Transmission Diagnostics	4	Set of ZF Diagnostics (Includes the 3 Following Items)	Option	\$3,248.00	\$3,630.61	\$4,175.21	\$4,473.73	\$4,643.29
Transmission Diagnostics	5	Includes - Testman Diagnostic System	incd with set					
Transmission Diagnostics	6	Includes - SAE Cable	incd with set					
Transmission Diagnostics	7	Includes - Econet Testman Software						
		Other Option - Specify						

W/C Restraints									
W/C Restraints	1	AMSECO - A.R.M.	Standard	Included					
W/C Restraints	2	AMSECO Reliant Mobility Aid Securement System	Not Applicable	NA					
W/C Restraints	3	AMSECO Passive rear-facing restraints (rear facing barriers) per ADA location	Option	\$833.00	\$931.13	\$1,070.80	\$1,147.36	\$1,190.84	
W/C Restraints	4	USSC - First	Option	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	
W/C Restraints	5	Freedom - First	Option	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	
W/C Restraints	6	Freedom - RTT	Standard	Included					
W/C Restraints	7	Q'Straint - QNT 360 per ADA location	Option	\$0.00	\$314.10	\$361.22	\$387.04	\$401.71	
W/C Restraints	8	Q'Straint - QUBE 3- Point Securement Station per ADA location	Option	\$104.00	\$116.25	\$133.69	\$143.25	\$148.68	
W/C Restraints	9	Q'Straint - Quantum Securement System per ADA location	Option	\$110,386.00	\$11,833.27	\$13,010.56	\$14,583.71	\$15,136.43	
W/C Restraints	10	Q'Straint/Sure Lok - OMNI Floor Anchor System per ADA location	Option	\$0.00	\$126.31	\$145.26	\$155.64	\$161.54	
W/C Restraints	11	Q'Straint Side N Click floor mount restraint system per ADA location	Option	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	
W/C Restraints	12	USSC/Freedom Q- Pod restraint system per ADA location	Option	\$3,650.00	\$410.31	\$516.61	\$571.66	\$586.66	
W/C Restraints	13	AMSECO Dual Auto Lock W/C Restraint System per ADA location	Option	\$310.00	\$101.72	\$116.98	\$125.34	\$130.69	
W/C Restraints	14	USSC - V-PRQ	Option	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	
W/C Restraints	15	Sure Lok - RTT Electric	Not Applicable	NA					
W/C Restraints	16	Sure Lok - RTT Manual	Not Applicable	NA					
W/C Restraints	17	Additional L-truck per/foot	Not Applicable	NA					
W/C Restraints	18	RESNA WC18 compliant restraint	Not Applicable	NA					
W/C Restraints	19	RESNA WC19 compliant restraint	Not Applicable	NA					
W/C Restraints	20	AMSECO Q- Pod W/C Restraint System per ADA location	Option	\$3,755.00	\$4,197.34	\$4,826.94	\$5,172.07	\$5,368.09	
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	Deduction	(\$175.00)	(\$195.62)	-\$224.96	(\$241.04)	(\$250.18)	
Wheel Chair Ramp (low-floor only) / Lift (high-floor only)	2	LIFT- U Model LU18, Dual- Mode 1:6 (Street)/1:8 (Sidewalk)	Standard	Included					
Wheel Chair Ramp (low-floor only) / Lift (high-floor only)	3	Ricon 61 SA Self-Leveling Ramp	Option	\$1,269.00	\$1,418.49	\$1,631.26	\$1,747.90	\$1,814.14	
Wheel - Brakes									
Wheel - Brakes	1	S- Cam Drum w/Mabco ABS System - (DEDUCT)	Deduction	(\$2,400.00)	(\$2,682.72)	-\$3,085.13	(\$3,305.71)	(\$3,431.00)	
Wheel - Brakes	2	Front Wheel Drum Brakes - (DEDUCT)	Not Applicable	NA					
Wheel - Brakes	3	Rear Wheel Drum Brakes - (DEDUCT)	Not Applicable	NA					
Wheel - Brakes	4	All Wheel Drum Brakes	Deduction	(\$2,400.00)	(\$2,682.72)	-\$3,085.13	(\$3,305.71)	(\$3,431.00)	
Wheel - Brakes	5	MGM "E-Stroke" Electronic Brake Monitoring System - Disc Brakes	Option	\$1,845.00	\$2,062.34	\$2,371.69	\$2,541.27	\$2,637.58	
Wheel - Brakes	6	MGM "E-Stroke" Electronic Brake Monitoring System - Drum Brakes	Option	\$1,879.00	\$2,100.35	\$2,415.40	\$2,588.10	\$2,686.19	
Wheel - Brakes		All Wheel Disc Brakes	Standard	Included					
Wheel - Brakes		Other Option - Specify							
Wheel - Hubometer									
Wheel Hubometer	1	None	Standard	Included					
Wheel Hubometer	2	Vredestein w/O Tents w/o Guard	Option	\$1,000.00	\$80.48	\$93.55	\$99.17	\$107.93	
Wheel Hubometer	3	S&A Fluorocarbon 392 Electronic	Option	\$436.00	\$487.36	\$560.46	\$600.54	\$623.30	
Wheel Hubometer	4	E1 Ward Data System (Includes Receiver, Display Unit and Antenna)	Option	Quote					
Wheel Hubometer	5	Engler (Standard) Mechanical W/O Tents W/O Guard	Option	\$79.00	\$88.31	\$101.55	\$108.81	\$113.94	
Wheel Hubometer	6	Engler Hubometer W/Powder Coat Guard	Option	\$204.00	\$228.03	\$262.24	\$280.99	\$291.64	
Wheel - Hubs		Other Option - Specify							
Wheel Hubs	1	Hub Piloted Wheels and Axles W/Grease Seals	Standard	Included					
Wheel Hubs	2	Hub Piloted w/O Seals (per Axle)	Option	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	
Wheel Hubs	3	Stud Piloted Wheels and Axles w/Grease Seals	Option	\$395.00	\$441.53	\$507.76	\$544.07	\$564.69	
Wheel Hubs	4	Stud Piloted Wheels and Axles w/O Seals	Option	\$395.00	\$441.53	\$507.76	\$544.07	\$564.69	
Wheel Hubs	5	Wabco Traction Control	Standard	Included					
Wheel Hubs	6	Hydraulic Drop down snow chain system	Option	Quote					
Wheel - Tires		Other Option - Specify							
Wheel - Tires	1	Customer Supplied	Standard	Included					
Wheel - Tires	2	Michelin XZU2 (305/65R22.5)	Not Applicable	NA					
Wheel - Tires	3	Michelin XZU2 (305/70R22.5)	Not Applicable	NA					
Wheel - Tires	4	Michelin XZU2 (305/70R22.5) (7 tires per bus)	Option	\$4,375.00	\$4,890.38	\$5,623.93	\$6,026.04	\$6,254.43	
Wheel - Tires	5	Michelin XZU3 (305/65R22.5)	Not Applicable	NA					
Wheel - Tires	6	Michelin XZU2 (275/70R22.5)	Option	\$5,386.00	\$6,244.03	\$7,180.64	\$7,694.05	\$7,985.66	
Wheel - Tires	7	G152 (305/65R22.5) (7 tires per bus)	Option	\$6,982.67	\$7,481.93	\$8,180.64	\$8,694.05	\$8,985.66	
Wheel - Tires	8	Goodyear G152 (305/70R22.5) (7 tires per bus)	Option	\$4,900.00	\$5,477.22	\$6,236.80	\$6,749.17	\$7,004.96	
Wheel - Tires	9	Goodyear G152 (305/70R22.5) (7 tires per bus)	Option	\$5,013.00	\$5,602.41	\$6,442.78	\$6,993.43	\$7,165.07	
Wheel - Tires	10	Goodyear G152 (305/70R22.5) (7 tires per bus)	Option	\$4,823.00	\$5,391.15	\$6,199.82	\$6,643.11	\$6,894.88	
Wheel - Tires	11	Firestone 16H (205/70R22.5) (7 tires per bus)	Option	NA					
Wheel - Tires	12	Firestone 16H (205/70R22.5) (7 tires per bus)	Not Applicable	NA					
Wheel - Tires	13	BridgeStone 16H (205/70R22.5) (7 tires per bus)	Option	\$1,163.00	\$1,300.00	\$1,495.00	\$1,601.89	\$1,662.61	
Wheel - Tires	14	Tire Pressure Monitoring System	Option	\$4,865.00	\$5,438.10	\$6,253.81	\$6,700.96	\$6,954.93	
Wheel - Tires	15	Michelin XZU2 (305/65R22.5) (7 tires per bus)	Option						
Wheels									
Wheels	1	(7) Powder Coated Steel Wheels (White and Black)	Standard	Included					
Wheels	2	(7) Aluminum Alcoa - Full Polish	Option	\$1,277.00	\$1,427.43	\$1,641.55	\$1,758.92	\$1,825.58	
Wheels	3	(7) Aluminum Alcoa - Full Polish W/Dura Bright Finish	Option	\$1,756.00	\$1,962.86	\$2,237.29	\$2,418.68	\$2,510.35	

Wheels	4	(7) Aluminum Alcoa - Machine Finish	Option	\$790.00	\$883.06	\$1,015.52	\$1,088.13	\$1,129.37
Wheels	5	(7) Aluminum Alcoa - Machine Finish W/Dura Bright Finish	Option	\$1,294.00	\$1,446.43	\$1,663.40	\$1,782.33	\$1,849.88
Wheels	6	Remove Spare Wheel	Deduction	(\$151.00)	(\$168.79)	-\$194.11	(\$207.98)	(\$215.87)
Wheels	7	Add Dura Flange to Alcoa (Per Wheel)	Option	\$173.00	\$193.38	\$222.39	\$238.29	\$247.32
Other Option - Specify								
Windows								
Windows	2	Arrow Laminated Safety Glass (1/4") - Framed Sliders	Option	\$654.00	\$731.04	\$840.70	\$900.81	\$934.95
Windows	3	Arrow Laminated Safety Glass (1/4") - Framed Fixed	Option	(\$1,043.00)	(\$1,165.87)	-\$1,340.75	(\$1,436.61)	(\$1,491.06)
Windows	4	Arrow Laminated Safety Glass (1/4") - Framed Transom - operable	Standard	Included				
Windows	5	Arrow Hidden Framed Bonded - Fixed	Option	\$2,625.00	\$2,934.23	\$3,374.36	\$3,615.63	\$3,752.66
Windows	6	Arrow Hidden Framed Bonded - Transom - operable	Option	\$4,486.00	\$5,014.45	\$5,766.62	\$6,178.93	\$6,413.11
Windows	7	Add Window Guards per bus (Acrylic Liner and film)	Option	\$938.00	\$1,048.50	\$1,205.77	\$1,291.98	\$1,340.95
Windows	8	anti-graffiti 3M film single layer (per inside window)	Not Applicable	NA				
Windows	9	Stormite flush-mount serviceable w/lip	Not Applicable	NA				
Windows	10	All windows equipped with liners attached	Not Applicable	NA				
Windows	11	Ricon Hidden Framed Bonded - Fixed	Option	\$716.00	\$800.34	\$920.40	\$986.20	\$1,023.58
Windows	12	Ricon Hidden Framed Bonded - Transom - operable	Option	\$3,983.00	\$4,452.20	\$5,120.03	\$5,486.11	\$5,694.03
Windows	13	anti-graffiti 3M film 4-layer (per bus, Ricon Only)	Option	\$5,250.00	\$5,868.45	\$6,748.72	\$7,231.25	\$7,505.32
Windows	14	anti-graffiti 3M film 4-layer (per bus, Arrow Only)	Option	\$3,438.00	\$3,843.00	\$4,419.45	\$4,735.44	\$4,914.91
Windows	15	anti-graffiti 3M film single layer (per bus)	Option	\$1,250.00	\$1,397.25	\$1,606.84	\$1,721.73	\$1,786.98
Other Items								
Other Items	1	Brake System Diagnostics	Not Applicable	NA				
Other Items	2	Mentor Software (Tool Box), Serial Link/Interface Kit	Option	\$432.00	\$482.89	\$555.32	\$595.03	\$617.58
Other Items	3	Engine Dolly	Option	\$5,333.00	\$6,184.79	\$7,112.51	\$7,621.05	\$7,909.89
Other Items	4	Phillips Thermo Block Heater	Option	\$140.00	\$156.49	\$179.97	\$192.83	\$200.14
Other Items	5	Engine Skid Protection	Option	\$377.00	\$421.41	\$484.62	\$519.27	\$538.95
Other Items	6	Mobile Receiver for S&A 392 Hubometer	Option	\$436.00	\$487.36	\$560.46	\$600.54	\$623.30
Other Items	7	Floor Mounted 4-Way Flasher Switch	Standard	Included				
Other Items	8	Cup Holder	Option	\$35.00	\$39.12	\$44.99	\$48.21	\$50.04
Other Items	9	Auxiliary Drivers Fan	Option	\$89.00	\$99.48	\$114.41	\$122.59	\$127.23
Other Items	10	Stainless Steel Trash Bag Holder	Option	\$170.00	\$190.03	\$218.53	\$234.15	\$243.03
Other Items	11	Transfer Cutter	Option	\$63.00	\$70.42	\$80.98	\$86.78	\$90.06
Other Items	12	Keyed Ignition Switch	Option	\$120.00	\$134.14	\$154.26	\$165.29	\$171.55
Other Items	13	Fiber Optic Backlighting on Drivers Dash	Option	\$850.00	\$950.13	\$1,092.65	\$1,170.77	\$1,215.15
Other Items	14	Exterior Ad Frame - Front 21" X 40"	Option	\$175.00	\$195.62	\$224.96	\$241.04	\$250.18
Other Items	15	Exterior Ad Frame - Curbside 30" X 88"	Option	\$283.00	\$316.34	\$363.79	\$389.80	\$404.57
Other Items	16	Exterior Ad Frame - Streetside 30" X 144"	Option	\$335.00	\$374.46	\$430.63	\$461.42	\$478.91
Other Items	17	Exterior Ad Frame Rear 21" X 72"	Option	\$226.00	\$252.62	\$290.52	\$311.29	\$323.09
Other Items	18	I/O Controls LED Interior Lights	Standard	Included				
Other Items	19	Pretoria LED Interior Lights	Option	NA				
Other Items	20	See II Transit Airroll	Not Applicable	NA				
Other Items	21	Open Bottom Racks	Option	Quote				
Other Items	22	Suburban Package Racks/Open Bottom	Option	Quote				
Other Items	23	Hywin Automatic Greasing System	Not Applicable	NA				
Other Items	24	EMCO Wheelon Post Lock Nozzle	Standard	Included				
Other Items	25	Hydra Drive Tools	Not Applicable	NA				
Other Items	26	Special Breakdown Drive Tool Kit	Option	\$38,165.00	\$43,215.27	\$49,697.56	\$53,250.93	\$55,269.14
Other Items	27	BAE APES2 bellows driver pack	Option	\$38,667.00	\$43,721.97	\$49,705.27	\$53,259.20	\$55,277.72
Other Items	28	WASCO E-COMP	Not Applicable	NA				
Other Items	29	USB 6.7 Fold Up Wiring Diagram (hybrid option)	Option	\$35.00	\$39.12	\$44.99	\$48.21	\$50.04
Other Items	30	Allison Hybrid Manuals	Option	\$75.00	\$83.84	\$96.41	\$103.30	\$107.22
Other Items	31	BAE Hybrid Manuals	Option	\$55.00	\$61.48	\$70.70	\$75.76	\$78.63
Other Items	32	Allison Mid-Life Overhaul Parts List and Cost	Option	NA				
Other Items	33	BAE Mid-Life Overhaul Part List and Cost	Not Applicable	NA				
Other Items	34	winter weather package (heated front entrance)	Not Applicable	NA				
Other Items	35	First Aid kit for 24 people option	Option	\$69.00	\$77.13	\$88.70	\$95.04	\$98.64
Other Items	36	2 front dash-mounted fans to defrost front door	Standard	Included				
Other Items	37	driver's LED reading light	Standard	Included				
Other Items	38	driver's sun visors	Standard	Included				
Other Items	39	driver's foot controls-adjustable Kongsberg system	Option	\$1,130.00	\$1,263.11	\$1,452.58	\$1,556.44	\$1,615.43
Other Items	40	Stainless Steel molding to cover edges on entrance and rear rise on passenger assist	Option	\$387.00	\$432.59	\$497.48	\$533.05	\$553.25
Other Items	41	Separate control for non-synchronized wipers	Not Applicable	NA				

WARRANTIES

Warranties	Designation	Description (what is covered)	Years	Miles	Source	Price:
Complete Bus	Option	Full coach warranty includes and applies to electrical, doors, seats, flooring, roof hatches, destination signs, wheel chair ramp, hand rails, P.A., etc., but does not include ITS or special options.	2	100,000	GILLIG	Included
Body Structure	Standard	Applies to structural members in the body and undercarriage including the structural members in the suspensions.	3	150,000	GILLIG	Included
Corrosion & Structural Integrity	Option	Covers against a significant loss of structural integrity of the assembly or it's functional performance, resulting from pertinent loss of cross-section due to corrosion caused by normal environmental elements but excludes corrosion caused by aggressive road de-icers such as Magnesium Chloride or equivalents, unless GILLIG approved preventative measures are taken (see service manual).	12	500,000	GILLIG	Included
Propulsion System (Diesel, CNG, Hybrid)	Standard	See Cummins Parchment	2	Unlimited	Cummins	Included
Propulsion System (Electric)	Standard	See Cummins Parchment	3	100,000	Cummins	Included
Transmission (Allison)	Option	See Allison Parchment	5	300,000	Allison	Included
Energy Storage System	Standard	See Cummins Parchment	6	300,000	Cummins	Included
Emission Control System	Standard	See Cummins Parchment	5	100,000	Cummins	Included
Subsystems:						
Brake	Standard	Excludes Friction Material	2	100,000	Meritor	Included
Destination Signs	Standard	See Twin Vision/Luminator Parchment	6	Unlimited	Twin Vision/Luminator	Included
Heating, Ventilation	Option	No consumables	2	100,000	Mobile Climate Control	Included
Air Conditioning Unit and Compressor	Option	See Thermo King Parchment	3	Unlimited	Thermo King	Included
Door systems	Option	Vapor	2	Unlimited	Vapor/GILLIG	Included
air compressor	Standard	See Cummins Parchment	2	Unlimited	Cummins	Included
air dryer	Option	No consumables	2	100,000	GILLIG	Included
Wheelchair lift and ramp system	Standard	See Lift-U Parchment	2	Unlimited	Lift-U	Included
Starter.	Standard	mechanical only.	3	350,000	Delco	Included
Alternator S	Standard	Alternator only. Does not include the drive system.	2	Unlimited	Niehoff	Included
Charge air cooler	Standard	Charge air cooler including core, tanks and including related surrounding framework and fittings.	3	Unlimited	Modine	Included
Fire suppression	Standard	Fire suppression system including tank and extinguishing agent dispensing system	3	Unlimited	Amerex	Included
Hydraulic systems	Standard	Including hydraulic pump & power steering as applicable.	2	Unlimited	GILLIG	Included
Propulsion cooling systems	Standard	Radiator including core, tanks and related framework, including surge tank. Transmission cooler.	3	Unlimited	Modine	Included
Power electronics	NA	DC/DC converters, inverters, if supplied	NA	NA	NA	NA
Passenger seating	Standard	excluding upholstery.	5	Unlimited	AMSECO	Included
Fuel storage and delivery system	Standard	See AGILITY CNG Parchment	3	150,000	Agility	Included

SFMTA-2025-21-FTA

Agreement

Appendix A, Item A4

Contract Amendment 1

State of Washington
Contracts & Procurement Division
Department of Enterprise Services
P.O. Box 41411
Olympia, WA 98504-1411

Gillig LLC
451 Discovery Dr
Livermore, CA 94551

**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 Gillig LLC, a California limited liability company ("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:

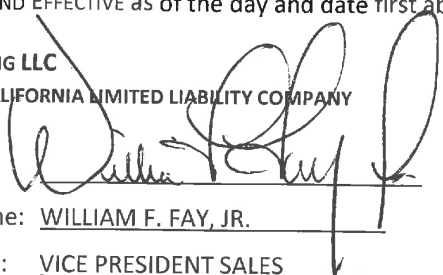
- 1. **ECONOMIC PRICE ADJUSTMENT.** Pursuant to Section 3.4 of the Master Contract Economic Price Adjustment using the Bureau of Labor Statistics Index for Truck and Bus Bodies, Series No. WPU 1413 to determine a price change, the prices set forth in the Exhibit B – Prices are increased by 11.78%.
- 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.

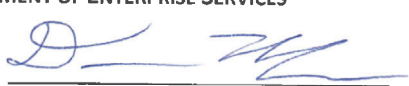
5. ELECTRONIC SIGNATURES. A signed copy of this Amendment or any other ancillary agreement transmitted by facsimile, email, or other means of electronic transmission shall be deemed to have the same legal effect as delivery of an original executed copy of this Amendment or such other ancillary agreement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

GILLIG LLC
A CALIFORNIA LIMITED LIABILITY COMPANY

By: 
Name: WILLIAM F. FAY, JR.
Title: VICE PRESIDENT SALES
Date: JUNE 1, 2022

STATE OF WASHINGTON
DEPARTMENT OF ENTERPRISE SERVICES

By: 
Name: David Mgebroff
Title: Strategy Supervisor
Date: 06/01/2022

SFMTA-2025-21-FTA

Agreement

Appendix A, Item A5

Contract 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
Gillig LLC 451 Discovery Dr Livermore, CA 94551	Amendment No.:	2
	Effective Date:	February 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 Gillig LLC., a California limited liability company ("Contractor") and is dated as of February 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 by instrument titled First Amendment (dated June 1, 2022) to make an economic price adjustment.
- C. The Parties now desire to amend the Contract to add a model to the Contract price sheet due to a change in technology from a manufacturer.
- D. The amendment set forth herein is within the scope of the Contract.
- E. The Parties now desire to amend the Contract as set forth herein.

A G R E E M E N T

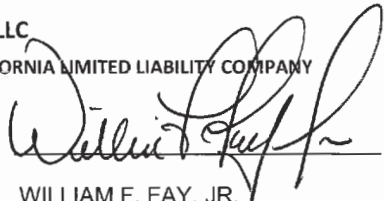
NOW THEREFORE, in consideration of the mutual covenants and agreements set forth herein, the Parties hereby agree to amend the Contract, as previously amended, as follows:

- 1. **ADDED MODEL.** Pursuant to Section 3.6 of the Contract Goods and Services Addition, the parties agree to add the 35' Gillig with Allison eGen Flex Hybrid and 40' Gillig with Allison eGen Flex Hybrid, along with additional electric HVAC and Air options as stated in the attached price sheet. Enterprise Services has reviewed the change as within scope of the Contract that is the result of a new technology solution from a manufacturer.
- 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.** 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.
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.

GILLIG LLC
A CALIFORNIA LIMITED LIABILITY COMPANY

By: 

Name: WILLIAM F. FAY, JR.

Title: VICE PRESIDENT SALES

Date: JANUARY 30, 2023

STATE OF WASHINGTON
DEPARTMENT OF ENTERPRISE SERVICES

By: 

Name: David Mgebroff

Title: Strategy Supervisor

Date: 2/1/2023

SFMTA-2025-21-FTA Agreement

Appendix A, Item A6

Contract 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
Gillig LLC 451 Discovery Dr Livermore, CA 94551	Amendment No.:	3
	Effective Date:	April 1, 2023

**THIRD AMENDMENT
TO
STATEWIDE 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 ("State") and Gillig LLC., a California limited liability company ("Contractor") and is dated as of April 1, 2023.

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 Parties previously amended the Contract:
 - a. by instrument titled First Amendment (dated June 1, 2022) to make an economic price adjustment of 11.78%.
 - b. by instrument titled Second Amendment (dated February 1, 2023) to add goods and services for the Allison eGen Flex Hybrid.
- 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

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:

$$\text{New Price} = \text{Old Price} \times (\text{Current Period Index} / \text{Base Period Index}).$$

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.

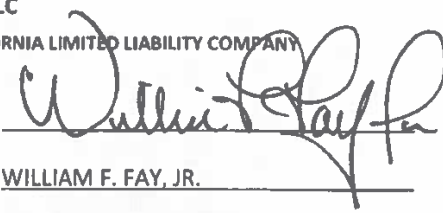
EXECUTED AND EFFECTIVE as of the day and date first above written.

GILIG LLC

A CALIFORNIA LIMITED LIABILITY COMPANY

STATE OF WASHINGTON

DEPARTMENT OF ENTERPRISE SERVICES

By: 

By: 

Name: WILLIAM F. FAY, JR.

Name: Kelli Carmony

Title: VICE PRESIDENT SALES

Title: Procurement Supervisor

Date: MARCH 20, 2023

Date: 3/22/23

SFMTA-2025-21-FTA Agreement

Appendix A, Item A7

Contract 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
	Amendment No.:	4
	Effective Date:	April 1, 2024
Gillig LLC 451 Discovery Dr Livermore, CA 94551		

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 Gillig LLC., a California limited liability company ("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 follows:
 - a. First Amendment: to make an Economic Price Adjustment of 11.78% dated on June 1, 2022.
 - b. Second Amendment: to add goods and services for the Allison eGen Flex Hybrid Extended dated on February 1, 2023.
 - c. Third 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

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, 2025.

2. **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 price set forth in the in the Exhibit B – Prices are increased by 7.15%.
3. **NONDISCRIMINATION.** The following provision is added as a new subsection at the end of Section 18 of the Contract (General Provision):

18.24. **NONDISCRIMINATION.**

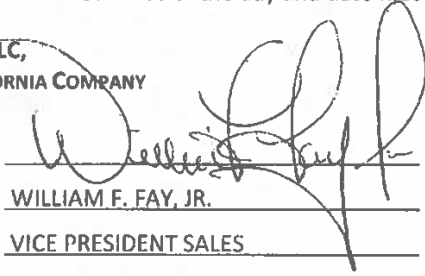
- (a) **Nondiscrimination Requirement.** During the term of this Contract, Contractor, including any subcontractor, shall not discriminate on the bases enumerated at RCW 49.60.530(3). In addition, Contractor, including any subcontractor, shall give written notice of this nondiscrimination requirement 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.

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.

GILLIG LLC,
A CALIFORNIA COMPANY

By: 
Name: WILLIAM F. FAY, JR.
Title: VICE PRESIDENT SALES
Date: MARCH 14, 2024

STATE OF WASHINGTON
DEPARTMENT OF ENTERPRISE SERVICES

By: 
Name: Kelli Carmony
Title: Procurement Supervisor
Date: 3/18/2024

SFMTA-2025-21-FTA Agreement

Appendix A, Item A8

Contract Amendment 5

State of Washington Contracts & Procurement Division Department of Enterprise Services P.O. Box 41411 Olympia, WA 98504-1411	CONTRACT AMENDMENT	
	Contract No.:	06719
Gillig LLC 451 Discovery Dr Livermore, CA 94551	Amendment No.:	5
	Effective Date:	5/13/2024

**FIFTH AMENDMENT
TO
CONTRACT No. 06719-01
TRANSIT BUSES – HEAVY DUTY**

This Fifth Amendment (“Amendment”) to Contract No. 06719 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 Gillig LLC, a California Limited Liability Company (“Contractor”) and is dated as of May 13, 2024.

RECITALS

- A. Enterprise Services and Contractor (collectively the “Parties”) entered into that certain Contract No. 06719 for Transit Buses dated effective as of April 1, 2021 (“Contract”).
- B. The Parties previously amended the Contract as follows.
 - a. First Amendment: to make an Economic Price Adjustment of 11.78% dated, June 1, 2022.
 - b. Second Amendment: to add goods and services for the Allison eGen Flex Hybrid Extended, dated February 1, 2023.
 - c. Third Amendment: to extend contract for an additional twelve (12) months, and to make an economic price adjustment of 15%, dated April 1, 2023.
 - d. Fourth Amendment: to extend contract for an additional twelve (12) months, to make an economic adjustment of 7.15%, and to add non-discrimination requirement 18.24, dated April 1, 2024.
- 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

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. ADVANCE PAYMENTS. Section 6.5 No Advance Payments is deleted in its entirety and replaced with the following:

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. ADDED OPTIONS. Pursuant to section 3.6 of the Contract Goods and Services Addition, the parties agreed to add the Heliox Chargers in the attached Exhibit A to the options lists for 35 ft and 40 ft buses, at the prices in the attached exhibit A.
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.

GILLIG LLC,
A CALIFORNIA LIMITED LIABILITY COMPANY

By:

Name: WILLIAM F. FAY, JR.

Title: VICE PRESIDENT SALES

Date: MAY 15, 2024

STATE OF WASHINGTON
DEPARTMENT OF ENTERPRISE SERVICES

By:

Name: Michellee M Jemmott

Title: Procurement Supervisor

Date: May 17, 2024



April 26, 2024

Washington State Department of Enterprise Services
Ricky Vang, Transport Analyst
1500 Jefferson Street SE
Olympia, WA 98501

RE: Master Contract No. 06719-01- Heliox Chargers for Battery Electric Buses

Mr. Vang,

GILLIG proposes to amend the contract to reflect the addition of Heliox chargers for Battery Electric Buses.

Proposed pricing for the Heliox chargers is as follows:

Heliox Charger Model

• Fast DC 50KW Mobile Charger	\$59,500.00
• Fast DC/OC 180KW Charger with (1) Plug-In Dispenser	\$129,987.00
• Fast DC/OC 360KW Single Port Charger Only (No Dispenser Included)	\$180,000.00
• Gantry Mounted Depot Inverted Pantograph (250A)	\$56,446.00
• Opportunity Charging Mast with Inverted Pantograph (600A)	\$255,000.00

For your convenience the prices quoted above have been added to the attached Exhibit B 35ft (rows 392-396) and 40ft tabs (rows 390-394). The additions are highlighted in yellow for easy identification.

Regards,

A handwritten signature in black ink, appearing to read "William F. Fay, Jr.", written over a faint circular stamp.

William F. Fay, Jr.
Vice President Sales
Phone: 800-735-1500

Enclosures

CC: Holly Piper, Director, Sales Operations
Javier Hernandez, Jr, Director, National Sales
Lee Petersen, Senior Pricing & Sales Contracts Manager
Richard Bissell, NW Regional Sales Manager

SFMTA-2025-21-FTA Agreement

Appendix A, Item A9

Contract Amendment 6

State of Washington Contracts & Procurement Division Department of Enterprise Services P.O. Box 41411 Olympia, WA 98504-1411	CONTRACT AMENDMENT	
	Contract No.:	06719-01
Gillig LLC 451 Discovery Dr Livermore, CA 94551	Amendment No.:	6
	Effective Date:	April 1, 2025

**SIXTH AMENDMENT
TO
CONTRACT NO. 06719-01
TRANSIT BUSES**

This sixth 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 Gillig LLC., a California limited liability company (“Contractor”) and is dated as of April 1, 2025.

RECITALS

- A. Enterprise Services and Contractor (collectively the “Parties”) entered into that certain Contract No. 06719-01 dated effective as of April 1, 2021 (“Contract”).
- B. The Parties previously amended the Contract as follows:
 - (1) First Amendment: to make an Economic Price Adjustment of 11.78% on June 1, 2022; and
 - (2) Second Amendment: to add goods and services for Allison eGen Flex Hybrid Extended date on February 1, 2023.
 - (3) Third Amendment: to extend the contract for an additional twelve (12) months, and to make an Economic Price Adjustment of 15% on April 1, 2023.
 - (4) Fourth Amendment: to extend the contract for an additional twelve (12) months, make an economic price adjustment of 7.15%, and add sub-section 18.24 Nondiscrimination on April 1, 2024.
 - (5) Fifth Amendment: to include advance payment options for performance in section 6.5 on May 17, 2024.
- C. The amendment set forth herein is within the scope of the Contract.

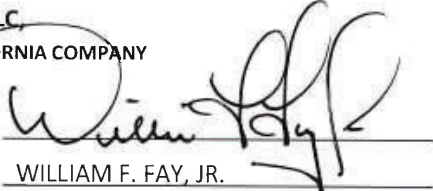
AGREEMENT

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. **CONTRACT TERMS.** Pursuant to Section 1 Term of the Contract, this contract has been extended for an additional twelve (12) months, this final extension term is until March 31, 2026.
2. **ECONOMIC PRICE ADJUSTMENT.** Pursuant to section 3.4, 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 price set forth in Exhibit B – Prices are increased by 3.79%.
Pursuant to section 3.1 of the Contract, the pricing for the goods/services is hereby amended by deleting the existing **Exhibit B – Prices** in its entirety and inserting the attached **Exhibit B – Prices** (effective April 1, 2025). These prices include the agreed economic adjustment from the Bureau of Labor and Statistics (BLS) index/indices: 3.79%.
3. **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.

GILLIG LLC
A CALIFORNIA COMPANY

By: 

Name: WILLIAM F. FAY, JR.

Title: VICE PRESIDENT, SALES

Date: MARCH 19, 2025

STATE OF WASHINGTON
DEPARTMENT OF ENTERPRISE SERVICES

By: Breann Aggers

Name: BREANN AGGERS

Title: PROCUREMENT STRATEGIST

Date: 04/03/25

Please see attached Exhibit B – Prices (effective April 1, 2025)

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	5	40-ft Low Floor Battery Electric Buses	\$1,435,741	\$7,178,705
2	1	Spare Parts (from Schedule 1A)	N/A	\$150,000 (fixed allowance)
3	1	Training for 40-ft Low Floor Battery Electric Buses	N/A	\$150,000 (fixed allowance)
4	1	Special Tools (from Schedule 1B)	N/A	\$100,000 (fixed allowance)
5	1	Allowance for regulatory mandated changes, requested passenger enhancements and system modifications resulting from changes to project interface	N/A	\$125,000 (fixed allowance)
Grand Total				\$7,703,705

Schedule 1A – Spare Parts List

Spare Parts List including prices to be agreed upon by the parties and documented here by modification of the Agreement.

Schedule 1B – Special Tools List

Special Tools List including prices to be agreed upon by the parties and documented here by modification of the Agreement.

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. or as otherwise agreed to.
- 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 D: Reserved. (HIPPA Business Associate Agreement)

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

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. CHANGES TO FEDERAL REQUIREMENTS

A. Federal requirements that apply to the SFMTA, the FTA Master Agreement between the City and the FTA, and any Amendments thereto may change due to changes in federal law, regulation, other requirements, or guidance, or changes in the FTA Master Agreement including any information incorporated by reference and made part of that FTA Master Agreement..

B. Applicable changes to those federal requirements will apply to this Agreement, Contractor, and parties to any subcontract at any tier.

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. To the extent permitted by law, all documents to which access was provided will be treated as Confidential Information of Contractor according to Section 14.1.3 of the Contract

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. To the extent permitted by law, all excerpts and transcriptions that were reproduced or copied will be treated as Confidential Information of Contractor according to Section 14.1.3 of the Contract

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. FEDERAL TAX LIABILITY AND RECENT FELONY CONVICTIONS

A. Contractor certifies that it:

1. Does not have any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability; and

2. Was not convicted of the felony criminal violation under any Federal law within the preceding 24 months.

B. Flow-Down. Contractor is required to flow this requirement down to participants at all lower tiers, without regard to the value of any subagreement.

VI. 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.

VII. NOTICE TO FTA AND U.S. DOT INSPECTOR GENERAL OF INFORMATION RELATED TO FRAUD, WASTE, ABUSE, OR OTHER LEGAL MATTERS

A. If a current or prospective legal matter that may affect the Federal Government emerges, the Contractor must promptly notify the City, which will promptly notify the FTA Chief Counsel and FTA Regional Counsel for the Region in which the City is located. The Contractor must include an equivalent provision in its sub agreements at every tier, for any agreement that is a “covered transaction” according to 2 C.F.R. §§ 180.220 and 1200.220.

B. 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.

C. Matters that may affect the Federal Government include, but are not limited to, the Federal Government’s interests in the Award, the accompanying Underlying Agreement between the FTA and the City, and any Amendments thereto, or the Federal Government’s administration or enforcement of federal laws, regulations, and requirements.

D. Additional Notice to U.S. DOT Inspector General. The Contractor must promptly notify the City, which will promptly notify the U.S. DOT Inspector General in addition to the FTA Chief Counsel or Regional Counsel for the Region in which the City is located, if the Contractor has knowledge of potential fraud, waste, or abuse occurring on a Project receiving assistance from FTA. The notification provision applies if a person has or may have submitted a false claim under the False Claims Act, 31 U.S.C. § 3729, et seq., or has or may have committed a criminal or civil violation of law pertaining to such matters as fraud, conflict of interest, bid rigging, misappropriation or embezzlement, bribery, gratuity, or similar misconduct involving federal assistance. This responsibility occurs whether the Project is subject to this Agreement or another agreement with the City involving a principal, officer, employee, agent, or Third Party Participant of the Contractor. It also applies to subcontractors at any tier. Knowledge, as used in this paragraph, includes, but is not limited to, knowledge of a criminal or civil investigation by a Federal, state, or local law enforcement or other investigative agency, a criminal indictment or civil complaint, or probable cause that could support a criminal indictment, or any other credible information in the possession of the Contractor. In this paragraph, “promptly” means to refer information without delay and without change. This notification provision applies to all divisions of the Contractor, including divisions tasked with law enforcement or investigatory functions.

VIII. 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.

IX. NONDISCRIMINATION ON THE BASIS OF DISABILITY

The Contractor agrees to comply with the following federal prohibitions against discrimination based on disability:

A. Federal laws, including:

1. Section 504 of the Rehabilitation Act of 1973, as amended, 29 U.S.C. § 794, which prohibits discrimination based on disability in the administration of federally assisted Programs, Projects, or activities;

2. The Americans with Disabilities Act of 1990 (ADA), as amended, 42 U.S.C. § 12101, et seq., Titles I, II, and III, which requires that accessible facilities and services be made available to individuals with disabilities;

3. The Architectural Barriers Act of 1968, as amended, 42 U.S.C. § 4151, et seq., which requires that buildings and public accommodations be accessible to individuals with disabilities;

4. Federal transit law, specifically 49 U.S.C. § 5332, which now includes disability as a prohibited basis for discrimination; and

5. Other applicable federal laws, regulations, and requirements pertaining to access for seniors or individuals with disabilities.

B. Federal regulations and guidance, including:

1. U.S. DOT regulations, “Transportation Services for Individuals with Disabilities (ADA),” 49 CFR Part 37;

2. U.S. DOT regulations, “Nondiscrimination on the Basis of Disability in Programs and Activities Receiving or Benefiting from Federal Financial Assistance,” 49 CFR Part 27;

3. Joint U.S. Architectural and Transportation Barriers Compliance Board (U.S. ATBCB) and U.S. DOT regulations, “Americans With Disabilities (ADA) Accessibility Specifications for Transportation Vehicles,” 49 CFR Part 38;

4. U.S. DOT regulations, “Transportation for Individuals with Disabilities: Passenger Vessels,” 49 CFR Part 39;

5. U.S. DOJ regulations, “Nondiscrimination on the Basis of Disability in State and Local Government Services,” 28 CFR Part 35;

6. U.S. DOJ regulations, “Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities,” 28 CFR Part 36;

7. U.S. EEOC, “Regulations to Implement the Equal Employment Provisions of the Americans with Disabilities Act,” 29 CFR Part 1630;

8. U.S. Federal Communications Commission regulations, “Telecommunications Relay Services and Related Customer Premises Equipment for Persons with Disabilities,” 47 CFR Part 64, subpart F;

9. U.S. ATBCB regulations, “Electronic and Information Technology Accessibility Standards,” 36 CFR Part 1194;

10. FTA regulations, "Transportation for Elderly and Handicapped Persons," 49 CFR Part 609;

11. FTA Circular 4710.1, "Americans with Disabilities Act: Guidance;" and

12. Other applicable federal civil rights and nondiscrimination regulations and guidance.

X. 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.

XI. 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.

XII. 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.

XIII. 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.

XIV. 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.

XV. 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.

XVI. 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.

XVII. TERMINATION FOR CONVENIENCE OF CITY *(required for all contracts in excess of \$10,000)*

See Agreement Terms and Conditions.

XVIII. TERMINATION FOR DEFAULT *(required for all contracts in excess of \$10,000)*

See Agreement Terms and Conditions.

XIX. 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.

XX. DOMESTIC PREFERENCES FOR PROCUREMENTS

A. Contractor should, to the greatest extent practicable and consistent with law, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products).

B. For purposes of this section

1. “Produced in the United States” means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States.

2. “Manufactured products” means items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.

XXI. 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 loading 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.

XXII. PROCUREMENT OF RECOVERED MATERIALS

A. Contractor must comply with section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976 as amended, 42 U.S.C. 6962. The requirements of Section 6002 include procuring only items designated in the guidelines of the Environmental Protection Agency (EPA) at 40 CFR part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds \$10,000 or the value of the quantity acquired during the preceding fiscal year exceeded \$10,000; procuring solid waste management services in a manner that maximizes energy and resource recovery; and establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.

B. Contractor should, to the greatest extent practicable and consistent with law, purchase, acquire, or use products and services that can be reused, refurbished, or recycled; contain recycled content, are biobased, or are energy and water efficient; and are sustainable. This may include purchasing compostable items and other products and services that reduce the use of single-use plastic products. See Executive Order 14057, section 101, Policy.

XXIII. 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.

XXIV. 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.

XXV. 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.

XXVI. 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.

XXVII. 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.

XXVIII. 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.

XXIX. 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.

XXX. 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.

XXXI. LOBBYING *(To be submitted with each bid or offer exceeding \$100,000)*

Certification required (See Attachment F). 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 must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the non-Federal award.

XXXII. 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.

XXXIII. 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.

XXXIV. 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.

XXXV. 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.

Appendix G
SFMTA's Additional Technical Specifications

Please see the attached conformed Technical Specifications.

**CITY AND COUNTY OF SAN FRANCISCO
SAN FRANCISCO MUNICIPAL TRANSPORTATION AGENCY**

**TECHNICAL SPECIFICATIONS
FOR**

**THE PROCUREMENT OF
40-FOOT, LOW FLOOR,
BATTERY ELECTRIC BUSES**

CONTRACT NO. SFMTA-2025-21-FTA

October 15, 2025

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1 OVERALL REQUIREMENTS

1.1 SCOPE

These specifications detail the technical requirements for the construction of new heavy-duty 40-foot and 60-foot, Low Floor Battery Electric Buses 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, and shall deliver an average of 160 miles of range on a full charge on all SFMTA routes (see Section 6.1.1, Operating Range).

The Contractor shall be responsible for designing, fabricating, assembling, testing, and finishing transit Buses, 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 Bus subcomponents and systems are compliant with all such subcomponent vendors’ requirements and recommendations. Contractor and Agency shall identify subcomponent vendors that shall submit installation/application approval documents with the completion of a pilot or lead Bus.

The Contractor shall not make any substantive or material changes that would differentiate one Bus from another Bus. If the Contractor identifies a change during the manufacturing process that would materially improve the design, safety and/or performance of the Bus, this change must (a) be discussed with the Agency and (b) be considered as a retrofit (if possible) to any previous Bus(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 Background Information

The SFMTA has committed to operating a zero-emissions bus fleet by the year 2035, and is currently conducting a pilot program to test 40-ft battery electric buses from multiple OEMs. The pilot program consists of revenue service testing and performance analysis for a duration of at least 18 months. The SFMTA now plans to expand their 40-ft battery electric bus pilot program and conduct a 60-ft battery electric bus pilot program, and they have used many of the findings of their 40-ft battery electric bus pilot program to inform these technical specifications.

San Francisco currently operates the largest fleet of zero emission electric trolley vehicles in North America, with 278 vehicles in revenue service. The SFMTA plans to transition all routes that are currently served by diesel hybrid buses to battery electric buses using the knowledge obtained from their 40-ft and 60-ft pilot programs. The Buses obtained from this procurement will be compared to the SFMTA's current fleet of diesel hybrid and trolley buses on their environmental impact, quality of service, and performance characteristics.

1.1.2 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.

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 Vehicle that defines the largest ramp over which the Coach can roll.

Bus – The term refers to the bus specified for procurement in this contract, unless otherwise specified.

Capacity (electrical energy storage device) – Two levels of capacity shall be defined: gross and useable. Gross Capacity shall be the capacity energy (kWh) of the entire battery pack and shall include usable, unusable, and/or reserve capacity energy. Useable Capacity shall be the capacity available for use by the operator in normal operation of the bus.

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

Curb Weight – Weight of Vehicle, including oil, and coolant, and all equipment required for operation and required by this specification, but without passengers or operator.

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. In a battery electric bus, this typically converts high voltage from the drive train battery system to 12/24VDC in lieu of a conventional engine driven alternator. 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.

Electric Drive System – Traction motor, system controller, 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 off-vehicle electric energy source.

EAM (Enterprise Asset Management) – SFMTA’s computerized maintenance system by Hexagon which is utilized for tracking Vehicle 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 Vehicle manufacturer, at which the Vehicle can be safely and reliably operated for its intended purpose. The GVWR shall be greater than or equal to GVW.

High Voltage – Electrical potential of 50 volts or greater (AC and DC).

Heating, Ventilation, and Air Conditioning (HVAC) – The on-board system which keep the bus properly heated, cooled, and ventilated.

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 Vehicle applications.

Low Floor - Bus 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 Vehicle.

Overhead Charging – A charging system that includes overhead rails located on the forward roof area of the Vehicle and is compatible with an inverted overhead pantograph charging system compliant with the SAE J3105 standard for overhead charging.

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 Vehicle'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.

Propulsion System - System that provides propulsion for the Vehicle 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 Bus caused by operating an electric motor-generator system. This act returns energy to the Vehicle propulsion system and provides charge to the Energy Storage System.

Related Defect(s) – Damages inflicted on any component or subsystem as a direct result of a Defect.

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

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

Smart Charging – The practice of managing charging for electric vehicles via standardized data connections between vehicle and charger. Smart charging may be used to reduce peak charging loads or limit the wear on the energy storage system of the vehicle due to charging.

Standee Line - A line designating an area outward of which a passenger may not stand while the Bus 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 bus 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 – Vehicle data monitoring system for electric vehicles. Provides tools for energy management, vehicle battery statistics, automated reports, real time vehicle 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.

1.1.3 Acronyms

The following is a list of acronyms used in the Technical Specifications:

<u>A/C</u>	Air Conditioning
<u>ABS</u>	Anti-Lock Braking System
<u>AC</u>	Alternating Current
<u>ADA</u>	Americans with Disabilities Act
<u>Ah</u>	Amp hour
<u>ANSI</u>	American National Standards Institute
<u>APC</u>	Automatic Passenger Counter
<u>API</u>	Application Programming Interface
<u>APTA</u>	American Public Transportation Association
<u>ASHRAE</u>	American Society of Heating, Refrigerating, and Air Conditioning Engineers
<u>ASTM</u>	American Society for Testing and Materials
<u>AVL</u>	Automatic Vehicle Location
<u>AWS</u>	American Welding Society
<u>BMS</u>	Battery Management System
<u>CAD</u>	Computer-Aided Dispatch
<u>CCR</u>	California Code of Regulations
<u>CCTV</u>	Closed-Circuit Television
<u>CFR</u>	Code of Federal Regulations
<u>dB</u>	Decibel

<u>DC</u>	Direct Current
<u>DDU</u>	Driver Display Unit
<u>DR</u>	Diagnostic Reader
<u>DTE</u>	Diagnostic Test Equipment
<u>DVAS</u>	Digital Voice Annunciation System
<u>DVD</u>	Digital Versatile Disc
<u>EMC</u>	Electromagnetic Compatibility
<u>EMF</u>	Electromagnetic Force
<u>EMI</u>	Electromagnetic Interference
<u>EPA</u>	Environmental Protection Agency
<u>EPU</u>	Emergency Propulsion Unit
<u>ESS</u>	Energy Storage System
<u>FCC</u>	Federal Communications Commission
<u>FEA</u>	Finite Element Analysis
<u>FEMA</u>	Failure Mode Effects Analysis
<u>FSRP</u>	Field Service Repair Procedure
<u>FMCSR</u>	Federal Motor Carrier Safety Regulations
<u>FMVSS</u>	Federal Motor Vehicle Safety Standards
<u>FTA</u>	Federal Transit Administration
<u>GAWR</u>	Gross Axle Weight Rated
<u>GPS</u>	Global Positioning System
<u>GVW</u>	Gross Vehicle Weight
<u>GVWR</u>	Gross Vehicle Weight Rating
<u>HVAC</u>	Heating, Ventilation and Air Conditioning
<u>IEEE</u>	Institute of Electrical and Electronics Engineers
<u>IPC</u>	Illustrated Parts Catalog
<u>IP</u>	Internet Protocol
<u>ISO</u>	International Organization for Standardization
<u>JIC</u>	Joint Industrial Council
<u>kWh</u>	Kilowatt-Hours
<u>LED</u>	Light Emitting Diode
<u>MIL-STD</u>	Military Standard

<u>NEC</u>	National Electrical Code
<u>NFPA</u>	National Fire Protection Association
<u>NHTSA</u>	National Highway Traffic Safety Administration
<u>NTSC</u>	National Television System Committee
<u>OCU</u>	Operator Control Unit
<u>OEM</u>	Original Equipment Manufacturer
<u>PA</u>	Public Address
<u>PCB</u>	Printed Circuit Board
<u>PLC</u>	Programmable Logic Controller
<u>PPU</u>	Primary Propulsion Unit
<u>psi</u>	Pounds per Square Inch
<u>RFI</u>	Radio Frequency Interference
<u>SAE</u>	Society of Automotive Engineers
<u>SPI</u>	Society of the Plastics Industry
<u>SDTS</u>	Self Diagnostic Testing Software
<u>SLW</u>	Seated Load Weight
<u>UL</u>	Underwriters Laboratories
<u>USDOT</u>	United States Department of Transportation
<u>VDC</u>	Volts of Direct Current

1.1.4 Legal Requirements

- A. The Bus shall meet all applicable FMVSS in effect at the date of manufacture. The Bus 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. Manufacturer shall certify to SFMTA that the Bus complies with 49 U.S.C. § 5323l and FTA implementing regulations at 49 CFR Part 665 concerning Coach testing.
- C. Manufacturer shall test the prototype Bus at the Altoona, PA Testing Facility and shall provide copies of all testing reports. If the Bus 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. Manufacturer shall certify that the proposed Bus 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 Bus shall have the following overall general dimensions:

TABLE 1.2 – Bus Requirements

	40' Bus	60' Bus
Length, excluding bumpers	41' +/- 2'	60' +/- 2'
Width, exterior, excluding mirrors	102" max	102" max
Overall height without roof-mounted HVAC system	134" max	134" max
Overall height with roof-mounted HVAC system, as applicable	140" max	140" max
Seating capacity	32 min	44 min
Overall passenger capacity	65 min	110 min
Seat width (one passenger)	18" min	18" min
Seat width (two passengers)	35" min	35" min
General aisle width	22" min	22" min
Headroom along center aisle, at front axle wheelhouse	79" min	79" min
Headroom along center aisle, at rear axle wheelhouse	73" min	73" min
Front door height from ground (normal)	15.3" max	15" max
Front door height from ground (kneeled)	13" max	13" max
Rear door height from ground (normal)	15.3" max	15" max
Body ground clearance	7.3" min	8" min
Approach angle, with/without over-raise feature	8.6 degrees min	10 degrees min
Break over angle with/without over-raise feature	8.9 degrees min	10 degrees min
Departure angle with/without over-raise feature	9 degrees min	10 degrees min
Turning radius (outside body corners)	46' max	45' max
Axle zone clearance	5" min	5" min

1.2.1 Turning Radius

The Bus shall meet the outside body turning radius requirements specified in Table 1.2 regardless of load to the GVWR.

On 60' buses, the articulated angle shall be no greater than 46 degrees. The swing-out of the outer rear corner of the trailer shall not exceed 29-1/2 inches.

1.2.2 Underbody Clearance

The Bus 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 Bus, including traction motor shall be protected from impacts.

Ramp Clearances: Any encroachment into the approach or departure angle area shall encounter a structural member before any component. Contractor shall verify the approach and departure angles.

Ground Clearance: Ground clearance shall be no less than eight 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 inches.

1.3 PROPULSION SYSTEM PERFORMANCE

The Bus 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 Bus shall not be noticeable. Minimum actual Bus speed and acceleration requirements can be found in Table 1.3.1. The SFMTA, at its sole discretion, may require Contractor to verify the performance of the Bus on any or all the grades listed.

TABLE 1.3.1 – Performance Requirements

Speed on Grade		
Grade	Speed Requirement 40-Foot	Speed Requirement 60-Foot
0% Grade	63 mph (max)	63 mph (max)
2% Grade	55 mph	40 mph
5% Grade	25 mph	20 mph
10% Grade	15 mph	11 mph
16% Grade	10 mph	8 mph
18% Grade	>0 mph	5 mph
20% Grade	Not Applicable	>0 mph
23% Grade	Not Applicable	Not Applicable

Acceleration on Grade			
Grade	mph	Time (seconds) 40-Foot	Time (seconds) 60-Foot
0% Grade	0-10	5	7
0% Grade	0-20	10	10
0% Grade	0-40	26	35
2% Grade	0-15	8	9
5% Grade	0-18	10	12
10% Grade	0-14	10	12
16% Grade	0-10	12	12

Locations of Grades for Speed and Acceleration Tests:

Interstate 280 at 25 th 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 Bus shall be designed to be compatible with the terrain and environment found in the SFMTA's service area. Also, the Bus shall be capable of running continuously at GVWR in the environmental conditions found in SFMTA's service area. These conditions include high humidity, rain, and occasional temperature extremes.

Bus 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 manufacturer shall supply new performance data to the SFMTA as appropriate when programming changes affect vehicle performance.

Manufacturer to provide a complete list of programmable acceleration and deceleration settings and list the changes to vehicle 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.

Contractor shall supply documentation confirming the Bus 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 Bus 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 Bus 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 Bus 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 Bus 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 Contractor to verify the clearance of the Bus on any or all the locations listed below.

Paths for Clearance Testing:

- Sacramento Street – from Drumm St. to Van Ness.
- Clay Street – from Van Ness to Drumm St. 24 Divisadero Line – from 30th & Mission, heading west on 30th, turning right/north on Noe, turning left/west on 26th Street, then right/north on Castro/Divisadero – following that north to Geary Blvd. This route is repeated in the opposite direction.
- Operate around turn from Clayton onto Market and from Market onto Clayton (note: 40-ft only).
- DeHaro Street – from Mariposa St. to 23rd St (note: this is a 21% grade).
- 23rd Street – between Indiana and Pennsylvania 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 intersection; confirm the departure angle.
- Rhode Island 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 Crossover to WB Lincoln Way (curb lane to curb side bus stop right turn) or 3rd St NB to 20th (EB).
- U-turn loops on Fillmore and Marina-22-line, 14th/Quinatar-6-line.
- F-line ROW on Embarcadero from Battery to Mission. (we run buses on the F as a substitute following the tracks and due to the cobblestone, not sure what it does to vehicle body.
- 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 Bus 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 Bus is stationary with 80 dBA white noise on the left side exterior of the Bus; b) measure the noise level when the Bus is accelerating at full throttle from 0-35 mph; and c) observe vibrations/rattles with the Bus 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	76 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 a Bus is operating at all three conditions.

TABLE 1.5.2

OPERATING MODE (Curb Side)	MAXIMUM ALLOWABLE
Pull-away test at full throttle	83 dBA
Curb idle test w/AC ON	65 dBA
Full throttle from 35 mph	80 dBA

1.6 ELECTRONIC NOISE CONTROL

Electrical and electronic subsystems and components on the Bus 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 Bus may continue to drive until the operator moves to a safe location and parks the Bus at which point the Bus will automatically shut down. The components that must be protected in this way include, but are not limited to traction motor(s), power electronics, and energy storage units. Such automatic shut-down features shall be capable of being overridden to allow the Bus to be safely moved a short distance (for example: out of the flow of traffic). 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 electric vehicles, wiring, and connectors.

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 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 Bus should be clearly marked “ELECTRIC 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 Bus.

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 Bus body or storage box 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 Bus, all high voltage should be isolated within the battery boxes, regardless of the position of the master switch.

1.9 MASTER DISCONNECT

The Bus 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 master disconnect switch shall be capable of being locked in the "OFF" position. The purpose and function of the switch shall be clearly and permanently marked to be easily understood by an individual unfamiliar with electric Vehicles. 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 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 electric Coach shall be ensured by utilizing established EMC containment techniques, such as proper shielding, grounding, filtering, signal wiring separation, 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 SFMTA covering items 1-4 with problem areas identified.

1.11 PROTOTYPE

The Contractor shall produce and deliver to the SFMTA a prototype Bus 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 Bus only if all major performance criteria are met.

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 Bus shall be brought up to the final production Bus 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 Bus, the structure of the Bus 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 the 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 Bus 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 the detailed investigation of the failure and the detailed structural analysis of the complete Bus 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 Bus has been involved in a structurally 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 Bus 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 Bus (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 bus. 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 Bus shall resist corrosion from atmospheric conditions, road chemicals, salt and other commonly encountered corrosive substances, as well as from bus washing performed per SFMTA standards, for a period of either 12 years or 500,000 miles. An underbody coating shall be applied to the Bus unless the Bus underbody is not susceptible to corrosion; the SFMTA may grant a waiver to 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 Bus.

1.15 WORKMANSHIP

The Bus shall be built in accordance with 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 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)). Contractors shall provide general configuration layouts, arrangements, schematics (with or without dimensions), and, when applicable, specification sheets. Contractors shall provide electrical drawings, which shall include a master wiring schematic (complete bus electrical system), and individual sub-system schematics and wiring diagrams. The Contractor shall provide software information required by the SFMTA to perform maintenance.

The Bus 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.

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 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 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, and firewalls, and the facilitation of fast passenger evacuation.

Contractor shall ensure, as much as is practical, that all materials used in the construction of the passenger compartment of the Bus are 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. Contractor shall provide a list of Docket 90-compliant components utilized in the passenger compartment of the Bus for SFMTA approval.

A fire-retardant barrier or coating between the energy storage unit and storage box and the Bus itself should be used to prevent, or at the very least delay, the spread of fire.

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 or fire 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 Bus 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 Vehicle (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 required or selected by 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. 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:

- Steering and Hydraulic System
- 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
- Charging station(s) (if applicable)
- Bus Chassis

2 BODY

2.1 BODY STRUCTURE

The Bus shall have a clean, simple design, primarily derived from Bus 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 Bus shall navigate through all established SFMTA revenue bus infrastructure (including but not limited to charging areas, bus maintenance and storage areas, body shop areas, 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 Bus.

The passenger compartment shall be separated from the traction motor and energy storage systems by fireproof bulkheads. This bulkhead shall preclude or retard propagation of a traction motor 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 90A. Only necessary openings shall be allowed in the bulkhead, and these shall be fire-resistant. If the Supplier's overall design contains no bulkheads, the Suppliers may use the floor and roof 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 Bus. The structure shall also withstand impact and inertial loads due to street travel during normal SFMTA service throughout the Bus's service life without permanent deformation or damage. Contractor shall test the proposed Bus 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 vehicle 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 Bus, 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 Vehicle 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 Bus and road irregularities such as chuckholes and railroad level crossings.

2.1.3 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 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 Bus 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 Bus. Components located behind these panels cannot be damaged by this test method.

The Bus structure shall withstand a 25-mph impact by a 4,000-pound automobile at any point, excluding doorways, along either side of the bus and the articulated joint, if applicable, 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 Bus 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 vehicles from a ditch or pulling them to position to be towed from the front and shall not provide a foothold 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.

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 1/2-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 SFMTA approval that includes a 15-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 this 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. Vulnerable composite chassis components on the underside of the front and rear overhangs shall be protected by metal skid plates.

2.2 EXTERIOR

The exterior and body features, including grilles and louvers, shall be shaped to allow complete and easy cleaning by SFMTA's automatic bus 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 bus washers for the service life of the Bus. 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.

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.

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. Composite structural components shall be repairable using common composite repair techniques or be easily replaceable.

2.2.2 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.

2.2.3 Rain Gutters

Gutters shall be provided or designed as an integral part of the Bus body to prevent water flowing from the roof onto side windows and doors. Regardless of the motion of the Bus, 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 Bus. License plates shall be mounted so that they can be cleaned by the SFMTA's automatic bus 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 or Sportworks front-loading three-bicycle rack with non-glare finish, or approved equal, on the front bumper of the Bus. 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 Vehicle needs to be towed. The bike rack shall not impair or obstruct the visibility of the headlights; Contractor may submit an alternative bike rack designs or bus configurations 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.

2.2.6 Finish and Color

Bus exterior shall be painted or wrapped with decals (colors and paint specifications are given in Section 8: MATERIALS AND OVERALL WORK QUALITY). SFMTA and Proposer 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 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 Bus. Drilled holes and cutouts in exterior surfaces shall be made prior to cleaning, priming, and painting, where possible, to prevent corrosion. The bus shall be painted prior to installation of exterior lights, windows, mirrors, and other items that are applied to the exterior of the bus. Body filler materials may be used for surface dressing, but not for repair of damaged or improperly fitted panels. 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 $\frac{1}{4}$ inch thick shall be installed behind each wheel and shall extend downward to within four 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, Comotech, DOGA, or approved equal, electric powered, continuously variable speed windshield wipers for the windshield. At 60 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

Contractor shall provide conventional doors with stainless steel piano hinges for access to the rear service compartment and all auxiliary equipment compartments or shall provide alternative designs for SFMTA approval. 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 bus washing operations. Springs and hinges shall be corrosion resistant and shall last for the Buses service life.

2.2.10.1 Exterior 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 bus washing operations. Access doors when open, shall not restrict access for servicing other components or systems. 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 or mechanical props 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. Traction motor oil shall be checked and added through the maintenance compartment doors. Traction motor coolant shall be checked and added through a paddle door located on the roadside of the Bus. The location of these fluid access points shall be approved by the SFMTA.

2.2.10.3 Low Voltage Battery Compartment

The low voltage or auxiliary battery compartments shall be constructed of stainless steel, polyethylene, or approved equal material. Low-voltage batteries shall be located under the floor of the Bus, properly vented and self-drained, and accessible only from the outside of the Bus. The Bus 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 Bus body or storage box and are not ejected, or leak, even under severe crash conditions.

Batteries shall be mounted in trays that are constructed of stainless steel, polyethylene with a stainless steel sub-frame, or approved corrosion resistant materials. Batteries should be easily accessible; the SFMTA prefers that battery trays easily slide out of the body for service or replacement. Battery trays may be e-coated or powder coated to assist with corrosion or abrasion resistance. 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 Bus, 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. Location and design must be approved by SFMTA.

2.2.11 Bumper System

Bumpers shall be Romeo Rim High Energy Level Polymer (HELP) bumpers or approved equal, adapted to the Bus provided, and installed to meet the performance requirements of these Technical Specifications. Bumpers shall provide impact protection for the front and rear of the Bus up to 26 inches above the ground. The bumpers may wrap around the Bus but shall not exceed the allowable Bus width. Bumper material shall be corrosion resistant. Visible surfaces shall be black. These qualities shall be sustained throughout the service life of the Bus. 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 Bus 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 Bus, 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 Buses 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 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 bus. It shall protect the bus from damage by 5.5-mph impacts into the corners at a 30° lateral angle to the longitudinal centerline of the bus. 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 Bus. 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 bus when impacted anywhere along its width by the common carriage with contoured impact surface (defined in Figure 2 of FMVSS 301) loaded to 4000 lb., at 4 mph parallel to or up to a 30 deg angle to the longitudinal centerline of the bus.

The rear bumper or bumper extensions shall not offer footholds to unauthorized riders. The bumper extensions shall not hinder service and shall be integrated into the Bus body with no protrusions or sharp edges. The bumper shall be independent of all power systems of the Bus and shall not require service or maintenance in normal operation during the service life of the Bus. Any flexible portion of the bumper may increase the overall Bus 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 SFMTA revenue 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. Interior mullion trim, moldings, and trim strips shall be textured stainless steel, PVC, 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).

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.

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 synthetic paneling, backed with a durable, moisture-resistant material of sufficient thickness. The material shall be presented to the SFMTA for approval and 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 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, stainless steel, or a durable polymer material.

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 sufficiently durable and made of formed metal, polymer, or composite material.

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 or gray color that matches or coordinates with the Coach interior.

The dash will be constructed with a rigid sub-structure 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. Contractor and the SFMTA will determine which components shall be fastened to the dash during 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 should be minimized. Fasteners shall be corrosion resistant. Self-tapping screws are not permissible for attachment of interior panels.

2.3.6 Interior 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 springs or mechanical props, 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 bus interior.

2.4 FLOOR

The floor shall consist of the subfloor and the floor covering that will last the life of the bus. 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 bus.

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 $1\frac{1}{2}$ -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, René Composite, 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, 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. Steps leading to the upper deck are preferable; however, a ramp with a slope may be acceptable to the SFMTA. 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 Vehicle 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", Coosa Composites, 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 18 inches behind the turn of the corner at the forward edge of the wheel well; and at the exit door area 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. . The design 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 strip of corrosion resistant material. 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 bands are 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 accessories switched off.

3 FURNISHINGS

3.1 WINDSHIELD, DRIVER WINDOW, AND PASSENGER WINDOWS

The Bus body shall accommodate a windshield, driver's window, and passenger windows. All windows shall be supported by metal or composite 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. 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 sign 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 electric motor 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. The SFMTA prefers that passenger windows and door windows have no less than 28 percent luminous transmittance and have a solar heat gain coefficient of no greater than 40 percent; 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.

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 Bus. 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). Contractor shall provide emergency exit provision for SFMTA approval.

3.2 DOORS

Doors shall be a Vapor slide-glide style at the front entrance area and at the rear exit area(s) 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 on 40-ft Buses shall be in front of the drive (rear) axle; 60-ft articulated Buses shall have exit doors fore of the center axle and fore of the 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 Bus adjacent to each set of exit doors, there shall be pushbutton-style door request buttons to allow for onboarding passengers to open the exit door when the Bus 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 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 based on door types.

3.2.2 Dimensions

Door openings shall be no less than 74 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 37 inches wide for the entire vertical height.

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 (6) 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 Bus, 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. 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 Bus 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 electric or air-wave-type sensitive edge 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, Contractor shall utilize LED lights from a proven manufacturer. Wheelchair ramp and kneeling indicator lights shall be illuminated with LED light. 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 wheel well and the exit door(s). 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.

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, 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. Lighting in the turntable area of 60-ft articulated Buses may be reduced to 7 foot-candles.

Floor surface in the aisles shall be a minimum of ten foot-candles, and the vestibule area a minimum of 4 foot-candles with the front doors open and 2 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 Doc 90A. 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 motor compartments and all other compartments where service may be required to generally illuminate the area for night emergency repairs or adjustments. The motor compartment lights shall be controlled by a conveniently located toggle switch near the rear start controls in the compartment or in an 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, MCC, Eberspächer, or approved equal. 40-ft Buses shall be equipped with a single HVAC system; 60-ft articulated Buses shall utilize an HVAC system on each section of the vehicle fore and aft of the articulated joint.

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 Proposer 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 60 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 4 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 lift system compliant to requirements defined in 49 CFR 571.403 (FMVSS 403) shall provide ingress and egress quickly, safely and comfortably, both in forward and rearward directions, for a passenger in a wheelchair from a level street or curb. The wheelchair loading system shall conform to all applicable ADA requirements. The task of the final commissioning shall be included in the Contract price.

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, 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 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 40' Bus unless otherwise directed by the SFMTA. A minimum of 44 passenger seats shall be provided in each 60' Bus unless otherwise specified 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 23.6 inches wide at seated passenger hip height. 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 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. SFMTA prefers USB hubs with USB 2A and C ports. 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 27 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, 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. In locations at which cantilevered installation is precluded by design and/or structure, other seat mounting may be allowed. 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 10 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 Bus is in motion. No seats shall rattle while the Bus 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 one 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 1/4-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 1/4-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 1/4-inch permanent deformation in the seat or its mountings. The seat assembly shall withstand static horizontal forces of 500 pounds evenly distributed along the top of the seatback with less than 1/4-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 6, 8, 10, 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 plastic construction with replaceable inserts to minimize weight while allowing for maximum vandal resistance and minimal maintenance. Seats must be modular, allowing each component to be easily replaced if necessary. Seat surfaces and back inserts shall be granite blue), or an alternative color as approved by the SFMTA. Priority seats and stroller seats require white stencil on the seat inserts according to 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. Contractor shall submit wheelchair accommodation options for SFMTA review and approval as part of the general seating arrangement.

The design and construction of the Bus 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 Bus to accommodate a wheelchair ramp that meets these requirements.

3.7.5.1 Maneuvering room

Maneuvering room inside the bus 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. 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 should 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. 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 cable 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. Contractor shall submit pushbutton locations for 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.

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. For 60-ft articulated Buses, passenger assists shall be provided to aid in the transition between the front and rear sections of the Bus.

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 SFMTA prefers not to drill through the assists. Contractor shall submit the proposed layout of passenger assists and grab handles to the SFMTA for approval.

A crash resulting in a 1-foot intrusion into the Bus 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. Black powder coating shall be applied to any passenger assists in the front of the Bus 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.

3.9.4 Grab Straps

Contractor shall supply Bentech grab straps (part # SH-21-TP) or approved alternative on the overhead assists. 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 plastic receiver cups or stainless-steel receiver cups with isolators bolted 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

Contractor shall provide and install on each Bus 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.

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 will 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 Bus 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 Bus 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 display and shall feature 14 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 display and shall feature 14 rows by 96 columns of LEDs.

3.10.5 Rear Destination Sign

The rear destination sign shall be amber color display and shall feature 14 rows by 48 columns of LEDs. The rear destination sign shall include an integrated backup camera, which will display a view on the driver's integrated dash display with a latency of 100 milliseconds or less. The rear designation sign will also integrate with the Kratos DVR for the purposes of recording video.

3.10.6 Dash Mounted Run Number Sign

The integrated run number sign shall be amber display and have no less than 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 below) 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 curb-side of the Bus.

3.10.7 Operator Control Unit (OCU)

The OCU shall be used to view and update display messages. It shall be recessed mounted in an area that is easily accessed by the Bus 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 compartment shall have a locked 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 CUSTOMER INFORMATION SYSTEM

[RESERVED]

3.13 DIGITAL VOICE ANNOUNCEMENT SYSTEM

The Bus 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 Bus. To maximize the system's useful life and to ensure ease of integration with third party electronics on transit Vehicles, 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 Bus 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. Vendor 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.

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 Bus 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.

Contractor shall offer for purchase all required software, hardware configuration, and training to maintain and operate the DVAS.

All hardware and software shall be uniquely identified as 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. Sign shall be constructed to withstand the harsh environmental conditions found in transit applications.

The Contractor shall also install an independent analog passenger stop request display located on the front sign compartment door which functions simultaneously with the electronic sign when a stop is requested by passengers.

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 Bus route and trigger the announcement of the next Bus 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 Operator intervention or action 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 Bus stop.

3.13.4 Data Transfer and Wireless Data Transfer

The DVAS shall be reprogrammable on the Bus. On-Vehicle 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.

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 SFMTA engineering.

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 on a 40' Bus; ten interior speakers shall be installed on a 60' Bus. One exterior speaker shall be provided 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 Bus, and one interior AGC microphone shall be provided at the midpoint of each Bus. 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. 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 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 Vehicle's interior and exterior public address speakers. This system shall provide the driver 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 Kratos or approved equal and shall demonstrate successful operation of the system on each Vehicle. The DVRs system shall provide full coverage of the interior and exterior of the Vehicle 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 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 vehicle power. The system must be able to withstand all transients, surges, and dips in power from the Buses electrical system without any deterioration of system performance. The system shall not be affected by electro-magnetic interference (EMI) or radio frequency Interference (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 Vehicle 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

Contractor shall provide and install all camera system equipment required for full coverage of the vehicle, 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 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 Bus including in the front or sides of the Bus.

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 Bus to the dash display when the Bus is in reverse. In addition, a rear exterior IP camera shall be provided and shall be integrated with the Kratos DVR for the purpose of recording video.

Interior analog cameras overlooking each set of exit doors shall be provided and shall integrate with the driver's dash for the purpose of displaying live video to the dash display when the doors are open. Camera views for middle and rear exit doors shall be displayed on the dash display in a split-view configuration; Contractor may propose an alternative solution to the SFMTA for approval. An interior IP camera shall also be provided at each exit door and shall be integrated with the Kratos 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 Bus, 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 Bus. 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 Bus shall be pointed towards the rear and at the doors. It shall prevent damage to the lens from the Bus washers or tree branches on the Vehicle's route.

All cameras supplied shall have a 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 transit vehicle. 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 digital video recorder (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 removal 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, Vehicle 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 Bus 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 Bus when the Bus returns to the yard in a manner satisfactory to the SFMTA.

The download shall continue until complete even if the Bus is powered down.

The DVR shall have the capability to transmit live video, from inside the Bus, upon demand to a laptop or other mobile device while the Vehicle 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 Bus 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 Bus 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.

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 Vehicle 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 Vehicle is back in the depot yard. It shall include a "GPS Search" feature that will allow 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 alerts that can send notifications to 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 Vehicle when the Vehicle 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 Bus shall be a CradlePoint wireless router or approved equal. The Contractor shall supply or use an existing antenna mounted on the roof of the Bus 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 install provisions for a continuous battery powered Lytx DriveCam system on all Vehicles. The SFMTA shall provide all required hardware and harnesses. 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 SFMTA.

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 full bill of materials provided in ATTACHMENT 8 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 SFMTA review and approval. The SFMTA prefers that the operator's handset shall be located on the curbside of the operator's dash adjacent to the farebox; alternative locations may be submitted for SFMTA approval.

The task of the final commissioning of the mobile radio/AVL system shall be included in the Contract price.

The proposed 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

Contractor shall provide and install all antennae for the SFMTA radio system specified in Section 3.17. Contractor shall provide and install coaxial cables from the ITS compartment to each antenna location.

3.17.2 Discrete Signals

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 a Genfare Odyssey fare box, including a mounting plate and wiring for power and J1708 connectivity, shall be provided as far forward 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 location shall provide sufficient clearance for easy access to the cash box/receiver system, coin and bill modules, and the Master Controller Card. 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.

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. 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

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. 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 CID(s) must be approved by the SFMTA.

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

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 stops 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 Vehicle 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 Vehicle door opening.
- B. Fully adjustable detection zones that meet the requirements of the Vehicle 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 Vehicle.
 - Variations in light and temperature.

Contractor shall offer for purchase all required specialized tools for the APC. 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 Vehicle 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 Vehicle while passengers board and exit. Location information will include but not be limited to route and Bus 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 Bus/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.

Microcomputer gathered data should consist of but not be limited to:

- A. Route ID
- B. Vehicle 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. 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 to the rear of the operator's barrier 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 Vehicle number on a decal on the roof of the Vehicle. A Bus 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. 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 CHASSIS MOUNTED PEDESTRIAN BARRIER (S1 GARD)

Contractor shall provide a chassis mounted S1 Gard pedestrian barrier (part number 547320 or approved equal) 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 Bus breakover angle.

3.24 TELEMATICS

The Contractor shall provide a data monitoring system by ViriCiti, making use of the ViriCiti Datahub onboard vehicle telematics device. The service shall collect information on energy management, route data, average passenger loads, and vehicle data (including fault codes). The monitoring system shall be fully compliant with version 2.0 or later of the Open Charge Point Protocol (OCPP) standard. In addition to complying with OCPP, the vendor 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 data monitoring system.

The ViriCiti Datahub shall interface with the SFMTA's HxGN EAM asset management system through an API or other means to retrieve bus status and any associated status descriptions for display on ViriCiti's telematics dashboard. ViriCiti shall also provide odometer mileage data to the SFMTA HxGN EAM asset management system through an API or other means. Frequency of data uploads to and downloads from HxGN EAM shall be subject to approval by the SFMTA.

The Contractor shall provide a five-year subscription for ViriCiti, which includes the core vehicle and charging station packages as well as the optional driver behavior, maintenance, and smart charging packages.

3.25 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 a render or engineering drawing of the operator's area for approval by the SFMTA prior to the manufacture of each prototype Coach.

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 exiting the control station, or while operating the Coach.

4.1.1 Operator Control

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 Figure 4-1 (Operator Control Requirements). All required switches and controls are included in Figure 4-2 (Operator Switches and Controls) and shall be rated for heavy duty automotive applications.

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

Vehicle 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 75 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 ESS state of charge and the voltage of the 12 volt and 24 volt batteries. The Bus 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. For 60-ft buses, the display shall be capable of receiving triggers from three sources (backup camera, rear exit door camera, and middle exit door camera).

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.

FIGURE 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
5 th percentile acc. pedal angle at rest	Conform to SAE J287-J941-J1052 and J1522
5 th 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 26" 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 – 80 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

FIGURE 4-2 OPERATOR SWITCHES AND CONTROLS

SWITCHES
Master run switch
Start button (if applicable)
Kneel switch
Over raise feature
Hill holder switch
Interior lighting switch
Wheelchair ramp switch
Power door switch
Operator area lighting switch
Hazard light switch
Pedal adjustment
Silent alarm switch
Speaker selection switch
Hazard warning switch, with extension arm
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")
Turn signal disable switches (right and left)
Event marker button
High beam switch
Regen disable switch (not to be accessible in operator area)
Interlock override switch (see Section 4.1.4.3)

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)
Wheelchair ramp controls
Harris radio MDT
Destination sign controls
Exterior side mirror adjustment control
Instrument panel lighting intensity control

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 Figure 4-3 (Onboard Diagnostic Indicators). Space shall be provided on the panel for future additions of no less than five indicators.

FIGURE 4-3 ONBOARD DIAGNOSTIC INDICATORS

VISIBLE INDICATOR	AUDIBLE ALARM	FUNCTION
Low coolant	Yes	Coolant pressure low
Battery overheating	Yes	Battery coolant temperature high
Low air	Yes	Air system low in primary or secondary reservoir
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
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.
Estimated range remaining	No	Indication of estimated range remaining on state of charge.
Wait to start (if applicable)	No	Indicates Bus electric drive is not ready to be started
Door obstruction sensor	Yes	Indication of rear door sensitive edge activation
High voltage system fault	No	Detects high voltage faults and initiates drive system shutoff and battery disconnection.
ABS failure	No	Detects failure in ABS system
HVAC failure	No	Detects failure in HVAC system
Charging system low/high	No	Detects a fault in the charge rate, initiating a time-delay shutoff if necessary

4.1.4 Door Controls

Controls for the front entrance and rear exit doors shall be either a single 5-position master door switch or a push button control, 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. In the case of the push button control, the hazard light shall be activated whenever the front or rear doors are opened or enabled. The 5-position master door switch shall have the following settings:

FIGURE 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 push buttons on the outside of the Vehicle on each exit door. While the rear exit doors are enabled to open, passengers on the outside of the Vehicle shall be able to push the buttons to open the door. With the rear door override switch enabled from the operator's area, the rear exit door will open and remain open if the rear exit doors are enabled by the master door switch.

Contractor shall provide the complete door control design for 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 Vehicle, and a braking interlock shall engage the rear axle service brake system once the vehicle reaches two mph or below. 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 Vehicle 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 driver, shall, when set in the disable position, release and deactivate the door interlocks, allowing the release of the inhibited throttle, and enabling the front 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, 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 two-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 BKBL1824D4SS, BKBL2D24D4V, V4105-42W, or approved equal and the horn assembly shall be a Vehicle Improvement Products HB9T, HB10NB3, V4P-001PRO2, or approved equal.

4.1.6 Accelerator and Brake Pedal

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 80 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 Figure 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 may include an additional 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 bus parked. 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 control shall 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, water-resistant, heavy-duty momentary contact switches, floor-mounted on a platform 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, a suitable model from ECCO, or approved equal, shall be located on the exterior of the Bus 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 a secured locking compartment on the Vehicle, only accessible by mechanics (see Figure 4-2 Operator Switches and Controls). The location shall be reviewed and approved by the SFMTA.

4.1.10 Silent Alarm

Contractor shall install a silent alarm switch (OTTO Engineering part number P4-614122 or approved equal). Approved equal switches should meet IP68 water and dust resistance requirements. The switch shall be located in an approved location below the seat cushion level on the street 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 non-removable 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 Bus. 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. 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 bare 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 windshield defroster unit shall comply with the SAE recommended practices J381 and J382. If the proposed ventilation system does not meet these requirements, the Contractor shall submit their proposed system to the SFMTA for final approval. Placement and modes of operation for the ventilation system must be approved by the SFMTA.

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 14 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.

4.4.2 Side Window

The operator's side-window shall consist of 1/4 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. 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 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 76 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 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 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. Contractor shall provide a Stealth Mic hands-free digital microphone system by Digital Recorders Inc. 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 Bus to drive.

4.8 OPERATOR BARRIER

An operator barrier in the operator's area shall be provided on all Buses. 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. The final barrier design must be approved by the SFMTA. 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 design of the operator barrier must be approved during the design review and shall comply with all applicable regulations. The barrier color should be 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 existing SFMTA fleet prior to submitting a proposal for the SFMTA to review and approve.

4.9 TRASH RECEPTACLE

Contractor shall provide and install a trash receptacle; the design of the receptacle shall be approved by the SFMTA.

4.10 SUN VISOR

Contractor shall provide an adjustable sun visor for use on the operator's front and side of the windshield. The front visor shall be a scissor type roller blind with 20 inches of travel. The side

visor shall be a black padded visor which shall not obstruct the street side exterior mirror. 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 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. 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 in the curbside wheel well or in the operator area. The location and design of the storage locker 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 Bus 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 an hour 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 adjustment shall be easily accomplished with minimum disassembly or removal of components. Caster and toe-in adjustments shall be possible without removal of any component.

5.1.2 Axles

All axles shall have a minimum load rating sufficient for the Coach loaded to GVWR and shall operate for 200,000 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. Front and rear axles shall be M.A.N, ZF, Meritor, Rockwell, or other approved equal.

The front axle suspension system shall be a dropped beam type with hollow section. The Contractor may propose an alternate independent front suspension system.

The rear axle shall be a heavy-duty non-steerable type. 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 SKF, Inc., FAG, 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 plunging 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 bus hits a bump (higher than street surface), and 2.75 in. rebound (downward travel) when the bus comes off a bump and the wheels fall relative to the body. Elastomeric bumpers shall be provided at the limit of jounce travel. Rebound travel may be limited by elastomeric bumpers or hydraulically within the shock absorbers. Suspensions shall incorporate appropriate devices for automatic height control so that regardless of load the Bus height relative to the centerline of the wheels does not change more than ½ in. at any point from the height required. The safe operation of the Bus 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 three 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 30 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 12 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 Bus is in motion. The kneeling controls shall not be operational while the wheelchair ramp is deployed. 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 five 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 SFMTA at the design review. 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.

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 Bus 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 Bus is within a predetermined speed range. The over-raise feature shall be de-activated once the Bus speed exceeds the allowable speed limit. The SFMTA prefers that the over-raise feature have the capability to activate while the Vehicle 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 Buses 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.

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 Bus 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 Bus 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 Vehicle 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 driver's seat. The design and location must be approved by 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 Bus 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 SFMTA.

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 vehicle 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 bus 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

Contractor shall provide a system for preventing the Bus 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 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 bus 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 Bus. 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. Contractor may opt to limit the ESS capacity so that regenerative braking is always available on the Bus or shall propose an alternate solution at the design review.

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 Vehicle is like that of a conventional diesel bus and requires no additional driver skill or training to operate beyond that of a conventional diesel bus.

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 Buses 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. 1/4" 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. Identification plates or decals 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 Hydrovane, Powerex, or Air Squared, a Knorr oil flooded screw, 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 four 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 supported at 30 in. intervals 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 30" 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. 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 Vehicle'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 Bus 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 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, 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. 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. 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

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, Manuli, Balflex 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 Bus 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 interchangeable except for the middle axle of an artic where a super single tire size is used and shall be removable without a puller; a design utilizing super single tires may be proposed to the SFMTA for approval. Wheels shall be compatible with tires in size and load-carrying capacity front wheels and tires shall be provided in accordance with the SFMTA's requirements listed in Section 5.8.2.

5.8.2 Tires

The Contractor shall provide Michelin X InCity Energy Z LR L-315/80R22 or 305/70R22.5 tires or an approved alternative. 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

Contractor shall furnish and install a fire suppression system by Amerex, or an approved equal.

The automatic detection and activation system shall provide 24-hour fire protection for the traction motor compartment. 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.

In addition to the other alarm sensors, a thermostat detector shall be provided to monitor the temperature of the rear propulsion compartment. This system shall include an uninterruptable power supply, consisting of an easily sourced and replaced battery, capable of sustaining operation for a period of at least 24 hours regardless of the primary energy source SoC and remain uninterrupted regardless of master run switch position.

The system shall also provide both a manual and automatic means to actuate the fire suppression system pneumatically or electrically. The fire detection layout and the location of the manual actuation switch must be approved by the SFMTA.

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

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 light from the sun, 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 Bus shutdown and from Bus 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.
- 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 Vehicle speed falls below 15 mph or after certain time delay, adjustable between zero and 15 seconds.
- Commence Event Recording & Data Logging

5.10 ARTICULATED JOINT

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 can make 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 to prevent a tripping hazard. It shall be designed for ease of access for inspection and repairs of all devices that are part of it or devices that pass through the turntable area. Underfloor turntable components shall be easily accessible. Floor plates must be easily lifted and secured in the open position by one person for inspection and repairs. Turntable seats shall be quickly and easily removable by one person. The underfloor turntable area shall be completely enclosed by the bellows and bulkheads on the lead and trailing units to prevent drafts into the passenger compartment. The area between the turntable floor and the bellows shall be closed to prevent collection of trash in the bottom of the bellows. Closeouts shall be attached with removable fasteners. An access hatch shall be provided for routine maintenance (i.e., greasing, adjusting potentiometer, maintenance items).

An anti-jackknife joint shall be provided. The Bus shall sense vehicle speed, relative angle between the lead and trailing sections, throttle and braking actions, and any other necessary inputs to control the degree of stiffness in the joint to ensure that the Bus does not jackknife or operate in a dangerous or unsafe condition; a means shall be provided so that the operator can override the joint control in an emergency. The interconnecting structure shall be designed to prevent separation of the lead and trailing units from a road accident with a commercial or private vehicle. Contractor shall submit the design of the anti-jackknife joint for approval by the SFMTA.

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 by the SFMTA.

Easy access shall be provided to overhead electrical, air, hydraulic, and refrigerant lines passing through the turntable. Hydraulic fittings in the turntable shall be suitable for the given application and must be compatible with other fittings throughout the vehicle. Supports for overhead lines in the turntable shall be sufficient to last the life of the Bus without suffering fatigue failure and shall not cause undue wear or damage to the overhead lines as the joint is articulated.

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.

5.10.1 Raceway

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, and system support lines, as well as all electrical and electronic cabling in 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. 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 submitted for approval by the SFMTA.

Bulkhead fitting shall be provided for all overhead lines at both ends of the raceway. The bulkhead area shall be easily accessible for servicing.

5.10.2 Bellows

Replacement fabric type bellows with draft-free, no-sag bottom closure and water drains shall be provided between the lead and trailing sections to seal the bus interior and keep it free of water, dirt, and drafts. Bellows hardware shall be corrosion resistant, and the underfloor area of the bellows shall be easy to clean wherever regular maintenance is required. 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 SFMTA's discretion. The design of the bellows shall be submitted for approval by the SFMTA.

6 PROPULSION SYSTEM

6.1 PROPULSION SYSTEM DESCRIPTION

The Coach shall be powered by a battery 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. Function and operation of the Coach shall be transparent to the Coach operator and passengers. The prime 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. Durability of the battery electric 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.

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

6.1.1 Operating Range

The average operating range of the Bus on all SFMTA routes shall be at least 160 miles on a full charge at the beginning of Bus life while operating in 60°F weather and carrying either a 52-passenger load on a 40-ft Bus or a 78-passenger load on a 60-ft bus. The SFMTA, at its sole discretion, may require performance testing to verify Bus range on any of their routes, including:

- 22 Fillmore
- 9 San Bruno

- 1 California
- 24 Divisadero
- 29 Sunset
- 43 Masonic
- 44 O'Shaughnessy

6.1.2 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 propulsion system interlock arrangement and control must be approved by the SFMTA.

6.2 PROPULSION SYSTEM SERVICE

For the Bus propulsion system, Contractor shall provide a voltmeter for the 12-volt system, a voltmeter for the 24-volt system, and energy storage system main pressure and temperature gauges. Both drive and energy storage temperature gauges shall have a resettable maximum temperature indicator.

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.

6.2.1 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. 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 external charging stations and regenerative braking.

6.3 ENERGY STORAGE SYSTEM

Contractor shall provide design and performance data for the energy storage system to the SFMTA. The energy storage system shall be of a commercial design capable of operating in the SFMTA transit environment. The primary charging of the energy storage system shall be

accomplished by an external DC charger, the on-board Electric Drive system controller and regenerative braking.

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

The Bus shall have a heavy-duty energy storage unit, designed to last the life of the Bus, which, coordinated with the electric drive and the rear axle drive ratio, will enable the vehicle to meet all specified range, top speed, acceleration, and hill climbing requirements while still maintaining passenger comfort and providing a smooth ride. The ESS shall be rated to operate at the GVWR of the Bus. ESS will be designed to retain 75% of its as new energy carrying capacity after 6 years or 300,000 miles of operation.

The energy storage 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.)

The drive energy storage system shall include a voltage equalization system that will perform real-time equalization of voltage between individual energy storage cells within each module. This equalization function shall be accomplished automatically and shall not require manual intervention by the Bus operator or maintenance personnel.

Altoona testing results for vehicle efficiency in kWh/mile must be submitted for the proposed vehicle configuration. Preference will be given for systems that deliver the best performance when configured to the SFMTA's specifications.

The Bus 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 vehicle accident. Analysis to validate the design and test data shall be provided to the Agency. The energy storage system shall be designed and constructed to prevent gas or fumes from the energy storage system from entering the interior of the Bus.

6.3.1 Battery Specification

The Coach shall make use of an Energy Storage System (ESS) composed of battery cells using lithium iron phosphate, lithium nickel manganese cobalt oxide, lithium titanate, or an approved alternative battery chemistry. 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 System shall 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. The enclosures shall be designed to last for at least 12 years in transit service operations. The enclosures 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 to maximize passenger capacity. The enclosure distribution shall not adversely affect handling of the Bus.

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 all issues or prior incidents relating to safety. Any thermal runaway events shall include a full explanation of the cause of the event and a list of all remedial action taken by the Contractor to prevent similar occurrences in the future.

Test results from FTA Multi-Cycle economy tests or other applicable test procedures shall be provided to the SFMTA. Results shall include vehicle configuration and test environment information. Energy economy data shall be provided for each design operating profile. The design operating profile is assumed to be defined by the FTA Multi-Cycle.

ESS energy consumption tests shall be run on these three duty cycles:

- Manhattan with an approximate 6.8 mph average speed
- Orange County with an approximate 12 mph average speed
- EPA HD-UDDS with an approximate 19 mph average speed

This data should include a breakdown of power consumption by subsystem and equivalent comparison to diesel bus performance.

The SFMTA expects energy consumption data to be provided for each of the listed test cycles.

6.3.2 Energy Storage System Charging

The Bus shall support the SAE J1772 DC charging standard and shall accept charge using a J1772 CCS/Combo connector. The Manufacturer shall provide a detailed description of its charging system and specify its compliance with J1772 standard. The Bus shall be capable of 2-way communication between the charging dispenser and the Bus ESS/BMS. The Bus must provide the following driver alerts: (i) dynamic state of charge of the Energy Storage System, and (ii) charge rate. The SFMTA requires that both the Bus and charger systems be capable of independently commanding an emergency stop of the recharge cycle should a critical fault occur.

The SFMTA expects that all charging for the in-service use of the Buses will be done at an SFMTA maintenance facility using a direct single port plug-in style charger.

The Buses shall be capable of being safely recharged via a DC charger utilizing the J1772 CCS/Combo connector from 10% SOC to 100% in less than four hours, provided that a capable charging system is utilized. The ESS shall maintain this capability throughout the 12-year life of the Bus, or up to 500,000 miles, whichever occurs first.

Provisions for overhead chargers compliant with SAE J3105 must be provided. The ESS must be able to accept a charge rate of 300kW for a continuous period of 15 minutes. The center of the overhead charging rails shall be installed above or in front of the center of the front axle of the Coach. Buses shall be equipped with RFID tags to assist with overhead charging activation.

The Buses must be immobilized during all charging operations. Upon successful engagement of the charging interface, the Bus shall be interlocked such that propulsion is rendered non-tractive and the brakes applied.

6.3.3 Conductive Manual Interface (On Board)

The SFMTA requires a contact style charging interface to be provided on the rear of the Bus on both streetside and curbside. The charging ports shall be protected from water and debris intrusion. The ports shall be easily accessible from the outside of the Bus through a separate body access hatch. The ports shall be located between 3 and 5 feet above the road surface with the Bus air suspension adjusted to ride height. Contractor shall provide drawings of the Bus charging ports layout will be provided by the Contractor to the SFMTA.

The SFMTA requires charging ports that comply with the SAE J1772 CCS Type 1 quick charging connector standard or approved equal. The Buses shall be fully compatible with ChargePoint Express Plus DC charging stations.

At a minimum, the SFMTA expects the system to reach peak charge rates of 150 kW via single port plug-in style charging, or at 200 amps and the maximum voltage that can be supplied to the traction battery (whichever is lower).

6.3.4 Charging Station Data Collection and Transmission

The systems shall collect, store, and transmit additional data such as past Bus warning, error codes and charging details to remote locations, and automatically output this data and integrate it into the SFMTA's data collection system.

6.3.5 Electric Bus Fire Wall

A fireproof bulkhead (firewall) shall separate the passenger compartment from the battery enclosures; the bulkhead shall preclude or retard propagation of a battery fire into the passenger compartment. Any passageways for the climate control system air shall be separated from the battery compartment(s) by fireproof material. All piping, connectors, fittings, access panels, and 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 DRIVE SYSTEM CONTROLLER (DSC)

The DSC (or similar onboard system) shall regulate energy flow throughout the electric drive and power system components to provide motive performance and accessory loads while maintaining critical system parameters (e.g., voltages, currents, temperatures) 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.

The system shall provide the following functionality:

- Storage of the Bus's data file generated on a day-to-day basis, to include:
 - At a minimum, duty cycle information (e.g., time stamp, vehicle speed, elevation, location, ambient temperature), and energy profile information (e.g., voltage and current from the traction motor, auxiliary systems, ESS, power electronics, onboard charging system) at 1-second intervals
 - History of charging sessions, energy in, time stamp, SOC
 - Incidents and alarms
 - Health monitoring and diagnostics information
- A means of indicating to the operator that the Bus has limited range or SOC remaining, and derating the bus performance and disabling non-critical features as necessary to extend remaining range. The parameters and details of this feature must be approved by the SFMTA during the Pre-Production Meeting.
- A wireless means of communication to the on route and depot charging stations, and/or if probed via a WLAN in close proximity but may remain separate from the Driver System Controller.
- The system is assumed to include current / power sensors at strategic locations throughout the propulsion system components such that real time comparisons can be made between anticipated power flow and actual power. This feature shall facilitate health checking of components to indicate "open", "shorted" and/or components that have considerable variance.
- The system is assumed to include the necessary sensor inputs at strategic locations, such as, temperature, voltage, pressure, etc. such that the entire array of devices is monitored in real time. This feature shall be able to execute

commands for the self-preservation of component life, health, reliability, and safety. The on-board diagnostic system shall trigger a visual and audible alarm to the operator when the motor controller detects a malfunction, and the protection systems are activated.

- The system shall protect the traction motor(s) against progressive damage. The system shall monitor conditions critical for safe operation and automatically de-rate power and/or speed.
- The system shall include a subsystem capable of monitoring the level of connectivity between all propulsion components and associated cabling / connectors to the Bus's chassis and low (12/24 vdc) systems to insure isolation. The energy storage module shall have at least two automatic means / devices of disconnect and one manual capable of interrupting the positive and negative connections within the module enclosure and rated for disconnect at maximum current.
- The system shall have an interlock that prevents engagement when the charger is connected to the traction battery.

If available, Contractor may offer an expert level software such that the Bus is optimized per duty cycle on the fly, e.g., "adaptive learning" to consider, route, time of day. The intent of this software would be to maintain the Bus's level of expected performance while minimizing the charging required. Contractor may also make the drive system parameters configurable to allow optimization of acceleration and regenerative braking, overall performance, and electric power efficiency.

6.5 TRACTION MOTOR

The Coach shall be powered by a traction motor to 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 electric propulsion system as well as in the areas of reliability, audible noise, and vibration.

- A. Two mechanics shall be able to remove, replace, and prepare the traction motor for service in less than 20 total combined man-hours.
- B. 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.)
- C. Contractor shall provide a list of all special tools required for maintaining and rebuilding the traction motor, if applicable.
- D. "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 SFMTA.

Both ports shall be permanently affixed to the Coach for ease of plug-in. The option to include remote diagnostic communication is encouraged.

6.6 BATTERY MANAGEMENT SYSTEM (BMS)

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

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

1. The BMS must be capable of monitoring the voltage of cells within each battery pack. The BMS must be able to read individual battery or block voltages at a frequency sufficient to ensure reliable, functional, and safe operation.
2. The BMS must be capable of monitoring battery temperatures, mitigating damage to the battery and surroundings, and preventing thermal runaway.
3. The BMS must be capable of communicating when a battery fault (as defined by the battery manufacturer) has occurred and must be able to identify and communicate the location of the faulty battery to perform maintenance.
4. The BMS must be capable of engaging prudent safety interlocks when an unsafe battery condition has been detected.
5. The BMS must be able to monitor the battery SoC and provide information to the rest of the vehicle.
6. The BMS must be able to communicate all data to the bus level information system (reference TS 84) for storage and communication.

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

During operation, battery temperatures must never exceed the manufacturer's recommended range in the design operating profile and specified ambient conditions. Battery cooling must be

sufficient to prevent the temperature from exceeding the battery manufacturer's recommended maximum temperature.

Design and performance of the BMS must be approved by the SFMTA.

6.7 HIGH VOLTAGE DISCONNECT SYSTEM

The high-voltage system shall be fitted with automatic disconnecting contactors located as closely as possible to the positive and negative battery output terminals to minimize the external circuitry that is not de-energized when the devices open. These contractors shall be in addition to any such devices incorporated in the motor controller and shall not require electrical power to operate (that is, they shall be normally open when unpowered).

The contactors shall be rated to interrupt the full load of the bus.

Contactors shall be controlled by the "High Voltage Disconnect" switch, and any safety-critical interlocks and interlock loops, motor-controller overcurrent-protection functions, and vehicle crash and/or fire sensors. Reset of the contactors shall require the deliberate action of the operator or maintenance personnel. Contactors should provide a visual or electrical indication of their status (open or closed) or of a failure to function.

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

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. All access to high voltage enclosures must be interlocked, such that opening an enclosure automatically disconnects the high voltage system.

6.8 COOLING SYSTEM

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

If a liquid cooling system is provided, a sight glass to determine the system coolant level shall be provided and shall be accessible by opening one of the compartment's access doors at the ground level or at an approved location. A spring-loaded, pushbutton type, lever type, or approved alternative valve to safely release pressure or vacuum in the cooling system shall be provided. An overflow reservoir is to be provided, unless otherwise approved by the SFMTA. The overflow reservoir is to provide extra capacity to the system. It will be sized to sufficiently replace any common air pockets that form in the system. An expansion tank shall be provided to eliminate air pockets.

Unless otherwise approved by the SFMTA, any radiator used shall be of durable corrosion-resistant construction with bolted-on removable tanks, or welded header tanks. The radiator shall be designed so that a mechanic can gain access to a substantial portion of the side facing the in-board side of the Bus for the purpose of cleaning the radiator in five minutes or less.

Any radiator used shall be designed to withstand thermal fatigue and vibration associated with the installed configuration for a minimum of 300,000 miles without failure.

All liquid high voltage cooling systems shall be equipped with a properly sized water filter. Electrically driven, temperature-controlled cooling fans shall be provided.

Any radiator used shall be of tube and fin construction. If serpentine fins are used, they must have hemmed edges. Time for removal and replacement of the radiator by a mechanic shall not exceed 8 hours.

An appropriately sized surge tank shall be easily accessible through the rear access door or shall be roof mounted. An alternative location for the surge tank may be submitted to the SFMTA for approval. EDPM or silicone hoses shall be used, and the cooling system piping shall be fabricated to include rolled ends to enhance clamp retention where hoses connect. The fan system shall include electronic feedback control and have diagnostics capability through a standard SAE J1939 diagnostics port. Diagnostics shall be accessible through standard laptop computers. Fan system diagnostics shall identify individual fans that have failed. The fan system may be integrated into other onboard diagnostics systems.

The fan control system may assure maximum efficiency of the system by activating only those fans necessary to maintain the drive system at proper operating temperatures, or by reducing the fan speed. It may also include a feature to automatically reduce fan speed, when temperature conditions allow, and whenever the vehicle stops to minimize ambient noise. Fan system may include a reversible feature to aid in cleaning the radiator. The fan system must be compatible with the Bus fire control system to assure fans are all turned off within 10 seconds of a fire being detected. A switch for manual activation of the fans may be included in the electric drive compartment.

All electrically driven cooling pump are to be of a brushless motor design. Additionally, there shall be no seals that prevent liquid from the pump impeller from entering the electric drive

motor. The pumps shall be fully sealed, maintenance free and rated at a minimum of 40,000 hours of operation at full load.

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 SFMTA review and approval.

6.11 LUBRICATION

If necessary for maintenance purposes, traction motors shall have an oil sampling device compatible with the Probalyzer system or approved equal. The location of the sampling plug requires SFMTA review and approval.

6.12 ACCESSORIES

All accessories shall be electrically powered and shall not draw so much power from the ESS that the Coach performance during normal use fails to meet the stated performance metrics in Section 1.3 (Propulsion System Performance).

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. Precautions shall be taken to minimize hazards to service personnel. Startup and normal operation of the Bus shall not result in dangerous or damaging voltage fluctuations.

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

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 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 may 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

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 vehicle chassis/frame at one location only, as close to the batteries as possible. When using a chassis ground system, the chassis shall be grounded to the frame in multiple locations, evenly distributed throughout the vehicle to eliminate ground loops. No more than three ring terminal connections shall be made per ground stud with spacing between studs ensuring conductivity and serviceability. Electronic equipment requiring an isolated ground of the battery (i.e., electronic ground) shall not be grounded through the chassis. Insulation of grounds shall in no way conflict with other vehicular 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 vehicles or design specifications for an equivalent environment. 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 40,000 hours. Electric motors shall be located for easy replacement and shall be replaceable in less than 15 minutes by a mechanic.

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 any service compartment wiring modules 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 and J1128. All high-voltage power and ground wiring shall conform to specification requirements of SAE 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. 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.

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 or split loom tubing.

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 motor 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.

7.9 MULTIPLEXING SYSTEM

The electrical system shall be controlled by multiplexing Programmable Logic Controllers (PLCs) made by I/O Controls, Vansco, Continental ZR32-B, VBEA, or an approved equal and shall be located in a sealed compartment. 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 SFMTA shall be granted no-cost licenses to utilize all software for interfacing with the multiplexing system for as long as the Buses 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 1 amp.

Protection to each individual circuit in the multiplexing system shall be provided. A method of performing a system check of the circuits shall be provided. 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 all essential information and identify all equipment needed to test and troubleshoot the multiplexing system. 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 X2Power deep cycle AGM, DEKA 8A8D Absorbed Glass Mat (AGM) MagnaPower, Odyssey PC2150S Group 31, Contractor OEM, or approved alternative batteries shall be provided. They shall bear an initial warranty date no earlier than 60 days prior to the manufacture date of the Bus. 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 long enough to allow the operator to safely stop and park the vehicle.

The Bus 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, State of Charge (SOC), and health of the battery when compared to its original capacity. The batteries shall be sufficiently protected from over temperature or meltdown.

The Bus shall keep the low voltage batteries charged whenever the Bus is powered on or the ESS is being charged. 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.

Battery terminals shall be located for access in less than 30 seconds with jumper cables; Anderson SB350 connectors (part number 6322G2) 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 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, polyethylene, or approved corrosion resistant materials and shall properly support the batteries during service. Battery trays may be electrocoated or powder coated to assist with corrosion or abrasion resistance. The SFMTA strongly prefers a sliding battery tray design to facilitate removal or servicing of the low voltage batteries; 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.

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.

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 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 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 Vehicle.

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:

- Air filters
- Ventilating air filters
- Coolant and oil filters
- Belts
- Lamps
- Fuses
- Brake lining material
- Hoses and lines – air, coolant and hydraulic
- Wire terminations and connectors
- Air bags
- Brake Rotors

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 of 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 Vehicle 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. 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 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. Dates, hours, and locations of training shall be at the discretion of the SFMTA.

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
- 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

Contractor shall provide detailed instructional guides, outlining training philosophy, and weighted areas of instruction based on Contractor's understanding of the complexity of the equipment from a maintenance performance standpoint. In addition, Contractor shall identify recommended course lengths with basic electrical/electronic knowledge-driven instruction leading to a proficiency level suitable for new Vehicle 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 SFMTA 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 Bus 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 SFMTA approval, which may be based on Contractor's recommendations).

A list of test equipment and special tools required to maintain the system shall be provided by the Contractor. Contractor shall provide pricing for a test fixture which duplicates an entire Vehicle 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.

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 Vehicle "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 bus 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

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 SFMTA 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

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 SFMTA employees in actual classroom and Vehicle “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 digital copies 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.

9.1.11 Interactive Multimedia Training

Contractor shall provide pricing for a series of interactive training modules on Coach maintenance procedures. 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 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, 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 Buses 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)
- 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 Bus type according to Figure 9-1.

The Contractor shall provide all electronic copies of the Vehicle drawings as necessary for the pre-production process approvals. These drawings include Seating Layout Drawings, Dash layouts, Camera Layouts, AVA AVL drawings, Paint Scheme, APC layout, Fleet Management system drawings, Antenna layouts, Clipper location, and Radio provisions layouts. 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 Vehicle by the SFMTA during the entire expected operational life of the Vehicle. 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 Vehicle during its service lifetime. The Contractor shall submit a generic 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	5	6 years
Contractor Parts Manual	5	12 years
Contractor Operator's Manuals	10	6 years

The supplied manuals shall provide complete, concise, and clear documentation for all equipment ordered on the Vehicle and shall not include superfluous documentation for equipment that was not provided with the Vehicle. 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 Bus Manuals can be supplied without security after the SFMTA signs a limited copyright agreement form. OEM component supplier manuals are not available in an "unsecured" file format. Within the relevant Vehicle 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 Vehicle, unless such change is agreed to in writing by both the SFMTA and the vendor. 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. 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 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.

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 should 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. Bus 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 Bus Service Manuals. An emphasis should 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

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 Vehicle 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 Bus and its systems and 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 Bus and its relationship to and interactions with other primary systems on the Bus 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 Bus.
- 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 Bus.
- G. Air and hydraulic system diagrams showing locations in the Bus 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 9.2.5 (Electronic Systems Documentation.)

9.2.1.1 Preventive Maintenance

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 Vehicle.

In addition to the above requirements, the structure of the PM schedule must include 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:

- 1) List of parts (Manufacturer Part #, Description, Quantity, UOM) required or recommended for each procedure
- 2) 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 Vehicle 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 Vehicle 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 Vehicle 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.

- Vehicle 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 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 Vehicle, including but not limited to pre-service and in-service check-outs, response to safety alarm systems, control of lighting and auxiliary Vehicle 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 Bus, and where the contract for Bus 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, Bus service and parts manuals, and Bus 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 Bus 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
- Subcomponent serial numbers for all major systems

- Test records, including water test
- 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 Vehicle 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. Contractor shall supply Parts Manual illustrations in either SVG vector or compressed JPG file format, whichever works better for the SFMTA.

The Contractor will supply its published Bus 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 Bus Manual delivery (with First Bus delivery) and again with the Final Bus Manual delivery (30 Days after receipt of SFMTA comments).

9.3 VEHICLE SUBSYSTEMS INTEGRATION AND DIAGNOSTIC TESTING REQUIREMENTS

Contractor shall integrate all electronic systems on the Vehicle 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. 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 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 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. 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

Bus after the Bus 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 6 years or 300,000 miles, whichever comes first.

The ESS shall be warranted and guaranteed to be free from Defects and related Defects for a period of 6 years or 300,000 miles, whichever comes first. The ESS warranty shall cover the replacement of any ESS modules and components required to ensure that the Coach retains at least 75% of the original usable energy capacity throughout the warranty period.

10.1.1.3 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 ELECTRIC BUS SUBSYSTEM AND COMPONENT WARRANTY

Items	Description	Years*	Mileage*
1	Traction Motor and control system	5	300,000
2	Traction Inverter and control system	5	300,000
3	Energy Storage System and control system	6	300,000
4	Drive and non-Drive Axles	5	300,000
5	Suspension	2	100,000
6	Brake System (excluding friction material)	3	150,000
7	Basic Body Structure	3	150,000
8	Structural Integrity and Corrosion Protection	12	500,000
9	Cooling System including electric fans	3	150,000
10	Heating and Ventilation Units	3	150,000
11	Power Steering System	3	150,000
12	Wheelchair Ramp System	3	150,000
13	Destination Sign and Voice Annunciation System	3	150,000
14	Door System	3	150,000
15	Air System, not limited to Compressor, Dryer, Tanks, Valves	3	150,000
16	Flooring	6	250,000

*Whichever Occurs First

10.1.2 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.

10.1.3 Detection of Defects

If 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 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 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.

10.1.4 Fleet Defects

A "Fleet Defect" is defined as the failure of identical subsystems or components on at least 40 percent of Vehicles 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 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.

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, 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.

10.1.4.1 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 Vehicle.

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 Bus 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 Buses 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.

10.1.4.2 Responsibility for Corrective Work

The Contractor shall pay for all necessary labor and material to affect all repairs or modifications to all Vehicles, including Buses for which the warranty had expired. If one or more of the Contractor's suppliers do not honor these Fleet Defect provisions, Contractor shall bear full responsibility for the repair of all Fleet Defects.

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 first.

10.1.4.4 Supply of Parts

If a retrofit requires the Contractor to supply parts to the City, 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 Bus. If retrofit parts are delivered to the City in any form other than individual kits, the Contractor shall undertake all work necessary to assemble parts into individual kits or shall reimburse the City (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 City's inventory obsolete, the City 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.

10.1.4.5 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.

10.1.4.6 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 SFMTA-supplied items.

10.1.5 Contractor's Representative

The Contractor shall, at its own expense, provide qualified factory authorized service personnel at 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, Contractor shall supply a record of Contractor's personnel working within SFMTA property to the SFMTA supervisor or superintendent on site.

The record shall contain the following information: Date, Name, and SFMTA Vehicle ID number being worked on. Contractor shall inform the SFMTA in advance of any modifications proposed on the Vehicle 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 SFMTA property.

10.2 REPAIR PROCEDURES

The SFMTA shall endeavor to perform warranty work wherever possible and seek reimbursement from Contractor for required labor hours and parts used. Contractor may be requested to perform or assist with sufficiently technical or abnormal warranty-covered repair work. 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.

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, they 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 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". The Contractor may use SFMTA shop space for repairs if approved by the SFMTA. If SFMTA does not approve shop space the supplier shall use their own offsite location to repair the Bus. If the Coach is removed from 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 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 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 unexpired warranty will apply to the newly installed part.

The SFMTA may allow the use of remanufactured parts provided by the Contractor to be approved by the SFMTA.

10.2.2.2 Contractor-Supplied Parts

Contractor shall furnish parts for all warranty work, whether the warranty labor is performed by the Contractor or by the SFMTA. 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.

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.

10.2.2.3 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. 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 biweekly 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. 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 vehicle, 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.

Contractor shall reimburse the SFMTA for approved warranty claims within 60 Days after each warranty claim has been submitted by the SFMTA. In the event the Contractor requires the failed component(s) be returned, the sixty 60 days reimbursement timeline requirement will begin from the date the Contractor receives the failed component(s).. 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 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.

Contractor shall reimburse 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 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, Contractor shall provide a complete list of all manufacturers and/or vendors that Contractor will use in building the Vehicles. 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 Vehicle 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 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 SFMTA's data processing methods.

10.3.3 Database Information

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. 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.

This record shall be intended for import into the SFMTA's own database system, shall have no access restrictions, and shall not be indexed. Contractor may supply a single file, which contains records for multiple Coaches.

At a minimum, the following Vehicle components shall be serialized and included in the record for the Coach:

Differential	Steering gear box
Traction Motor	Brake booster
Energy Storage System (ESS)	Front axle
ECU (Electronic Control Unit or similar)	Rear axle
Destination sign(s)	Hydraulic pump
Air compressor	Wheelchair ramp
Any auxiliary modules such as a radio or GPS system, which is installed by the vendor	

The Coach master file shall include at least the following data for all Coach and all systems/components listed above:

SFMTA Equip Code	Description	Mfr. name	Mfr. part #	Model #	Serial #	Location on Coach or other Equip	UOM	Next Higher Assembly Equip Code
CHAR(35) *	CHAR(60)	CHAR (10)**	CHAR (30)	CHAR (25)	CHAR (30)	CHAR(5) ***	CHAR(2) *	CHAR(35) (if applicable)

* The SFMTA will provide a coding structure for Contractor to use when creating this equipment master file

** The SFMTA will provide a code and description list of Manufacturer values; Contractor will use the appropriate code from the list in this column

*** The SFMTA will provide a code and description list of Location values; Contractor will use the appropriate code from the list in this column.

Serialized tire "brands" table records will also be provided in the same format as above but will be provided in a separate file. The locations for tires on each Coach are as follows (see ** note on above data table):

- 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 SFMTA with the following database information for the Illustrated Parts Manual via an approved electronic file sharing system.

The parts catalog data must be provided in Microsoft Excel format. Columns with data will consist of at least the following: section, graphic title, figure number, item number (item 1, 2, 3, etc. on the graphic), part description, quantity, and unit of measure. An example of an acceptable format is provided below.

Section	Fig #	Item #	Description	Qty.	UOM	GRAPHIC_TITLE
(14)	(14)	(14)	CHAR (60)	#(14,4)	CHAR (3)**	Coach-1-1-curb side locations

* SFMTA will provide a code and description list of Manufacturer values, Contractor will use the appropriate code from the list in this column

** SFMTA will provide a code and description list of UOM values, vendor will use the appropriate code from the list in this column.

An example of this data can be found below:

Section	Fig #	Item #	Mfr	PN	Description	Qty	UOM	GRAPHIC_TITLE
2	1	1	Am Seat	500895	INSTALLATION DRIVER S BARRIER	1	EA	Coach-1-1-curb side locations

The Contractor shall provide the SFMTA with the following database information for all parts used on the Coach:

Mfr name	Mfr part #	Description	Net price w/freight	UOM	Next Higher Assembly Part #
CHAR(5)	CHAR(30)	CHAR(60)	NUMBER(14,2)	CHAR(2)*	CHAR(30) (if applicable)

* The SFMTA will provide a code and description list of Manufacturer values; Contractor will use the appropriate code from the list in this column.

** The SFMTA will provide a code and description list of UOM values, vendor will use the appropriate code from the list in this column.

All warranty repairs done by the Coach manufacturer at its shop must include a copy of the work performed to document work history by the SFMTA into in-house inventory software.

10.3.3.3 Publications Software

The Contractor shall provide the following drawings via an approved electronic file sharing system, 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

The Contractor shall furnish the spare parts and tools per Section 4.1.2 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.

Contract or 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 Bus manufacturer's description
- By Bus manufacturer's part number

The Supplier shall provide 30-Day pricing information to help support the SFMTA in stocking of parts. 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:

- A. Grouping by system, and special tool for stocking identification.
- B. 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.

C. 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.

D. 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.

E. A cross-reference and indexing system for replacement components common to more than one subsystem (whether Vehicle, test equipment, or special tool). Such components shall have only one-part number.

F. Alternate sources of supply for all commercially available replacement parts.

G. 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. Contractor shall guarantee availability of 14-Day delivery or less from receipt of normal purchase order. Contractor shall not make exclusive agreements with sub-suppliers that would preclude the SFMTA from purchasing components directly from sub-suppliers. 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). 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 Vehicle 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 (see Section 11.2) 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 Vehicles 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 Buses 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 (see Section 11.4) to have been caused by a design flaw or Defect in the Vehicle 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 Vehicles 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 Vehicle 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.

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. All grease fittings shall be capable of being serviced from a pitted area. Electronics assemblies and subassemblies shall also be maintainable using standard, commercially available test equipment and maintenance tools. The Contractor must provide a list of all special tools and any special information that is needed to repair and reassemble electronic assemblies. 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 Bus. 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

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.

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 Bus, 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 Electric Drive System Tools

If applicable, Contractor shall provide pricing information for a complete set of electric 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 electric drive system; one electric drive stand with adapters for overhaul purposes; and one set of dynamometer controls and adapter plates to mate the electric drive supplied to the SFMTA transmission dynamometer.

11.5.1.3 Special Differential and Propeller System Tools

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

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 bus 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 SFMTA approval. OEM shall provide a list of maintenance activities that can be performed while the vehicle is charging.

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.

Contractor 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 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 will 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 Vehicles 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

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).

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.

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 Production Tooling Calibration

When calibrated tools or other devices are used for bus production, they shall be proved accurate at formally established intervals and adjusted, replaced, or repaired as required to maintain quality.

12.1.3.3 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.

12.1.4 Control of Purchases

[RESERVED]

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 SFMTA Vehicles.

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 Vehicles shall be provided by the QA organization.

12.1.5.2 Nonconforming Materials

[RESERVED]

12.1.5.3 Statistical Techniques

[RESERVED]

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 Buses. Identification may include cards, tags, or other normal quality control devices. A vehicle history book shall be attached to each Bus to track QA functions and defects as the work progresses through the shop (see Section 12.2.2.3). A copy of the report must be attached to each Bus upon vehicle 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 Personnel

Sufficient trained inspectors shall be employed to ensure that all materials, components, and assemblies are inspected for conformance with the Vehicle design and specifications.

12.1.6.2 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 obsolete, unsuitable, or as scrap shall be plainly marked and controlled to prevent installation on the Coach.

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 car and included in the Vehicle History Book when all discrepancies have been eliminated.

An Inspection and Test Log (Log) shall be maintained by the Contractor during equipment assembly. All Contractor and SFMTA in-process inspection sheets and test data records for that Bus shall be contained in this Log, which will be provided in the Vehicle History Book (see Section 12.2.3.3 – Vehicle History Book).

12.1.6.3 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 SFMTA review and approval prior to the commencement of building the first Coach of this Contract.

12.1.6.4 First Article Inspection

The first article Coach shall undergo a detailed inspection by 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.

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 Buses.

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.

As necessary and 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 Contractor shall provide a workspace for the Resident Inspector(s) in proximity to the final assembly area. This space shall be equipped with desks, chairs, and other equipment sufficient to accommodate the Resident Inspector 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.

12.2 TEST REQUIREMENTS

This Section defines and establishes the requirements for comprehensive testing of the prototype and production buses. Criteria for evaluating Coaches in the pre-delivery and post-delivery tests will be uniform. No changes to the Bus specifications will be made after Acceptance aside from those arising from mutually agreed-upon change orders.

The prototype bus shall conform to the requirements of Section 12.2.1 (Prototype Bus Test Requirements), Section 12.2.2 (Pre-Delivery Tests), and Section 12.2.3 (Post-Delivery Tests).

Production buses shall conform to the requirements of Section 12.2.2 (Pre-Delivery Tests) and Section 12.2.3 (Post-Delivery Tests).

12.2.1 Prototype Bus Test Requirements

This Section defines and establishes the requirements for comprehensive testing of the prototype bus 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 (as per Attachment 7)
- Dimensional requirements (as per Section 1.2)
- Electronic noise control (as per Section 7.12)
- Audible noise control
- Contract compliance
- Braking
- Jerk rate
- Air compressor recovery rate

SFMTA may provide sample test plans for duty cycle and performance, audible noise control, braking, jerk rate, and air compressor testing. Contractor shall finalize their proposed testing plans and submit the plans to the SFMTA for approval.

Duty cycle and performance testing must be performed within the City and County of San Francisco after prototype bus delivery; all other tests may be performed at a suitable location of Contractor's choosing. While instrumented and loaded with ballast, the Coach shall be tested on the routes specified in Attachment 7 to verify that the performance requirements in these Specifications are being met.

Contract compliance will be determined in the configuration audit during the First Article Inspection of the prototype bus.

The Contractor shall manage the testing and reporting process. 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 SFMTA facilities at the conclusion of testing.

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.

12.2.2 Pre-Delivery Tests

The Contractor shall conduct pre-delivery 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 Bus 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.

12.2.2.1 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.

12.2.2.2 Water Tightness

Each Coach shall be tested as per Section 2.1.7 (Exclusion of Water).

12.2.2.3 Vehicle History Book

The Contractor shall produce a Vehicle History Book for each completed Bus. The Vehicle History Books shall be a specific record of production, testing, inspection, and relevant documentation for each individual Vehicle. The Vehicle History Book shall contain original documents unless specified otherwise. All documents shall be marked with the Bus serial number, the production sequence number, or the SFMTA Bus number for the completed vehicle.

The Contractor shall provide electronic Vehicle History Books for each Bus. A draft Vehicle History Book will be submitted to the SFMTA for review and approval 60 Days before the first Bus is scheduled to ship.

At a minimum, each Vehicle History Book shall contain the following:

- Table of contents
- Production control cross-reference sheet, listing:
 - Bus serial number
 - Shop order/production sequence number
 - Final SFMTA Bus number
- Production schedule for each Bus showing start and end dates for each major stage of manufacturing
- (Electronic copies only) All production drawings by number and revision status, including release date, current revision, and outstanding engineering change requests at time of production
- List of all serialized components
- Log of all non-conformances including status
- Test records and certificates
- Records of all required inspections
- Completed pre-shipment checklist
- Shipping authorization form

Each vehicle history book shall be presented to the SFMTA prior to the Bus being released from the Contractor's facility.

12.2.3 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 functional tests.

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 to bring the vehicle into compliance.

12.2.3.1 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.

12.2.3.2 Functional Test and Vehicle Burn-In

Prior to Acceptance, each Vehicle shall have a minimum of 500 driven miles. This mileage can be accumulated during the drive to SFMTA's acceptance facility, if approved by the SFMTA in advance.

If a Bus 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. 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 schedule 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.

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 SFMTA for review and approval.

Reference Section 13.1 (Preferred Delivery Schedule).

12.3.3.1.1 Baseline Schedule

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.
- All activities related to major subsystems for the prototype and production Coaches.

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 Progress Review Meetings

On a schedule mutually agreed upon by the City and the Contractor, meetings will be held to review the CPM schedule. The City, the Contractor, and, if necessary, the appropriate subcontractors shall attend the meetings.

During the meeting, the Contractor's schedule submission will be discussed and revised by the Contractor as necessary. The City 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. City 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 City, 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.

12.3.5 Scheduling of Work

The program shall at minimum be divided into the following:

- Pre-Production Meetings
- 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 City'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 Vehicle 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 Vehicle drawings, controls, and test plans.

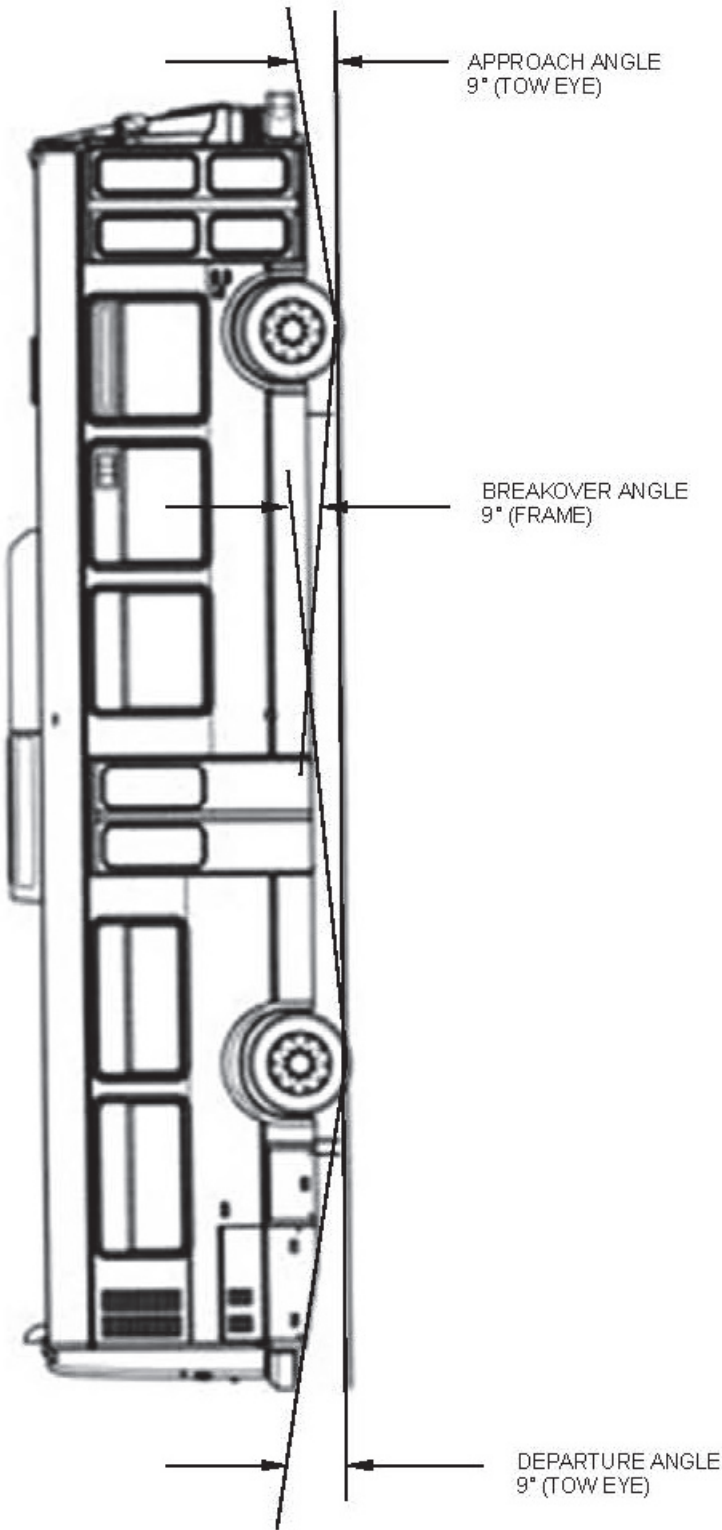
² Approval to deliver production Vehicles will not be granted until after submittal of a satisfactory training plan; draft operations, maintenance, and parts manuals; all computer software, manuals, current FSRP's, document and demonstrate their operation and after successful completion of all appropriate 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. OEMs are encouraged to provide a paint scheme to be approved by the SFMTA. The SFMTA reserves the right to utilize its own paint scheme.

The SFMTA's latest brand guide (PDF) will be provided to Contractor during the negotiation process.

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 coat system

	PPG Delta DBHS 2.7VOC or approved equal

Coach Exterior Color	Match approved paint scheme

Reference:	Section 2.2.6 (Finish and Color)

Coach Interior Color	Black N3472 (with flattener) for Operator area in front of Standee Line

Reference:	Section 2.3.4 (Front End)

FLOOR COVERING	Altro Transflor
Aisle floor*	Altro Transflor
Color:	TFFG2704F "Rocket",
Reference:	Section 2.4.3 (Floor Covering)

For Arctic, front and rear sections shall be as specified.

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 (2) inches wide
Color:	Yellow (colored throughout)
Reference:	Section 2.4.3 (Floor Covering)
Step Nosing	Altro Transflor Two (2) inches wide
Color:	Yellow (colored throughout)
Reference:	Section 2.5.1.1 (Step Treads)
Step Tread	Altro Transflor
Color:	TFFG2704F "Rocket",

Reference:	Section 2.5.1.1 (Step Treads)

Glazing

Passenger Windows	No less than 28 percent luminous transmittance.

Reference:	Section 3.1.3.2 (Materials)

Operator's Side –Window	76 percent luminous transmittance

Reference:	Section 4.4.2 (Side Window)

Door Glass	No less than 28 percent luminous transmittance

Reference:	Section 3.1.3.2 (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: Padded PT2C
Color:	Blue
Reference:	Section 3.7.4 (Construction and Materials)
Seat Shell Backs	Plastic
Reference:	Section 3.7.4 (Construction and Materials)
Seat Handhold	Plastic
Reference:	Section 3.7.2.1 (Transverse Seat)
Stanchions/Handholds	Stainless Steel with 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 3.1.3.2 (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.

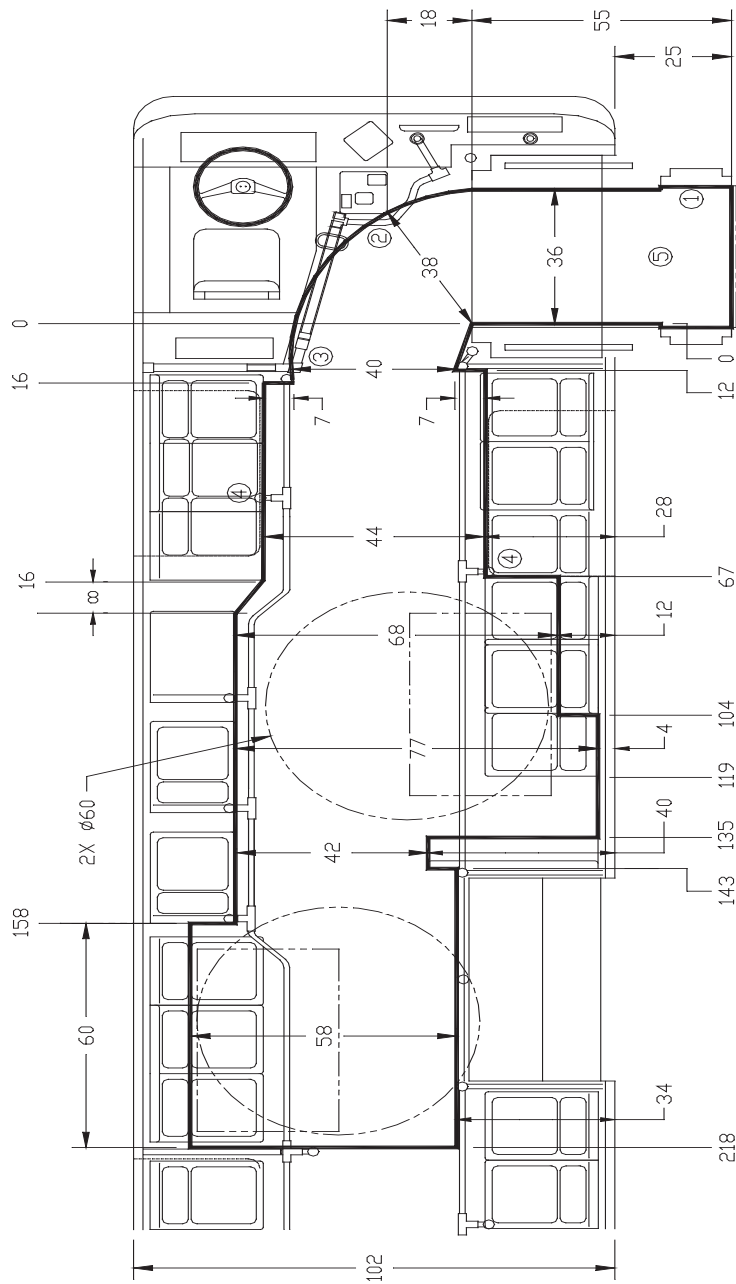
The limits for magnetic fields in the 1 Hz to 30 Hz (sub-RF) range have been set to limit the maximum induced current density within the human body to 10 mA/m² (rms). Other than the currently unresolved issue of risk of power frequency fields, there is no evidence of harmful effects from sub-RF magnetic fields that induce current densities in the body below 10 mA/m². 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/m². 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.

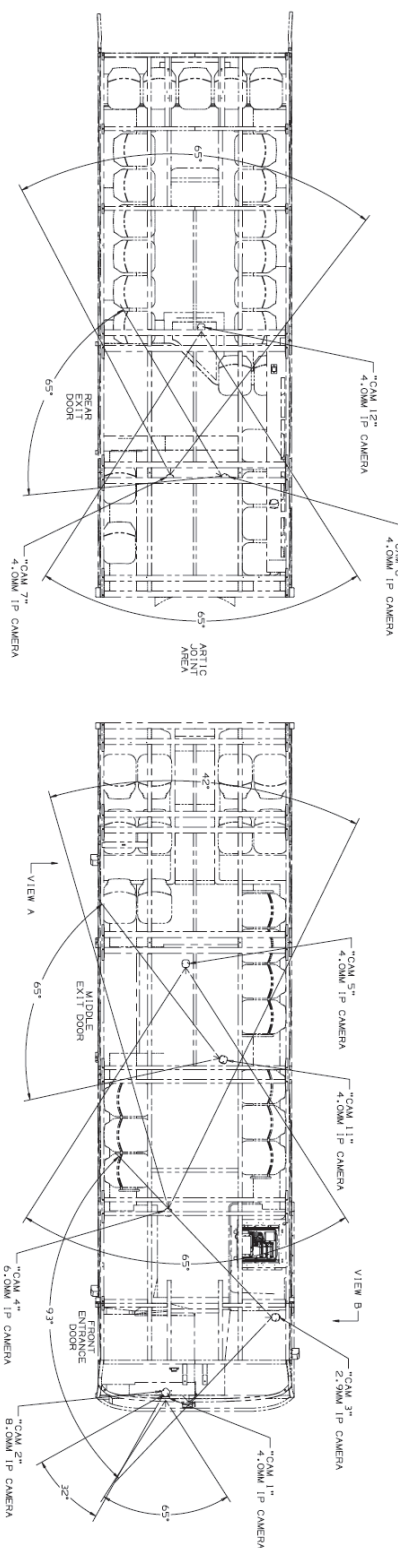
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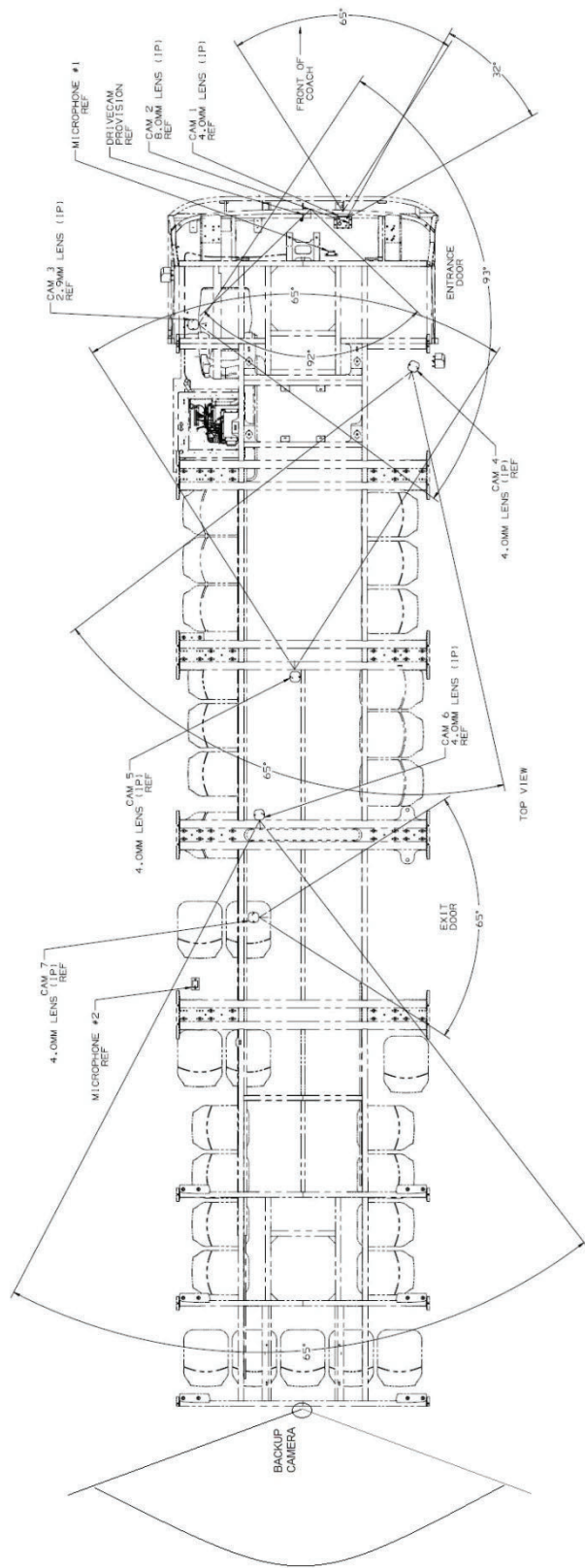


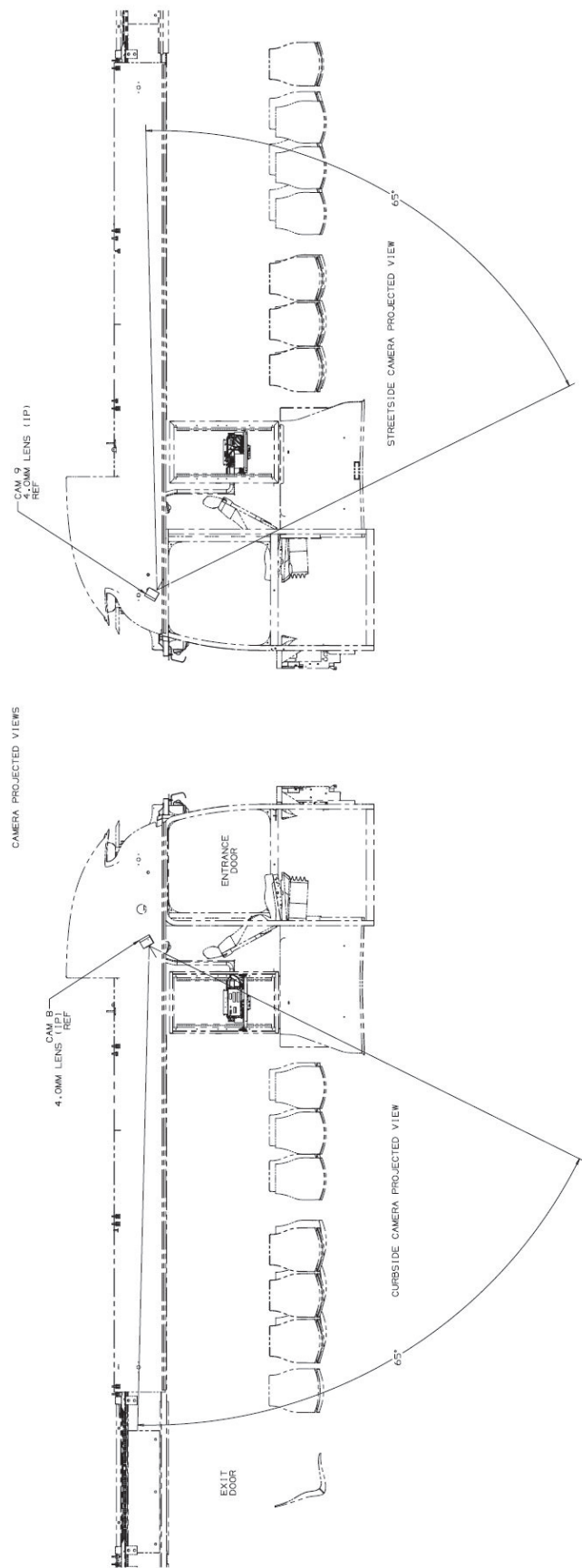
NOTES:

1. PLATFORM WIDTH INCREASED BY 1",
2. HAND RAIL CLEARANCE REDUCED BY 3" AT 35" ABOVE THE FLOOR,
3. DRIVER'S BARRIER BAR CLEARANCE REDUCED BY 4" AT 35" ABOVE THE FLOOR,
4. PASSENGER VERTICAL HAND RAIL CLEARANCE REDUCED BY 1",
5. FULLY DEPLOYED LIFT WITH 13" BARRIER EXTENDS 25" FROM SIDE OF BUS,
6. ALL DIMENSIONS ARE IN INCHES.

ATTACHMENT 6: CAMERA LAYOUT







ATTACHMENT 7: PERFORMANCE REQUIREMENTS

1. Speed, Acceleration, and Gradeability Requirements
2. Duty Cycle Requirements

**ATTACHMENT 7-1: SPEED, ACCELERATION, AND GRADEABILITY
REQUIREMENTS**

The pilot Bus shall be road tested and shall meet the following criteria with GVWR. Acceleration times begin when the accelerator pedal is depressed; lag time between depression of the accelerator pedal and movement of the Coach should be minimized. SFMTA will fully accept the pilot Bus only if all performance criteria (range, gradeability, charging times, etc.) outlined below are met. Any Buses that fail the below-mentioned performance criteria will be allowed no more than 90 days to rectify the failures or obtain a waiver for that requirement. Any Bus that fails to meet the criteria after the 90-day period or obtain a valid waiver from SFMTA will be eliminated from further testing and the OEM will be required to remove the bus and associated equipment from SFMTA's property as soon as possible.

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 & 28th Ave --	5% grade heading westbound for three blocks.
Jackson & Steiner --	10% grade heading westbound.
Castro & 24th Ave --	16% grade heading northbound.
	-- 18% grade.
	-- 20% grade.
Noe & 26th Ave --	23% grade heading southbound.

TABLE ATTACHMENT 7.1 – Speed Performance Criteria at GVWR

Grade	Speed Requirement 40-Foot	Speed Requirement 60-Foot	Speed Achieved	Pass/Fail
0% Grade	63 mph (max)	63 mph (max)		
2% Grade	55 mph	40 mph		
5% Grade	25 mph	20 mph		
10% Grade	15 mph	11 mph		
16% Grade	10 mph	8 mph		
18% Grade	>0 mph	5 mph		
20% Grade	Not Applicable	>0 mph		
23% Grade	Not Applicable	Not Applicable		

TABLE 7.2 – Acceleration Performance Criteria at GVWR

Grade	Acceleration Requirement (40-Foot)	Acceleration Requirement (60-Foot)	Time Achieved	Pass/Fail
0% Grade	0-10 mph in 5 seconds	0-10 mph in 7 seconds		
0% Grade	0-20 mph in 10 seconds	0-20 mph in 10 seconds		
0% Grade	0-40 mph in 26 seconds	0-40 mph in 35 seconds		
2% Grade	0-15 mph in 8 seconds	0-15 mph in 9 seconds		
5% Grade	0-18 mph in 10 seconds	0-18 mph in 12 seconds		
10% Grade	0-14 mph in 10 seconds	0-14 mph in 12 seconds		
16% Grade	0-10 mph in 12 seconds	0-10 mph in 12 seconds		

TABLE 7.3 – Other Requirements

Requirement	Pass/Fail
Does the bus charge from 10% SOC to 100% SOC in less than 4 hours?	
Does the bus accept charge at a minimum rate of 150kW via single port plug-in charging?	
Is the bus compatible with the ChargePoint Express Plus DC charging station?	
Is the bus compatible with ViriCiti onboard vehicle diagnostic hardware and software?	

ATTACHMENT 7-2: DUTY CYCLE REQUIREMENTS

Coaches shall be designed to be compatible with the terrain and environment found in SFMTA's service area. Also, Coaches shall be capable of running continuously with GVWR in the environmental conditions found in SFMTA's service area. These conditions include high humidity, rain, and occasional temperature extremes.

The operating range of the coach operating on all the routes specified in Table F.4 below shall be at least 160 miles on a full charge at any point during the 12-year useful life of the vehicle, with all accessories on, regardless of seasonal loads and driver efficiency.

Coaches 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. They shall operate in stop and go downtown traffic with no adverse effects. Coaches shall also be able to safely and efficiently negotiate the hilly conditions found in the City and County of San Francisco. 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 25°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 shall be approved by SFMTA.

The following composite routes are typical routes the Coach will take in normal revenue service. These include freeway and arterial travel.

TABLE 7.4 – Duty Cycle Requirements

Service Route to be Tested for 160 Mile Range at GVWR	Range Achieved	Pass/Fail
Route 29 Sunset		
Route 22 Fillmore		
Route 43 Masonic		
Route 9 San Bruno		
Route 1 California		
[RESERVED]		
Route 44 O'Shaughnessy		

TABLE 7.5 – Clearance Requirements

Location to be Tested	Pass/Fail
Travel on 30th and Mission, 30th, right on Noe, left on 26th, right on Castro, Divisadero to Geary (both directions) without chassis scraping	
Operate around left turn from Clayton onto Market and right turn from Market onto Clayton	
Travel on De Haro from Mariposa to 23rd St without chassis scraping (Note: this is a 21% grade)	
Travel on 23rd St from Indiana to Pennsylvania in both directions without contacting road with chassis. This determines straight-on approach, break over, and departure clearances.	
Travel on Mansell St at San Bruno to determine if bus meets departure angle clearance.	
Travel on Rhode Island and turn southbound onto 26th without contacting road with chassis. This determines front-left side chassis clearance through left hand turn.	
Travel on 2nd St and turn westbound onto Folsom without contacting road with chassis. This determines rear-right side chassis clearance through right hand turn.	

ATTACHMENT 8: SUGGESTED BILL OF MATERIALS

CUSTOMER INFORMATION SYSTEM (3.12)

Vendor Part Number	Description	Quantity
RESERVED	RESERVED	RESERVED

DIGITAL VIDEO RECORDING AND SURVEILLANCE CAMERA SYSTEM (3.15) Vendor Part Number	Description	40'/60'
CBL-HAR-NFSFM-60-MDR6-1	ASSY-CABLES,CAMERA SYSTEM	40' & 60'
RCM-MDR-6-M12	DVR-MDR6,2TB	40' & 60'
RCM-RS232-DVR-IVU	RS232 GPS cable	40' & 60'
NSW0812	POE SWITCH	40' & 60'
RCM-ADI2000.BCA	MODULE-EVENT SWITCH	40' & 60'
RCM-IP-SW1U	ETHERNET RELAY	40' & 60'
RCM-DC-UPS-1212-12A	UPS MODULE	40' & 60'
RCM-FB-PWR-CBL	FUSE BLOCK W/ PIGTAILS	40' & 60'
RCM-CBL-NF-SF-DVR-PWR	CABLE-DVR PWR/IGN INTERFACE	40' & 60'
RCM-CABLEDVR4B	CABLE-ETHERNET,CAT6E,18",BLUE 15 FT	40' & 60'
RCM-CABLEDVR4RG	CABLE-ETHERNET,CAT6E,18",90DEG,GREY 15 FT	40' & 60'
RCM-XNV6012-FF 2.4MM	CAMERA-IP,2.8MM (CAM #1), W/ AUDIO	40' & 60'
RCM-XNV6012-TOLE 8.0MM	CAMERA-IP,8.0MM (CAM #2), W/ AUDIO	40' & 60'
RCM-XNV6012-FD 2.4MM	CAMERA-IP,2.8MM (CAM #3), W/ AUDIO	40' & 60'
RCM-XNV6012-Aisle 2.4MM	CAMERA-IP,2.8MM (CAM #4), W/ AUDIO	40' & 60'
RCM-XNV6012-FS 2.4MM	CAMERA-IP,2.8MM (CAM #5), W/ AUDIO	40' & 60'
RCM-XNV6012-RS 2.4MM	CAMERA-IP,2.8MM (CAM #6), W/ AUDIO	40' & 60'
RCM-XNV6012-RD 2.4MM	CAMERA-IP,2.8MM (CAM #7), W/ AUDIO	40' & 60'
RCM-XNV6013-CS 2.8MM	CAMERA-IP,2.8MM (CAM #8), W/ AUDIO	40' & 60'
RCM-XNV6013-SS 2.8MM	CAMERA-IP,2.8MM (CAM #9), W/ AUDIO	40' & 60'
RCM-XNV6013-RV 2.8MM	CAMERA-IP,2.8MM (CAM #10), W/ AUDIO	40' & 60'
RCM-ANRDCAM	CAMERA-ANALOG,REAR DOOR	40' & 60'
RCM-ANSWCAM	CAMERA-ANALOG,STAIRWELL	60'
RCM-CMB-SF-FF-3S	BRACKET-FORWARD FACING CAMERA	40' & 60'
RCM-XNV6012-Aisle 2.4MM	CAMERA-IP,2.8MM (CAM #11), W/ AUDIO	60'
RCM-XNV6012-MS 2.4MM	CAMERA-IP,2.8MM (CAM #12), W/ AUDIO	60'
RCM-XNV6012-SW 2.4MM	CAMERA-IP,2.8MM (CAM #13), W/ AUDIO	60'
RCM-XNV6013-CSR 2.8MM	CAMERA-IP,2.8MM (CAM #14), W/ AUDIO	60'
IBR1700	Cradlepoint Router	40' & 60'
LG-IN2447	5G '11-1' antenna	40' & 60'

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	Quantity
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

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Item No.	Section	SFMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
1	1.11	The SFMTA will fully accept the Bus only if all major performance criteria, including those outlined in Sections 1.3, 1.4, and 1.5, are met. Any Buses 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 Bus 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 Bus and associated equipment from the SFMTA's property as soon as possible.	GILLIG requests that language be amended to "The SFMTA will accept the Bus only if all major performance criteria are met. Additionally, GILLIG and the Agency will work jointly to establish major performance criteria. To support the development of major performance criteria, GILLIG will provide a test vehicle, driver, and technical assistance to the Agency for up to two (2) days.	Approved
2	1.11	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.	Should GILLIG be the successful bidder, GILLIG reserves the right to work with the Agency on any/all change orders required by the Agency. As the bus manufacturer, we have no control over the Agency's decisions, and as a result, it is impossible to predict the cost impact in the bid process. GILLIG seeks concurrence.	Approved
3	1.11	The prototype Bus shall be brought up to the final production Bus configuration in all respects at no additional cost to the SFMTA, except as may be agreed by change orders.	Should GILLIG be the successful bidder, GILLIG reserves the right to work with the Agency on any/all pilot bus modifications required by the Agency. As the bus manufacturer, we have no control over the Agency's decisions, and as a result, it is impossible to predict the cost impact in the bid process. GILLIG seeks concurrence.	Approved
4	1.16.2	Contractor shall identify during design review those 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.	GILLIG requires additional information in order to properly include these requirements in the build &/or commit to the Agency. For example, manufacturer, model numbers, quantities defined, and an overall better understanding of the Agency's requirements. As a result, GILLIG requests approval to price these requirements separately or have further discussion at the preproduction meeting should we be the successful bidder.	Approved

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Item No.	Section	SFMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
5	1.17	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 Vehicle (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.	GILLIG wishes to advise the Agency, the low voltage batteries on the GILLIG Low Floor coach are located in the front of the bus, under the driver's floor area, rather than in the engine compartment, therefore a separate standalone system is required. With this in mind, if the Agency requires the house batteries to be monitored and protected by a fire suppression system, our proposal will include Amerex's V-13 system. This proposed system includes the following: (1) 280°F Spot Sensor (1) Battery Compartment Nozzle (1) 13lbs. ABC Dry Chemical Bottle Amerex's V-13 system is equivalent to their 2V system, with the main difference being the suppression agent. As mentioned in a previous deviation, Amerex's AVT agent is not offered at this time due to 120°F temperature limitations of the bottle. GILLIG does not deem the 120°F rating to be suitable for an automotive environment, especially where on this particular request for a front suppression system the bottle would be mounted in the interior compartment which would present concerns if the bus were to be parked in the sun on a hot day. Amerex have advised to use ABC agent in place of AVT where such concerns exist. They have also made us aware that they are working on providing an AVT option with a higher temperature rating for the bottle; however, that timeline has yet to be determined. GILLIG requests concurrence.	Approved
6	1.17	Contractor shall ensure, as much as is practical, that Aall materials used in the construction of the pPassenger cCompartment of the Coach Bus shall be are in accordance with the Recommended Fire Safety Practices defined in the latest version of FIA 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. Contractor shall provide a list of Docket 90-compliant components utilized in the passenger compartment of the Bus for SFMTA approval.	GILLIG wishes to inform the Agency that the GILLIG Low Floor Bus is fully compliant with all applicable Federal Motor Vehicle Safety Standards (FMVSS), including FMVSS 302, which is recognized as the current industry standard for vehicle safety. We note that your specifications reference compliance with Docket 90-A in several sections. As a point of clarification, Docket 90-A was issued by the Federal Transit Administration on October 20, 1993, and establishes "RECOMMENDED Fire Safety Practices for Transit Bus and Van Materials." GILLIG seeks confirmation that while we will make every effort to comply with Docket 90-A, there may be instances where full compliance is not feasible. In such cases, should we be the successful bidder, we are committed to collaborating with the Agency to address any areas where compliance cannot be fully achieved. GILLIG requests concurrence.	Approved
7	2.1.6	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 1/2-inch-deep on each side. The "turned-down" flange can be of welded, bent or cast construction.	GILLIG requests approval to provide jacking points located on the front and rear axles, rather than jack plates. This is the standard offering from Meritor and will permit easy and safe jacking with the flat tire or dual set on a 6 in. high run-up block not wider than a single tire.	Approved

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Item No.	Section	SFMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
8	2.1.6	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.	GILLIG requests approval to provide jacking points located on the front and rear axles, rather than jacking pads for each tire/wheel location. This is standard on all GILLIG coaches and there are no other options available at this time.	Approved
9	2.2.6	Bus exterior shall be painted or wrapped with decals (colors and paint specifications are given in Section 8: MATERIALS AND OVERALL WORK QUALITY). SFMTA and Proposer 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 SFMTA approval; this treatment includes Axalta 8430S Clearcoat or approved equals.	GILLIG wishes to advise the agency that roof fairings may only be painted one (1) color and that additional colors are only available with the application of decals. GILLIG seeks the Agency's concurrence.	Approved - SFMTA and Gillig to finalize paint scheme during preproduction meeting.
10	2.2.6	The bus shall be painted prior to installation of exterior lights, windows, mirrors, and other items that are applied to the exterior of the bus.	GILLIG preinstalls the front and rear exterior marker lamps prior to the front and rear cap being installed and painted. GILLIG proposes to paint the exterior bus with the front and rear marker lights installed. This is the GILLIG standard.	Approved
11	2.2.6	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	GILLIG request approval to provide our standard paint procedures and techniques. Please see attached.	Approved
12	2.2.9	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.	GILLIG wishes to advise the Agency, our windshield wiper motors are serviceable as a complete unit, not individual components. GILLIG seeks concurrence.	Approved
13	2.2.10	SFMTA prefers Contractor shall provide conventional doors with stainless steel piano hinges for access to the rear service compartment and all auxiliary equipment compartments or shall provide alternative designs for SFMTA approval.	GILLIG requests approval to provide exterior access doors with aluminum hinges in lieu of the stainless-steel hinges specified. Aluminum hinges are standard on the GILLIG Low Floor coach and inherent in our vehicles design. GILLIG request concurrence.	Approved

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Item No.	Section	SFMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
14.2.2.10.2		Traction motor coolant shall be checked and added through a paddle door located on the roadside of the Bus. The location of these fluid access points shall be approved by the SFMTA.	GILLIG wishes to advise the Agency, the surge tank and fill location for the traction motor coolant is located on the roadside and is accessed through a hinged door secured by two 1/4 turn latches. A square key is required to open. A smaller tool free access door is not available. The intent of not including a small access door is to ensure only authorized personnel have access to filling the systems. This ensures the correct coolant is used and the coolant fill cap is not removed while the system is hot. The battery electric bus uses two types of coolants, one for the powertrain electronics (including the traction motor and the passenger heating system) and the second (low conductivity coolant) for the high-voltage batteries. The fill location for both the powertrain electronics and the passenger heating system is on the roadside, and the battery coolant fill is on the curb side. GILLIG seeks concurrence of our standard coolant fill.	Approved
15.2.4.1		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.	GILLIG requests approval to provide a front & rear step height from the ground of 15.3".	Approved
16.2.4.1		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.	GILLIG wishes to advise the Agency, our vehicles door system is tied to the speed switch. The front door interlock will not disengage unless the vehicle comes to a complete stop or speeds below 3MPH.	Approved
17.3.1.1.2		The SFMTA prefers that passenger windows and door windows have no less than 28 percent luminous transmittance and have a solar heat gain coefficient of no greater than 40 percent;	GILLIG has reviewed this requirement and recommends a standard product offering from our passenger window supplier that will provide the following: 50% light transmittance 48% solar energy transmittance GILLIG requests the Agency's acceptance.	Approved. Will use Quick Ship system proposed by Gillig.
18.3.1.1		Contractor shall provide dimensions, specifications, and drawings for all windows.	GILLIG requests approval to delete the requirement to supply drawings for each of the bus windows. GILLIG will provide our standard parts and service manuals. These manuals include part numbers, pictures and illustrations.	Approved
19.3.1.1.1		The upper portion over the side destination sign 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.	GILLIG wishes to advise the Agency, all full-size passenger windows are equipped with a upper transoms (tip-in) as specified besides the small window opposite of the exit door. Due to the physical size of this window, a upper transom is precluded by design.	Approved
			The proposed window configuration is FMVSS 217 compliant and is also standard on the GILLIG Low Floor coach.	

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Item No.	Section	SFMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
20	3.1.1.4	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. 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 Bus.	GILLIG advises that all full size passenger windows are equipped with the emergency egress feature specified besides the small window opposite of the exit door. GILLIG also advises that a non-egress type window will be provided for the last window on each side of the coach. This is due to the proximity of the window bottom to the floor in the rear settee area on the Low Floor bus. The proposed window configuration is FMVSS 217 compliant and is also standard on the GILLIG Low Floor coach.	Approved
21	3.1.1.4	The upper window mounting hinge shall be stainless steel.	GILLIG requests approval to provide aluminum window frames rather than stainless steel. Both window suppliers GILLIG uses have advised GILLIG that stainless steel frames are not an available option on their product line.	Approved
22	3.2.2	Door openings shall be no less than 74 inches high. The front door free clear opening shall be able to accommodate a 32-inch wheelchair ramp at minimum.	GILLIG wishes to advise the Agency, the front door on our vehicle has been designed to utilize a nominal 30" wide wheelchair ramp. At this time, a 32" ramp is not an available option. The proposed wheelchair ramp meets ADA requirements and is currently being used on GILLIG buses throughout the country, in a variety of environments, with much success. GILLIG seeks concurrence.	Approved
23	3.2.3	The front doors shall be glazed as a one-piece panel at full length.	GILLIG requests approval to provide a front door with split glazing. In essence, the door is fully glazed in the upper and lower sections of each leaf. This is the only door/glazing configuration available from GILLIG at this time.	Approved
24	3.3.1.1	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.	GILLIG request approval to provide lower front and rear door area lights so that the entire door step and a portion of the ground area is sufficiently illuminated. The front and rear door lights will be activated when the doors are open and off when doors are closed.	Approved

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Item No.	Section	SFMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
25	3.3.2	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.	GILLIG wishes to advise the Agency that the interior lights on our vehicles do not automatically activate when the ignition switch is in the day-run position; they only do so in the night-run position. However, there is a three-position toggle switch (All-Off-Rear) located on the dashboard, allowing the driver to manually override the programming and turn on the lights as needed. GILLIG seeks the Agency's concurrence with our standard programming.	Approved
26	3.9	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.	GILLIG wishes to inform the Agency that the stanchions in our vehicles are only pinned or bolted at one end, not both. This design provides flexibility for the stanchions to move within the cup mounted on the passenger seats as the bus articulates. Additionally, the passenger seat model specified by the Agency includes hard, durable plastic cup mounting hardware rather than stainless steel. GILLIG seeks concurrence.	Approved
27	3.10	Contractor shall provide and install on each Bus an automatic electronic sign system by Luminator or approved equal. Front - 24x200 - Spectrum - 511305-001 Curbside - 8x96 - Amber - 511288-A0x Streetside - 8x96 - Amber - 511288-A0x Rear w/camera- 16x48 - Amber - 511291-A01 Dash - 12x40 - amber - 511240-A01 Operator Area - MCU Controller - 510632-C44	It has been brought to GILLIG's attention by Luminator, destination Sign part numbers may vary from the table shown in section 3.10 due to specific car builder interface and brackets. GILLIG & Luminator seek concurrence.	Approved
28	3.10.3	The curbside destination sign shall be amber display and shall feature 14 rows by 96 columns of LEDs. The display must be easily read from the sidewalk level.	It has been brought to GILLIG's attention by Luminator, the curb side destination sign on your current fleet is 8 rows x 96 columns. Luminator & GILLIG request concurrence to provide signs that match your current fleet.	Approved
29	3.10.4	The street side destination sign shall be amber display and shall feature 14 rows by 96 columns of LEDs.	It has been brought to GILLIG's attention by Luminator, the street side destination sign on your current fleet is 8 rows x 96 columns. Luminator & GILLIG request concurrence to provide signs that match your current fleet.	Approved

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Item No.	Section	SFMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
303.10.5		The rear destination sign shall be amber color display and shall feature 14 rows by 48 columns of LEDs. The rear destination sign shall include an integrated backup camera, which will display a view on the driver's integrated dash display with a latency of 100 milliseconds or less. The rear designation sign will also integrate with the Kratos DVR for the purposes of recording video.	GILLIG wishes to advise the Agency, the Luminator camera does not intergrate into Kratos DVR. Kratos supplies their own camera. GILLIG seeks concurrence.	Approved
313.13.2		The Contractor shall also install an independent analog passenger stop request display located on the front sign compartment door which functions simultaneously with the electronic sign when a stop is requested by passengers.	GILLIG requests clarification regarding the Agency's requirement for two interior stop request signs. In our past experience with Conduent, they have typically managed alerts and the stop request function with a single sign. Please advise for budgetary purposes.	Approved
323.14		Interior speaker grills shall be metallic material and shall be secured by tamper-proof screws or rivets.	GILLIG requests approval to provide an interior lighting system manufactured by I/O Controls. This system includes speaker grilles made from premium ABS plastic, color-matched to the cream-colored overhead lighting specified in this section. The grilles are securely installed using tamper-proof hardware. The I/O Controls lighting system is a standard offering on the GILLIG coach, having been successfully implemented on thousands of vehicles throughout the industry.	Approved

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Item No.	Section	SFMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
333.15		The Contractor shall provide equipment and installation for a digital video recording and surveillance system (DVRs) by Kratos or approved equal and shall demonstrate successful operation of the system on each Vehicle. The DVRs system shall provide full coverage of the interior and exterior of the Vehicle 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 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 vehicle power. The system must be able to withstand all transients, surges, and dips in power from the Buses electrical system without any deterioration of system performance. The system shall not be affected by electro-magnetic interference (EMI) or radio frequency interference (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 Vehicle 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.	GILLIG LLC, Approved Equal GILLIG wishes to advise the Agency that TOLE products have not previously been installed on GILLIG vehicles. The functionality and performance of TOLE products installed on the Bus is the responsibility of RCM Security and will not affect the Agency's acceptance of Bus, unless agreed upon by both parties. GILLIG seeks the Agency's approval.	Approved

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<u>Item No.</u>	<u>Section</u>	<u>SFMTA Spec</u>	<u>GILLIG LLC, Approved Equal</u>	<u>Resolution Between Gillig & SFMTA</u>
34	3.15.5	The wireless system on the Bus shall be a CradlePoint wireless router or approved equal.	GILLIG requests more information on the CradlePoint router model required by the Agency. Please provide the required model number.	SFMTA reviewed and approved Gillig's proposed bill of materials from Conduent.

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<u>Item No.</u>	<u>Section</u>	<u>SFMTA Spec</u>	<u>GILLIG LLC, Approved Equal</u>	<u>Resolution Between Gillig & SFMTA</u>
353.16		The Contractor shall install provisions for a continuous battery powered Lytx DriveCam system on all Vehicles. The SFMTA shall provide all required hardware and harnesses. 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 SFMTA. The task of the final commissioning onsite at the SFMTA shall be included in the Contract price.	GILLIG wishes to advise the Agency that Lytx products have not previously been installed on GILLIG vehicles. Based on information provided by Lytx in an email dated 09/18/2024, a hardware and wiring/cable kit may be available from Lytx. GILLIG will work in good faith with the Agency to review information made available by Lytx to the Agency and GILLIG, and to evaluate the feasibility of expanding GILLIG's scope of work to include pre-wire provisions. Additionally the functionality and performance of Lytx products installed on the Bus will not affect the Agency's acceptance of Bus, unless agreed upon by both parties. GILLIG seeks the agency's approval.	Approved

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<u>Item No.</u>	<u>Section</u>	<u>SFMTA Spec</u>	<u>GILLIG LLC, Approved Equal</u>	<u>Resolution Between Gillig & SFMTA</u>
36	3.18.1	A power-disconnect switch shall be provided inside the fare box for maintenance purposes.	GILLIG requests more information on this requirement: Is this requirement something provided by Genfare (GFI)? Please advise.	Incorporated into the farebox. No action by Gillig needed.
37	3.18.1	A 10-amp maximum, 24-volt, direct current protected circuit shall be used to power the fare box.	GILLIG wishes to advise the Agency that the typical configuration for fareboxes requires 15-amp power supply. GILLIG acknowledges that the Agency will provide and install GFI Odyssey Plus fareboxes which use a 10-amp power supply. Per the Agency's requirements, GILLIG will provide a 10-amp power supply. GILLIG seeks the Agency's concurrence that the 10-amp power supply is not typical and that the functionality and performance of the Farebox will not affect the Agency's acceptance of Bus, unless agreed upon by both parties.	Approved

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Item No.	Section	SFMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
38	3.18	Provisions for a Genfare Odyssey fare box, including a mounting plate and wiring for power and J1708 connectivity, 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 thereThe location shall provide 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 asand 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. .	GILLIG seeks clarity from the Agency regarding its farebox requirements. GILLIG's standard provision, when the Agency installs its own farebox after delivery, includes a stainless-steel pedestal (pre-drilled with weld nuts) and 24V wiring with 15-amp protection colled beneath the pedestal. Please confirm these provisions meets the Agency's requirements.	Approved
39	3.19	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 CID(s) 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.	GILLIG reached out to Cubic to review the Agency's RFP/specs, and Cubic has identified several concerns, areas needing clarification, and points requiring concurrence. Below is Cubic's response: "The solution we provide is specified by MTC (a regional agency), not SFMTA. If any adaptations are needed for Clipper materials to be used on a given bus, it would be the responsibility of SFMTA and their vendors to address them. We do not sell equipment directly to vehicle providers. MTC, on behalf of the agencies, handles procurement of inventory. We can provide a quote for a wiring harness, but not for the equipment. To provide this quote, we need to know how many devices will be installed on each vehicle. Please provide guidance and concurrence. " GILLIG wishes to advise the agency that, based on the limitations imposed by the third-party provider of the Clipper system, GILLIG's scope will be limited to providing 12v/24v power and mounting provisions for hardware. Additionally, the functionality and performance of the Clipper system will not affect the Agency's acceptance of Bus, unless agreed upon by both parties.	Approved

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Item No.	Section	SFMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
403.20.4		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 Bus/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 Buses reside. The system shall possess self-diagnostic capability.	GILLIG wishes to advise the Agency, Conduent has provided a quote that includes APC sensors. Their BOM and scope of work are attached for the Agency's review. GILLIG seeks concurrence this BOM and scope of work meets the Agency's requirements.	Approved
413.25		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.	As we thoroughly assess the requirements for backup power supply in our coaches, we wish to provide clarification on our current approach. Currently, GILLIG has not independently designed a single backup power supply for our coaches. In instances where applicable, we rely on our subcontractor vendors to manage their respective backup power supplies, which operate independently of our main low voltage batteries. After careful review, GILLIG will propose RCM battery backups to meet this requirement. RCM will provide battery backup hardware and GILLIG will provide integration with the CradlePoint Router, DVR, and Radio. GILLIG seeks the Agency's approval.	Approved
424.1.2		The speedometer shall be approved by the SFMTA and shall meet size and accuracy requirements found in either SAE J678 or J1226.	GILLIG wishes to advise the Agency, neither of these standards are applied to our vehicle, as they are older standards and do not apply to the current system. GILLIG applies CFR 393.82, as this defines the required accuracy of +/- 5mph at 50 mph. Furthermore, GILLIG's current system also uses a transmission/motor speed signal from the drive system to the propulsion SCM with rear axle ratio and tire size being an input made during vehicle build. These signals are provided to the System Control Module (SCM) provides the vehicle speed output which is displayed on the dash. GILLIG seeks concurrence.	Approved
434.1.2		FIGURE 4-2 OPERATOR SWITCHES AND CONTROLS Parking brake control (also acts as direction control neutral actuator)	GILLIG does not currently offer this functionality and requests removal of the requirement.	Approved

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Item No.	Section	SEMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
44	4.1.2	FIGURE 4-2 OPERATOR SWITCHES AND CONTROLS Turn signal disable switches (right and left)	To meet this requirement, GILLIG proposes installation of a switches inside of the Electronics Cabinet located aft of the Driver's area. The switches will enable/disable the exterior audible function of the turn signal system. GILLIG seeks the Agency's approval.	Approved
45	4.1.2	Foot-controlled headlight dimmer switch Fire suppression system manual activation switch Temporary interior lighting switch ("sweeper switch") Turn signal disable switches (right and left) Event marker button High beam switch	GILLIG wishes to advise the Agency, our vehicles high-beam switch is mounted on the driver's platform floor in an elevated toe switch bracket. It is an on/off latching switch and does not include a dimmer feature.	Approved
46	4.1.2	FIGURE 4-2 OPERATOR SWITCHES AND CONTROLS Interlock override switch (see Section 4.1.4.3)	GILLIG requests approval to provide the interlock switch mounted in the electrical control panel compartment, above the driver's head, rather than as specified.	Approved
47	4.1.3	Diagnostic indicators are listed in Figure 4-3 (Onboard Diagnostic Indicators). Space shall be provided on the panel for future additions of no less than five indicators.	GILLIG will make every attempt to maximize the number of spare indicators; however, due to the unique design of each coach, and the variety of option content, a fixed value is not something we can commit to. Should the Agency have a defined list of components they require provisions for, GILLIG and the Agency can evaluate such list at the pre-production meeting, should we be the successful bidder. GILLIG seeks concurrence.	Approved
48	4.1.3	VISIBLE INDICATOR: Mobility aid passenger exit signal AUDIBLE ALARM: No FUNCTION: Mobility aid passengers want to get off	GILLIG wishes to advise the Agency that our vehicles are designed with a touchpad mounted under the ADA sidewall-mounted flip-up seats. When activated, this touchpad illuminates a light on the dash and triggers a double chime in the driver's compartment. Both features are standard on a GILLIG bus and fully comply with ADA requirements.	Approved

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Item No.	Section	SFMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
49	4.1.4	The 5-position master door switch shall also activate the hazard light whenever the switch is not in the "centered" position. In the case of the push button control, the hazard light shall be activated whenever the front or rear doors are opened or enabled.	After careful review, GILLIG wishes to propose alternative functionality for this requirement: 1. If the door handle at open position (Front or Rear). 2. If the engine running. 3. When both condition #1 and #2 are true, the hazard light will be activated at flashing rate of 0.4 SEC On/Off. This is same as turn signal rate.	Approved
50	4.1.5	The steering column shall be capable of a minimum six inch horizontal adjustment and a two-inch vertical adjustment from the operator seat.	GILLIG requests approval to provide a steering column with a telescopic range of 1.88" and a minimum low-end adjustment of 31.61", measured from the top of the steering wheel rim in the horizontal position to the cab floor at the heel point.	Approved
51	4.1.5	The steering wheel shall be Vehicle Improvement Products BK8L1824D4SS, BK8L2D24DAV, V410S-42W, or approved equal and the horn assembly shall be a Vehicle Improvement Products HB9T, HB10NB3, V4P-001PRO2, or approved equal.	GILLIG wishes to advise the Agency, our standard vehicle design includes the following components: Wheel: B88L2034D4V Horn: HB10T Both components are manufactured by IMMIP®/VIP. GILLIG seeks concurrence.	Approved
52	4.1.9	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, a suitable model from ECCO, or approved equal, shall be located on the exterior of the Bus in an optimal audible location, and shall sound whenever the turn signal is activated.	GILLIG requests approval to provide an external audible curbside turn signal alarm manufactured by Floyd Bell. Floyd Bell horns/alarms are industry accepted and have been used in multiple transit applications for many years with proven success.	Approved
53	4.1.10	Contractor shall install a silent alarm switch (OTTO Engineering part number P4-614122 or approved equal).	GILLIG requests approval to provide a crime alarm switch manufactured by OTTO Engineering, part# P3-90081. This is the standard crime alarm switch used on GILLIG coaches.	Approved

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Item No.	Section	SEMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
54.4.2.1		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.	GILLIG requests approval to provide a driver's seat with a 9.45" maximum usable fore/aft slide travel rather than the slide travel specified. Due to the design constraints of the GILLIG Low Floor bus, the longer slide is not available. Additionally, the proposed configuration is compliant with the Agency's spec on page 91.	Approved
55.4.2.2		All bare metal on the operator seat, including the pedestal, shall be aluminum or stainless steel.	It has been brought to GILLIG's attention by USSC that their operator's seat frame is black painted carbon steel, not stainless steel. At this time, a stainless-steel pedestal is not an available option. GILLIG and USSC request concurrence of their standard design.	Approved
56.4.4.2		The operator's side-window shall consist of 1/4 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.	After careful review, GILLIG wishes to propose an operator's side-window that uses the same glass specifications as provided for the passenger window glass.	Approved
57.4.4.2		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.	AROW has brought to our attention, the specification calls for the driver window to be gray laminated with 76% plus light transmittance. Arow is not aware of a glass that meets this so they request approval to provide their standard green laminated glass with approximate 73% LT.	Approved
58.4.4.2		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.	GILLIG wishes to advise the Agency that the passenger window manufacturer has quoted green auto tint for the driver's window instead of grey. Green is the industry standard and currently the only available option. GILLIG requests your concurrence.	Approved
59.4.6		Contractor shall provide a Stealth Mic hands-free digital microphone system by Digital Recorders Inc. or approved equal for the public address system. Reference Section 3.14 (Public Address System).	GILLIG wishes to advise the Agency, the Digital Recorders Stealth Mic being requested has been discontinued from the manufacture. As a result, GILLIG requests approval to provide a boom style microphone manufactured by Soundview, rather than the microphone specified. The microphone can be controlled by a foot switch providing a "hands free" operation. Please see attached letter from Clever Devices.	Approved

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Item No.	Section	SFMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
60	4.10	Contractor shall provide an adjustable sun visor for use on the operator's front and side of the windshield. The front visor shall be a scissor type roller blind with 20 inches of travel. The side visor shall be a black padded visor which shall not obstruct the street side exterior mirror.	GILLIG requests approval to provide roller-style sunshades for both the driver's front windshield and side window. These sunshades are a standard feature on our coaches and offer the driver the flexibility to adjust them as needed. A padded visor is currently not available.	Approved
61	5.1.7	A warning light mounted near the curb side of the front door, a minimum 2.5 in. diameter amber lens, shall be provided that will blink when the kneel feature is activated.	GILLIG wishes to advise that the kneeling lamp is approximately 2" in diameter with a 4-second cycle time to facilitate boarding, as specified in this section.	Approved
62	5.2	Electro-hydraulic power steering shall be provided to reduce steering effort. The steering column shall have telescoping and tilt column adjustments.	GILLIG requests clarification on the Agency's steering column requirements. Our standard battery-electric vehicle is equipped with an electrically driven hydraulic pump, paired with a mechanical Douglas Autotech single-tilt steering column. GILLIG seeks confirmation that these components meet the Agency's specifications.	Approved
63	5.2.1	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.	GILLIG wishes to advise the Agency, the front suspension, steering system, and front axle used on the GILLIG battery-electric bus has been fully tested by GILLIG, the subcomponent suppliers and has received application /installation approval by all suppliers at a GAWR (up to 19,200 Lbs.). Testing includes internal (GILLIG), the subcomponent suppliers, third party durability testing, as well as Altoona. GILLIG can share the results of our Altoona Test upon request. GILLIG seeks concurrence.	Approved

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Item No.	Section	SFMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
645.3.8		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 vehicle 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 bus 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.	GILLIG wishes to advise the Agency, our vehicles brake interlock was not designed to hold a 23% grade. A 23% grade is above our vehicles interlock ability, and it is physically impossible to increase the pressure enough to meet this. Instead, our vehicle was designed around APTA TS.38, which requires the interlock to hold a 6% grade. GILLIG seeks concurrence.	Approved

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Item No.	Section	SFMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
65	5.3.9	Contractor shall provide a system for preventing the Bus 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 SFMTA during the design review period.	GILLIG wishes to advise the Agency, our battery-electric bus has two inherent features to assist with rollback, Vehicle Creep and Hill Hold Start Aid (HSA). Vehicle Creep is the intentional application of traction motor forward drive torque to slightly move the bus forward when both the throttle and the service brakes are fully released. On a level road, creep will provide a very slow-speed acceleration up to 4 mph (6 kph) in the forward direction. Creep is a standard feature of the GILLIG BEB, its characteristics are as follows: • Creep is applied when vehicle speed is below 4 mph (6 kph) and the throttle is released, and the service brakes are fully released and after regen has been disengaged. • As the grade increases, the amount of creep torque remains fixed, so the creep speed decreases as the grade increases until the torque required to climb the grade exceeds the creep torque, bringing the bus to a stop. If the grade force exceeds the creep torque, the bus can roll backwards which will require the driver to apply the service brakes to prevent rollback. - Creep torque assists in reducing rollback on a grade but is not a hill-holder feature; application of service brakes may be required to prevent rollback. - Creep does not provide any braking, so speed on a downgrade can exceed 4 mph (6 kph) Application of service brakes might be required to control coasting speed on a down grade. - Creep torque is turned off when the shifter is in the N (neutral) position. Driver Assist: Hill Hold Start Aid (HSA) is a short-duration rollback prevention feature. HSA prevents or reduces rollback on a grade after the driver releases the service brakes, but before the driver can apply the throttle and the motor develops torque to propel the bus. HSA is not an indefinite hill holder; it automatically disengages after a few seconds. HSA provides rollback prevention at brake release to give the driver time to apply throttle and allow the motor time to apply torque. There are two levels of the Hill Start Aid: • Level 1 is the primary system and used on flat to modest grades. The traction motor limits the bus from rolling backwards after the brake is released but before the driver can apply the throttle. - This feature detects if the bus starts to roll in the opposite direction of the selected gear. - Level 1 HSA is automatic and requires no action by the driver to apply and there is no switch to turn Level 1 HSA on or off. - There will be a very slight roll back, this is normal and triggers the Level 1 feature. - Depending upon the bus loading and the grade the performance can vary. • Level 2 is a driver-applied secondary system used on steep grades or with high loads. Level 2 requires the driver to anticipate the grade is too steep for Level 1 system to prevent roll back and that an additional brake application will be required. GILLIG requests approval to provide the following nylon tubing 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. This is the standard configuration on the GILLIG Low Floor coach.	Approved
66	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. BLUE - Indicates suspension	GILLIG requests approval to provide the following nylon tubing 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. This is the standard configuration on the GILLIG Low Floor coach.	Approved

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Item No.	Section	SFMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
67	5.5.4	A QBA series air dryer from Wabtec, Bendix or approved equal, shall meet the following salient characteristics: C.Twin tower desiccant style dryer capable of switching towers for regeneration.	GILLIG wishes to advise the Agency that our Battery Electric Bus air system has been designed and tested around a single Bendix AD-IP air dryer. The GILLIG BEB's air compressor is an oil-less scroll compressor (eliminating oil cover-over), provides 16.1 CFM to the air system and a single dryer has more than enough capacity to handle the demand. Although the AD-IP™ air dryer can be used in conjunction with larger compressors, it was designed primarily for units rated for up to 30 CFM. GILLIG request concurrence.	Approved
68	5.6.1	Flexible lines shall be minimized in quantity and length. 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.	GILLIG requests approval to provide hoses manufactured by Parker-Hannifin®. Parker-Hannifin® hoses are composed of polyester with wire braided reinforcement that utilize crimped and reusable fitting and have been tested and approved for the hydraulic system. The proposed hoses are currently being used on GILLIG buses throughout the country, in a variety of environments, with much success.	Approved
69	5.8.2	No valve stem tool will be permitted on the valve stem cap. Tires may come equipped with an external air pressure monitoring system.	GILLIG seeks clarity if the Agency requires a tire pressure monitoring system (TPMS). Please advise.	Approved. SFMTA does not require TPMS.
70	5.8.1	Wheels and rims shall be hub piloted and shall be aluminum one piece, Alcoa Dura-Brite or approved equal. All wheels shall be interchangeable except for the middle axle of an artic where a super single tire size is used and shall be removable without a puller; a design utilizing super single tires may be proposed to the SFMTA for approval.	GILLIG requests approval to provide front and rear wheels that have different offsets and different width dimensions. The front wheels are 9' (inches) in width and the rear wheels are 8.25' (inches) in width. The offsets are different due to the different widths of the front and rear tire. The front tire/wheel width is required for the increased load rating of the front axle needed with weight of the roof mounted batteries. This is inherent to the GILLIG Low Floor Plus Electric bus.	Approved

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Item No.	Section	SFMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
715.8.2		The Contractor shall provide Michelin XInCity Energy Z LR L-315/80R22 or 305/70R22.5 tires or an approved alternative.	GILLIG wishes to advise the Agency, Michelin's 315/80R22.5, X[®] INCTY Energy™ Z is approved for the front axle of our battery-electric bus; however, due to the vehicle weight rating, the only Michelin tire approved for the rear axle is 305/85R22.5, X[®] INCTY Grip D SL (J). This places an imbalance in interchangeability. GILLIG recommends the use of Goodyear tires on our battery-electric bus. The best combination is: Front: B315/80R22.5, G652 RTB™, Metro Miller™ (L) B315/80R22.5, Urban Max BSA™EV (L) Rear: B315/80R22.5, Intercity Cruiser® (J)	Approved
726.2		For the Bus propulsion system, Contractor shall provide a voltmeter for the 12-volt system, a voltmeter for the 24-volt system, and energy storage system main pressure and temperature gauges. Both drive and energy storage temperature gauges shall have a resettable maximum temperature indicator.	GILLIG seeks clarity on the requirement for the energy storage system main pressure. If the Agency means current high voltage indication, this is not currently provided but could be provided on the Forster gauge screen. GILLIG would also like to stress this high-voltage readout does not replace the need to use the test ports for HV lock-out tag procedures.	Approved. No gauge required.
736.8		An overflow reservoir is to be provided, unless otherwise approved by the SFMTA. The overflow reservoir is to provide extra capacity to the system. It will be sized to sufficiently replace any common air pockets that form in the system. An expansion tank shall be provided to eliminate air pockets.	GILLIG wishes to advise the Agency, our vehicles battery thermal management system (BTMS) includes a surge tank to allow expansion of the coolant. The surge tank also provides a fill point for the WEG coolant.	Approved
746.8		Unless otherwise approved by the SFMTA, any radiator used shall be of durable corrosion-resistant construction with bolted-on removable tanks, or welded header tanks.	GILLIG seeks concurrence of our standard BTMS tank configuration. GILLIG wishes to advise the Agency, the Modine system specified utilizes heavy duty, glass reinforced, nylon tanks that are crimped to the header ECP with a sealing gasket. This technology is inherent in Modine's design and is currently their only option. GILLIG requests concurrence of Modine's standard design.	Approved
757.7		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.	GILLIG wishes to advise the Agency, our battery-electric vehicle is partial compliant with Agency's requirement. GILLIG applies SAE J1128 on our low voltage electrical cables/harnesses. GILLIG meets and exceeds the Agency's requirement with the minimum 8 colors, as we use 14 different colors, and our wires/harnesses are labeled with circuit number and AWG size every 4". Furthermore, GILLIG makes every attempt to not repeat a wire color in a single harness, however, there may be an instance where it can't be avoided, due to the complexity of the harness or required connections. GILLIG seeks concurrence.	Approved

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Item No.	Section	SEMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
76	7.7	Any clamps used throughout the electrical system shall be stainless steel and shall be "dipped".	GILLIG requests approval to supply stainless-steel clamps with a red silicone rubber sleeved cushion, instead of the "dipped" version. These clamps are produced by Umpco, Inc. and comply with SAE specification AMS-3303. They are the standard clamps used on our coaches and currently the only available option.	Approved
77	7.7	Terminals shall be corrosion-resistant full ring type from Faston, or interlocking lugs with insulating ferrules where appropriate.	GILLIG wishes to advise the Agency, where full ring type terminals are used, they are made from corrosion resistant material and can be plated per the location and application. Faston (Now TE Connectivity) brand or equivalent are used. Insulating ferrules are used where appropriate. GILLIG seeks concurrence.	Approved
78	7.10	They shall bear an initial warranty date no earlier than 60 days prior to the manufacture date of the Bus. 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 long enough to allow the operator to safely stop and park the vehicle.	GILLIG wishes to advise the Agency, our low-voltage battery supplier typically starts warranty on the date the purchase is made. However, to support or new partnership with the Agency, our supplier has agreed to start the warranty on the day the battery installation commences at GILLIG.	Approved
79	7.10	Batteries shall not be jumped, quick-charged, or otherwise abused before delivery to the SEMTA. 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.	GILLIG acknowledges the Agency's concern regarding the treatment of batteries prior to delivery. While there may be instances where a vehicle is jump-started during the manufacturing process, these occurrences are infrequent and do not constitute a repetitive or abusive practice. GILLIG ensures that all batteries are handled in accordance with industry standards and that their integrity and capacity are maintained throughout the production process. GILLIG seeks concurrence.	Approved

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Item No.	Section	SFMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
807.10		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: •MIL-STD-461 - Requirements for the Control of Electromagnetic Interference Emissions and Susceptibility •UMTA-MA-06 0153-10 (DOT-FSC-UMTA-88-1) Radiated Interference in Rapid Transit Systems Volume I: Theory & Data •UMTA-MA-06-0153-11 (DOT-FSC-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"	GILLIG wishes to advise the Agency that test data pertaining to this requirement is proprietary and that information shared with the Agency will be limited to summary test results provided in PDF format. An in-person review of the testing process and data will be provided to the Agency to provide additional technical details.	Approved
818.4		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.	GILLIG acknowledges the SFMTA's right to inspect and review the work and materials provided under the Contract. However, GILLIG respectfully requests clarification on the specific requirements and standards that will be used to assess compliance. We are committed to delivering products that meet the agreed-upon specifications and will address any valid concerns raised. GILLIG also reserves the right to review any such notice of noncompliance to determine the appropriate course of action and the extent of any remedial work required. Any additional costs arising from work not covered under the original contract terms will need to be discussed and mutually agreed upon by both parties.	Approved
829.1.3		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 SFMTA operators, transit inspectors and maintenance personnel.	GILLIG wishes to advise the Agency, currently, we do not have content developed for train-the-trainer programs specifically tailored for the functions in question. Should GILLIG be the successful bidder, we commit to working directly with the Agency to ensure the comprehensive training of their staff on our product. This will be conducted using our standard curriculum and courses, tailored to meet the specific needs of your team. Please find attached a copy of our current and standard curriculum, outlining the courses we offer. Training will not be included on the bus price quotation. Gillig will provide price quotes for training courses when requested by the SFMTA.	Approved

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Item No.	Section	SFMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
83	9.1.4	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.	GILLIG wishes to advise the Agency, at present, GILLIG does not have content developed for the specific request in question. Should GILLIG be the successful bidder, we commit to working directly with the Agency to ensure the comprehensive training of their staff on our product. This will be conducted using our standard curriculum and courses, tailored to meet the specific needs of your team. Please find attached a copy of our current and standard curriculum, outlining the courses we offer.	Approved
84	9.1.6	First responder personnel, including firefighters, EMS, and law enforcement, shall be trained in best practices for interfacing with the Bus during emergency situations.	GILLIG wishes to advise the Agency, at present, GILLIG does not have content developed for the specific request in question. GILLIG seeks concurrence.	Approved
85	9.1.8	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 SFMTA approval, which may be based on Contractor's recommendations). A list of test equipment and special tools required to maintain the system shall be provided by the Contractor. Contractor shall provide pricing for a test fixture which duplicates an entire Vehicle system. The test fixture shall easily allow for the substitution of individual components of the system for test and repair purposes.	GILLIG wishes to advise the Agency, at present, GILLIG does not have content developed for the specific request in question. GILLIG confirms that on-site training for surveillance camera system is to be provided by RCM and is included with the technology package on the attached Itemized Price Variance provided for the buses. GILLIG confirms that an "OBVSS Test Kit" and "Special Tooling System Maintenance" kit are provided with the technology package on the Itemized Price Variance provided for the buses.	Approved - Gillig to provide details on training curriculum and hours during preproduction meeting.
86	9.1.9	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 Vehicle "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.	As part of our commitment to meeting your requirements, GILLIG is prepared to provide our standard training videos. This initiative aims to ensure that your team receives comprehensive training using our established materials. We believe that our standard training videos will effectively contribute to meeting the specified requirement. GILLIG seeks concurrence.	Approved

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Item No.	Section	SFMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
87	9.1.11	Contractor shall provide pricing for a series of interactive training modules on Coach maintenance procedures. 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 be compatible with all modern computer window-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 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.)	GILLIG wishes to advise the Agency, at present, GILLIG does not have content developed for the specific request in question. Should GILLIG be the successful bidder, we commit to working directly with the Agency to ensure the comprehensive training of their staff on our product. This will be conducted using our standard curriculum and courses, tailored to meet the specific needs of your team.	Approved

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Item No.	Section	SEMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
88	9.2.2	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	GILLIG requests approval to delete this section because it can be used to harm GILLIG's future business and financial health. Furthermore, requiring a company to provide information that can later be used to harm it, may be illegal* and certainly does not encourage partnerships or trust. GILLIG contends that the only valid reason to provide the cross reference vendor/supplier information requested, is if GILLIG is unable or unwilling to meet its obligations of supplying service parts in a timely manner. If this is the Agency's concern then the wording in Section 2.5.4 Parts Availability Guarantee of the new Standard Bus Procurement Guidelines would suffice. This wording requires the requested information to be provided, only when and if, GILLIG fails to meet its obligations in a predetermined time frame. In addition to the above language, GILLIG cannot allow any person or persons to obtain any vendor or OE part numbers, pictures or drawings of any sort while inspecting buses during the build process for any reason whatsoever. We feel this is direct violation of our trade secrets and proprietary information as well as possible contractual obligations to our suppliers. Any person caught violating any of these policies will be asked to leave the property and the agency will need to send a replacement for that person. (*Similar business impact as the class action lawsuit filed against Apple Computers by its distributors, who provided Apple with proprietary business data which was later used to take business away from them)	Approved
89	9.2.2.1	The listing shall include. •Vehicle 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	GILLIG requests approval to delete this section because it can be used to harm GILLIG's future business and financial health. Furthermore, requiring a company to provide information that can later be used to harm it, may be illegal* and certainly does not encourage partnerships or trust. GILLIG contends that the only valid reason to provide the cross reference vendor/supplier information requested, is if GILLIG is unable or unwilling to meet its obligations of supplying service parts in a timely manner. If this is the Agency's concern then the wording in Section 2.5.4 Parts Availability Guarantee of the new Standard Bus Procurement Guidelines would suffice. This wording requires the requested information to be provided, only when and if, GILLIG fails to meet its obligations in a predetermined time frame. In addition to the above language, GILLIG cannot allow any person or persons to obtain any vendor or OE part numbers, pictures or drawings of any sort while inspecting buses during the build process for any reason whatsoever. We feel this is direct violation of our trade secrets and proprietary information as well as possible contractual obligations to our suppliers. Any person caught violating any of these policies will be asked to leave the property and the agency will need to send a replacement for that person. (*Similar business impact as the class action lawsuit filed against Apple Computers by its distributors, who provided Apple with proprietary business data which was later used to take business away from them) GILLIG to provide GILLIG part numbers and descriptions via spreadsheet when the Parts Manuals are provided. The Parts Manuals reflect the final Bill-of-Materials for the build, including any last-minute changes.	Approved

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Item No.	Section	SFMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
90	10.1.3	If 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 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 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.	GILLIG's focus on designing and building the most reliable and cost-effective bus in the industry necessitates selecting supplier partners who share our philosophies on quality and reliability. As a result of this focus, GILLIG has no major fleet defects (grounded fleet), a minor number of vendor defects and the lowest warranty claim experience in the industry. GILLIG requests approval to utilize our standard Warranty support process, outlined in our GILLIG Warranty and Expectations Guidelines document, which includes our Warranty Application and Parts Ordering Procedure (Reference State of VA Contract# 010076). Additionally, due to the limited number of vehicles in the award, GILLIG wishes to propose that "Fleet Defect" provisions shall be limited to a selection of components that will be provided in writing for the Agency, and that the quantity of vehicles shall be 3 out of 5.	Approved
91	10-1	Specific subsystems and components shall be warranted and guaranteed to be free from Defects and deficiencies. 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. Air System, not limited to Compressor, Dryer, Tanks, Valves - 3 Years, 150,000 Miles	GILLIG requests approval to provide the Complete Bus warranty of 24 Months/ 100,000 miles to meet this requirement.	Approved. SFMTA willing to accept base Washington DES warranty.
92	10-1	Specific subsystems and components shall be warranted and guaranteed to be free from Defects and deficiencies. 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. Air System, not limited to Compressor, Dryer, Tanks, Valves - 3 Years, 150,000 Miles	GILLIG requests approval to provide the Complete Bus warranty of 24 Months/ 100,000 miles to meet this requirement.	Approved. SFMTA willing to accept base Washington DES warranty.
93	10-1	Specific subsystems and components shall be warranted and guaranteed to be free from Defects and deficiencies. 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. Brake System (excluding friction material) - 3 Years, 150,000 Miles	GILLIG requests approval to provide a warranty of 24 Months/ 100,000 miles to meet this requirement.	Approved. SFMTA willing to accept base Washington DES warranty.

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Item No.	Section	SFMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
94	10-1	Specific subsystems and components shall be warranted and guaranteed to be free from Defects and deficiencies. 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. Power Steering System - 3 Years, 150,000 Miles	GILLIG requests approval to provide a warranty of 24 Months/ Unlimited miles to meet this requirement.	Approved. SFMTA willing to accept base Washington DES warranty.
95	10-1	Specific subsystems and components shall be warranted and guaranteed to be free from Defects and deficiencies. 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. Traction Motor and control system & Traction Inverter and control system - 5 Years, 300,000 Miles	GILLIG requests approval to provide a warranty of 36 Months/ 100,000 miles to meet this requirement.	Approved. SFMTA willing to accept base Washington DES warranty.
96	10-1	Specific subsystems and components shall be warranted and guaranteed to be free from Defects and deficiencies. 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. Voice Annunciation System - 3 Years, 150,000 Miles	GILLIG requests approval to provide the Complete Bus warranty of 24 Months/ 100,000 miles to meet this requirement.	Approved. SFMTA willing to accept base Washington DES warranty.
97	10-1	Specific subsystems and components shall be warranted and guaranteed to be free from Defects and deficiencies. 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. Wheelchair Ramp System - 3 Years, 150,000 Miles	GILLIG requests approval to provide the Complete Bus warranty of 24 Months/ Unlimited miles to meet this requirement.	Approved. SFMTA willing to accept base Washington DES warranty.
98	10.1.4	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, 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.	GILLIG advises the Agency that Cummins Engine Company and Thermo King have advised GILLIG that they will not honor fleet defects. GILLIG requests approval to waive this requirement, but confirms that all the other regular warranty provisions still apply.	Approved

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Item No.	Section	SFMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
99	10.1.4	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 failure occurs prior to the expiration of the of the Fleet Defect warranty period applicable to the last such Vehicles accepted by the SFMTA.	GILLIG's focus on designing and building the most reliable and cost-effective bus in the industry necessitates selecting supplier partners who share our philosophies on quality and reliability. As a result of this focus, GILLIG has no major fleet defects (grounded fleet), a minor number of vendor defects and the lowest warranty claim experience in the industry. GILLIG requests approval to utilize our standard Warranty support process, outlined in our GILLIG Warranty and Expectations Guidelines document, which includes our Warranty Application and Parts Ordering Procedure (Reference State of VA Contract# 010076). Additionally, due to the limited number of vehicles in the award, GILLIG wishes to propose that "Fleet Defect" provisions shall be limited to a selection of components that will be provided in writing for the Agency, and that the quantity of vehicles required shall be 3 of 5 vehicles. Also, the provision only applies during the original warranty period and not any extended coverage period. GILLIG clarifies that in the event of a Fleet Defect, the coverage after the repair is for the time and/or miles of the unexpired original warranty as defined in the APTA/FTA Standard Bus Procurement Guidelines.	Approved
100	10.1.4.2	The Contractor shall pay for all necessary labor and material to affect all repairs or modifications to all Vehicles, including Buses for which the warranty had expired. If one or more of the Contractor's suppliers do not honor these Fleet Defect provisions, Contractor shall bear full responsibility for the repair of all Fleet Defects.	Should GILLIG be the successful bidder, GILLIG reserves the right to work with the Agency on any/all pilot bus modifications required by the Agency. As the bus manufacturer, we have no control over the Agency's decisions, and as a result, it is impossible to predict the cost impact in the bid process. GILLIG seeks concurrence.	Approved
101	10.1.5	The Contractor shall, at its own expense, provide qualified factory authorized service personnel at 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.	GILLIG will schedule field service technicians to be on-site soon after the buses start arriving, or as mutually agreeable to the Agency. The technician(s) will continue to be available on-site for as many workdays as necessary to get all buses accepted for service. This also applies to pre-set or regularly scheduled service visits during the warranty period. We just want the on-site requirement to be determined by the actual work needed, rather than by an arbitrary number of pre-set days. GILLIG requests approval of this modified requirement.	Approved

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Item No.	Section	SFMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
102	10.4.1.1	The Contractor's recommended spare parts list shall include the following: A. Grouping by system, and special tool for stocking identification. B. Generic name, trade name, description, rating, accuracy, Contractor's part number, original equipment manufacturer's (OEM's) name, OEM's part number, drawing references, and correlation with the maintenance manuals. C. 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. D. 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. E. A cross-reference and indexing system for replacement components common to more than one subsystem (whether Vehicle, test equipment, or special tool). Such components shall have only one-part number. F. Alternate sources of supply for all commercially available replacement parts. G. Current prices for all replacement parts.	GILLIG wishes to advise the Agency, our parts list consists of GILLIG part number, description, qty, price, and extended price only. GILLIG requests concurrence.	Approved
103	10.1.5	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 SFMTA property.	GILLIG's Field Service team will always strive to solve your problems and get your bus up and running as quickly as possible. When available, using the Agency's space to complete repairs is the best location in order to have them completed quickly. GILLIG request approval to provide the Agency with spare parts and tools required to complete warranty repairs, and whenever possible, to complete these repairs in the Agency's shop space as currently agreed upon between the Agency & GILLIG.	Approved
104	10.2.1	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 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". The Contractor may use SFMTA shop space for repairs if approved by the SFMTA. If SFMTA does not approve shop space the supplier shall use their own offsite location to repair the Bus.	GILLIG requests deletion of the requirement for the manufacturer to reimburse towing charges. The bus manufacturer has no control over this decision (tow/repair on site), and due to widely varying guidelines and criteria involved, it is impossible to predict the cost impact in the bid process. GILLIG, as well as other manufacturers have in the past experienced major administrative problems and costs regarding towing charges. Additionally, as a clarification, GILLIG cannot pay any towing beyond the basic bus warranty, as this would increase the unrecoverable costs even further.	Approved

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<u>Item No.</u>	<u>Section</u>	<u>SFMTA Spec</u>	<u>GILLIG LLC Approved Equal</u>	<u>Resolution Between Gillig & SFMTA</u>
105	10.2.1	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 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". The Contractor may use SFMTA shop space for repairs if approved by the SFMTA. If SFMTA does not approve shop space the supplier shall use their own offsite location to repair the Bus.	GILLIG requests deletion of the requirement for the manufacturer to reimburse towing charges. The bus manufacturer has no control over this decision (tow/repair on site), and due to widely varying guidelines and criteria involved, it is impossible to predict the cost impact in the bid process. GILLIG, as well as other manufacturers have in the past experienced major administrative problems and costs regarding towing charges. Additionally, as a clarification, GILLIG cannot pay any towing beyond the basic bus warranty, as this would increase the unrecoverable costs even further. To provide clarity on our warranty procedures, GILLIG utilizes the "GILLIG LLC Standard Repair Time" guide for all normal warranty work, excluding tasks designated to be performed by sub-suppliers (as discussed below). The reimbursement, as outlined in the attached documentation, encompasses the cost of repair. However, it is important to note that it does not cover driving or transporting the coach. In such instances, the work will be carried out by the Agency's maintenance department and subsequently reimbursed by GILLIG at the documented warranty labor rate. GILLIG clarifies that SFMTA will provide labor, tools, and space required to complete warranty repairs during the initial warranty period. GILLIG will provide replacements parts when found to be defective and following the GILLIG Warranty Parts Procedure (see attachment). SFMTA will be reimbursed for labor per the GILLIG Standard Repair Times document (attached). GILLIG will not provide a Contractor's Service Center. In the unlikely event that GILLIG requires direct access to the vehicle to perform warranty work, SFMTA will provide sufficient shop space for GILLIG technicians to safely and efficiently perform the work." In the rare scenario where abnormal warranty work is required, GILLIG commits to collaborating closely with the Agency to address any projects that the Agency believes should be repaired directly by GILLIG. GILLIG seeks your concurrence.	Approved. As per discussion, repairs of Major Systems under warranty would be facilitated by Gillig, utilizing subcomponent suppliers (Cummins, Thermoking, Borg-Warner).

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Item No.	Section	SFMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
106	10.2.2.1	Warranties on parts used shall begin once the Vehicle has been repaired.	GILLIG wishes to advise the Agency, as we continue to work together, we want to bring to your attention an important aspect related to our standard parts warranty. Our warranty policy, which is in line with the terms provided by our vendor, dictates that the warranty coverage begins on the day the parts are received by your agency, not on the day they are installed. This policy applies to Warranty Repair and components purchased from GILLIG for non-Warranty purposes. We understand that storage conditions and shelf life can vary, and as the OEM, we unfortunately have limited control over these factors. However, we believe that aligning the warranty start date with the receipt of the parts is in the best interest of both parties. To ensure clarity and consistency in our transactions, we kindly request your confirmation that your agency will conform to our standard parts warranty policy, as outlined above. This adjustment will help mitigate any discrepancies related to the warranty coverage period and allow us to provide the best possible support for the longevity and performance of our products. GILLIG requests concurrence.	Approved
107	10.2.2	If the SFMTA elects to perform, or procure a contractor to perform, the warranty-covered repairs, the requirements of this section shall apply.	It is GILLIG's priority to ensure that all warranty-covered repairs are completed by the appropriate party in order for you to receive the highest quality, least expensive and most efficient outcome possible. With this goal in mind, GILLIG is requesting your approval that Major Warranty-covered major component equipment repairs be carried out by the equipment suppliers (engine, transmission, HVAC and destination sign suppliers) in order to adhere to their mandate that all warranty repairs be performed by an authorized dealer unless the Procuring Transit Agency is an authorized warranty center. If the property elects to perform these repairs, without the written permission of the original equipment manufacturer, the remaining warranty coverage may be voided.	Approved
108	10.2.2.5	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.	GILLIG requests deletion of the requirement for the manufacturer to reimburse towing charges. The bus manufacturer has no control over this decision (tow/repair on site), and due to widely varying guidelines and criteria involved, it is impossible to predict the cost impact in the bid process. GILLIG, as well as other manufacturers have in the past experienced major administrative problems and costs regarding towing charges. Additionally, as a clarification, GILLIG cannot pay any towing beyond the basic bus warranty, as this would increase the unrecoverable costs even further.	Approved
109	10.3.1	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 system's modifications, parts retrofits, and factory recalls must be documented for integration into warranty software.	In the event that GILLIG is the successful bidder, we wish to inform the agency that we will utilize our standard warranty processing system. Our standard warranty processing system has been designed to ensure efficiency, accuracy, and transparency in managing warranty-related matters. We believe that employing our established system will contribute to a streamlined and effective process for both parties. GILLIG seeks concurrence.	Approved

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Item No.	Section	SFMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
110	10.2.2.4	The Contractor shall provide reimbursement for warranty/labor hours to the SFMTA. 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 vehicle, 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.	To provide clarity on our warranty procedures, GILLIG utilizes the "GILLIG LLC Standard Repair Time" guide for all normal warranty work, excluding tasks designated to be performed by sub-suppliers (as discussed below). The reimbursement, as outlined in the attached documentation, encompasses the cost of repair. However, it is important to note that it does not cover driving or transporting the coach. In such instances, the work will be carried out by the Agency's maintenance department and subsequently reimbursed by GILLIG at the documented warranty labor rate. In the rare scenario where abnormal warranty work is required, GILLIG commits to collaborating closely with the Agency to address any projects that the Agency believes should be repaired directly by GILLIG. GILLIG seeks your concurrence.	Approved. SFMTA and Gillig to establish labor rate at Pre-Production Meeting.
111	10.3.3.2	The Contractor shall provide the SFMTA with the following database information for all parts used on the Coach:	GILLIG wishes to advise the Agency, we don't provide this information. In lieu, we'll provide our standard manuals/schematics. If GILLIG is the successful bidder, sample manuals can be provided to the agency for review.	Approved
112	10.4	The Contractor shall furnish the spare parts and tools per Section 4.1.2 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.	GILLIG requests that the requirement be amended to allow GILLIG to provide a recommended spare parts list. This list will be provided after the production of the second coach.	Approved

Appendix G, Item G2 - Approved Equals to Technical Specifications for Contract No. SFMTA-2025-21-FTA

Item No.	Section	SFMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
113	10.3.3.3	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.	GILLIG requests deletion of the requirement to supply wiring diagrams in CAD format such that the Agency can modify the drawings as needed. These documents contain proprietary information. GILLIG will provide support for these buses with engineering assistance, and/or drawings that might be required for some specific situation in which the Agency would find them self in. The intent in requesting deletion of this particular section is only to protect proprietary GILLIG information.	Approved
114	10.4	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.	GILLIG requests approval to provide complete maintenance manuals and parts books thirty (30) days after the delivery of the first bus. This is to allow complete incorporation of any changes that may be required during the construction cycle of the vehicles.	Approved
115	10.4	Contract or shall provide a parts cross reference table, identifying sub-suppliers and their part numbers for all parts that are not manufactured by the Contractor.	GILLIG requests approval to delete this section because it can be used to harm GILLIG's future business and financial health. Furthermore, requiring a company to provide information that can later be used to harm it, may be illegal* and certainly does not encourage partnerships or trust. GILLIG contends that the only valid reason to provide the cross reference vendor/supplier information requested, is if GILLIG is unable or unwilling to meet its obligations of supplying service parts in a timely manner. If this is the Agency's concern then the wording in Section 2.5.4 Parts Availability Guarantee of the new Standard Bus Procurement Guidelines would suffice. This wording requires the requested information to be provided, only when and if, GILLIG fails to meet its obligations in a predetermined time frame. In addition to the above language, GILLIG cannot allow any person or persons to obtain any vendor or OE part numbers, pictures or drawings of any sort while inspecting buses during the build process for any reason whatsoever. We feel this is direct violation of our trade secrets and proprietary information as well as possible contractual obligations to our suppliers. Any person caught violating any of these policies will be asked to leave the property and the agency will need to send a replacement for that person. (*Similar business impact as the class action lawsuit filed against Apple Computers by its distributors, who provided Apple with proprietary business data which was later used to take business away from them)	Approved
116	10.4	The Supplier shall provide 30-Day pricing information to help support the SFMTA in stocking of parts. 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.	GILLIG will provide our standard manuals and cross-referencing information to satisfy this item in the specification. GILLIG's part manuals and parts price lists identify by part number and price all the equipment incorporated into the GILLIG coach as bid. The manuals also include cross-referencing to major OEM components, and other competitive and alternative sources, where available, but sometimes cannot include detail breakdowns because of proprietary contractual, or other non-availability reasons.	Approved

Appendix G, Item G2 - Approved Equals to Technical Specifications for Contract No. SFMTA-2025-21-FTA

Item No.	Section	SFMTA Spec	GILLIG LLC Approved Equal	Resolution Between Gillig & SFMTA
117	12.2.1	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 (as per Appendix F-2 of Volume 1) •Dimensional requirements •Accessibility (ADA) requirements •Noise control (audible and electronic) •Contract compliance •Braking •Jerk rate •Air compressor recovery rate The tests shall also ensure that the production Vehicles, 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 Vehicle 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.	GILLIG wishes to advise the Agency that test results are available from Altoona and GILLIG internal testing and will be provided to satisfy the requirements for 12.2 Test Requirements. Drawings and other documents will be provided to satisfy requirements specified below. •Duty cycle and performance: Publically available Altoona Test Report for the GILLIG Gen 3.0 Battery-Electric Bus will be provided and may be used to extrapolate performance on the Duty-Cycle Requirements of Attachment 7. •Dimensional requirements: Dimensional drawings will be provided (reference Table 1.2). •Accessibility (ADA) requirements: Dimensional drawings will be provided. •Noise control (audible and electronic): Publically available Altoona Test results will be provided for audible requirements and a GILLIG internal report will be provided for electronic. •Contract compliance: Publically available Altoona test results, GILLIG internal testing documents, and dimensional drawings will be provided to demonstrate compliance. •Braking: Publically available Altoona Test Report for the GILLIG Gen 3.0 Battery-Electric Bus will be provided and may be used to extrapolate braking performance. •Jerk rate: Publically available Altoona Test Report for the GILLIG Gen 3.0 Battery-Electric Bus will be provided and may be used to extrapolate jerk rate. •Air compressor recovery rate: Subcomponent supplier documentation will be provided to demonstrate compliance. Additionally, GILLIG and the Agency will work jointly to establish major performance criteria. To support the development of major performance criteria, GILLIG will provide a test vehicle, driver, and technical assistance to the Agency for up to two (2) days. GILLIG seeks concurrence.	Approved. SFMTA and Gillig to review seating configuration and ADA/box test compliance during preproduction meeting.
118	12.2.3.3	The Contractor shall produce a Vehicle History Book for each completed Bus. The Vehicle History Books shall be a specific record of production, testing, inspection, and relevant documentation for each individual Vehicle. The Vehicle History Book shall contain original documents unless specified otherwise. All documents shall be marked with the Bus serial number, the production sequence number, or the SFMTA Bus number for the completed vehicle.	Our aim at GILLIG is to continually enhance collaboration and operational efficiency with our valued partners. In the spirit of aligning our procedures for mutual benefit, we kindly request that the Agency consider adopting GILLIG's standard inspection record document for upcoming inspections. This meticulously developed document adheres to industry best practices and quality standards, with the belief that its use will significantly contribute to a more seamless and consistent inspection process between our organizations. For your convenience, we have attached GILLIG's standard inspection card for your review. GILLIG seeks your concurrence.	Approved
119	12.3.1	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.	GILLIG wishes to advise the Agency that GILLIG is not able to provide CPM scheduling or a formal reporting process. Should GILLIG be the successful bidder, a Pre-Production meeting will be scheduled to occur 6-9 months prior to the planned production start date of the first coach and production start dates for all coaches will be communicated to the Agency. GILLIG seeks concurrence.	Approved

Appendix G, Item G2 - Approved Equals to Technical Specifications for Contract No. SFMTA-2025-21-FTA

Item No.	Section	SFMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
120	12.3.3	A Baseline Schedule and Management Plan shall be submitted to SFMTA for review and approval. Reference Section 13.1 (Preferred Delivery Schedule).	GILLIG wishes to advise the Agency that GILLIG is not able to provide CPM scheduling or a formal reporting process. Should GILLIG be the successful bidder, a Pre-Production meeting will be scheduled to occur 6-9 months prior to the planned production start date of the first coach and production start dates for all coaches will be communicated to the Agency. GILLIG seeks concurrence.	Approved
121	12.3.3.1.1	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.	Due to the limited quantity of vehicles planned for this project, GILLIG wishes to amend this requirement and limit the scope of the deliverable to a simple project schedule with expected production start and estimated delivery timelines	Approved
122	12.3.3.1.2	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 Contractor's Management Work Plan shall be updated to include the latest revision to the project scope or other changes in project circumstances.	GILLIG wishes to advise the Agency that GILLIG is not able to provide a Management Work Plan or a formal reporting process. Should GILLIG be the successful bidder, a Pre-Production meeting will be scheduled to occur 6-9 months prior to the planned production start date of the first coach and production start dates for all coaches will be communicated to the Agency. GILLIG seeks concurrence.	Approved
123	12.3.5	The program shall at minimum be divided into the following: •Pre-Production Meetings •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.	GILLIG wishes to advise the Agency that, should GILLIG be the successful bidder, a Pre-Production meeting will be scheduled to occur 6-9 months prior to the planned production start date of the first coach and production start dates for all coaches will be communicated to the Agency. GILLIG seeks concurrence.	Approved
124	Attachment	Rear Bulkhead- 1/16 inch thick Color: Grey below the window / white above the window	Due to the vehicle design constraints, GILLIG is unable to provide a fixed rear window as specified. GILLIG requests approval to provide the GILLIG coach as built without a rear window.	Approved

Appendix G, Item G2 - Approved Equals to Technical Specifications for Contract No. SFMTA-2025-21-FTA

Item No.	Section	SFMTA Spec	GILLIG LLC, Approved Equal	Resolution Between Gillig & SFMTA
125	Attachment	Wheel Housings: 12-gauge or heavier stainless steel or equivalent fiberglass	GILLIG requests approval to provide the wheel housings manufactured of 14 gauge 3CR12 type stainless steel.	Approved
126	7-3	Does the bus charge from 10% SOC to 100% SOC in less than 4 hours?	GILLIG has no control over the Agency's charging infrastructure. As a result, we can't offer charging guidance and/or times. Charging times can vary due to many factors. In principle, batteries for a GILLIG bus are capable of being fully charged in approximately 2 hours, assuming a properly sized charger, adequate power at the Agency's facilities, charger output going towards a single bus, and electricity pricing that does not delay or reduce the power available for charging. In practice, a 3-4-hour charging window is common to accommodate these variables. A more precise theoretical charge time can be defined by the charger manufacturer. Because chargers operate differently, the charger manufacturer needs to apply their specific charger performance to define the theoretical charge time. GILLIG request concurrence.	Approved
127	7-2	The operating range of the coach operating on all the routes specified in Table F.4 below shall be at least 160 miles on a full charge at any point during the 12-year useful life of the vehicle, with all accessories on, regardless of seasonal loads and driver efficiency.	Upon careful review of the Agency's operating range, specifically detailed in Table F.4, we are delighted to confirm that the batteries provided not only meet but exceed the specified 160 miles range requirement at the start of life. It's important to note that the fulfillment of this requirement is a testament to the robust design and capabilities of our batteries. However, we want to emphasize that factors beyond our control, such as technological advancements or external conditions, may influence battery performance over an extended period of 12 years. GILLIG seeks concurrence.	Approved

WARRANTIES

Warranties	Designation	Description (what is covered)	Years	Miles	Source	Price:
Complete Bus	Option	Full coach warranty includes and applies to electrical, doors, seats, flooring, roof hatches, destination signs, wheel chair ramp, hand rails, P.A., etc. but does not include ITS or special options.	2	100,000	GILLIG	Included
Body Structure	Standard	Applies to structural members in the body and undercarriage including the structural members in the suspensions.	3	150,000	GILLIG	Included
Corrosion & Structural Integrity	Option	Covers against a significant loss of structural integrity of the assembly or it's functional performance, resulting from pertinent loss of cross-section due to corrosion caused by normal environmental elements but excludes corrosion caused by aggressive road de-icers such as Magnesium Chloride or equivalents, unless GILLIG approved preventative measures are taken (see service manual).	12	500,000	GILLIG	Included
Propulsion System (Diesel, CNG, Hybrid)	Standard	See Cummins Parchment	2	Unlimited	Cummins	Included
Propulsion System (Electric)	Standard	See Cummins Parchment	3	100,000	Cummins	Included
Transmission (Allison)	Option	See Allison Parchment	5	300,000	Allison	Included
Energy Storage System	Standard	See Cummins Parchment	6	300,000	Cummins	Included
Emission Control System	Standard	See Cummins Parchment	5	100,000	Cummins	Included
Subsystems:						
Brake	Standard	Excludes Friction Material	2	100,000	Meritor	Included
Destination Signs	Standard	See Twin Vision/Luminator Parchment	6	Unlimited	Twin Vision/Luminator	Included
Heating, Ventilation	Option	No consumables	2	100,000	Mobile Climate Control	Included
Air Conditioning Unit and Compressor	Option	See Thermo King Parchment	3	Unlimited	Thermo King	Included
Door systems	Option	Vapor	2	Unlimited	Vapor/GILLIG	Included
air compressor	Standard	See Cummins Parchment	2	Unlimited	Cummins	Included
air dryer	Option	No consumables	2	100,000	GILLIG	Included
Wheelchair lift and ramp system	Standard	See Lift-U Parchment	2	Unlimited	Lift-U	Included
Starter.	Standard	mechanical only.	3	350,000	Delco	Included
Alternator S	Standard	Alternator only. Does not include the drive system.	2	Unlimited	Niehoff	Included
Charge air cooler	Standard	Charge air cooler including core, tanks and including related surrounding framework and fittings.	3	Unlimited	Modine	Included
Fire suppression	Standard	Fire suppression system including tank and extinguishing agent dispensing system	3	Unlimited	Amerex	Included
Hydraulic systems	Standard	Including hydraulic pump & power steering as applicable.	2	Unlimited	GILLIG	Included
Propulsion cooling systems	Standard	Radiator including core, tanks and related framework, including surge tank. Transmission cooler.	3	Unlimited	Modine	Included
Power electronics	NA	DC/DC converters, inverters, if supplied	NA	NA	NA	NA
Passenger seating	Standard	excluding upholstery.	5	Unlimited	AMSECO	Included
Fuel storage and delivery system	Standard	See AGILITY CNG Parchment	3	150,000	Agility	Included

Appendix H
Gillig Option Proposals Accepted by the SFMTA

PRICE VARIANCE
10/29/2025
SF MUNI, CA OFF OF STATE OF WASHINGTON RFP# 2020 06719-01
(5) 40' BATTERY ELECTRIC LOW FLOOR PLUS BUSES, SN: TBD

ITEM	STATE OF WASHINGTON, WA	SF MUNI, CA	VARIANCE
EXTERIOR STYLING PACKAGE	LOW FLOOR PLUS	LOW FLOOR PLUS	-
CUMMINS EV TRACTION MOTOR, INVERTERS & POWER MANAGEMENT SYSTEMS	INCLUDED	REQUIRED	-
ESS ENERGY STORAGE SYSTEM WITH 6 BATTERY ENCLOSURES TOTALING 588 KWH CAPACITY	INCLUDED	REQUIRED	-
OVERHEAD CHARGE RAILS	NOT INCLUDED	REQUIRED	32,900.00
DEPOT PLUG-IN CHARGING PORT PER SAE J1772	(1) CCS TYPE 1 CONNECTOR (REAR - CURBSIDE)	(2) CCS TYPE 1 CONNECTOR (REAR - CS & SS)	4,750.00
COOLANT FILTER FOR EBUS APPLICATION	INCLUDED	REQUIRED	-
BRAKES	DISC BRAKES	DISC BRAKES	-
AXLE HUB SEALS	FRONT & REAR - GREASE SEALS	FRONT & REAR - GREASE SEALS	-
MERITOR FRONT & REAR AXLES	INCLUDED	REQUIRED	-
MAGNETIC AXLE DRAIN PLUGS	INCLUDED	REQUIRED	-
ELECTRONIC STABILITY CONTROL	INCLUDED	REQUIRED	-
AUTOMATIC TRACTION CONTROL	INCLUDED	REQUIRED	-
S-1 GUARD CURB SIDE OF REAR WHEEL	NOT INCLUDED	REQUIRED	4,729.00
HILL HOLDER SWITCH MOUNTED AT DASH	NOT INCLUDED	REQUIRED	275.00
HUBODOMETER	NOT INCLUDED	NOT REQUIRED	-
WHEEL MOUNTING	HUB PILOTED	HUB PILOTED	-
WHEELS	(6) ALCOA FULL POLISHED	(6) ALCOA MIRROR POLISHED W/ DURABRIGHT	2,509.00
TIRES	CUSTOMER SUPPLIED TIRES	CUSTOMER SUPPLIED TIRES	-
ELECTRIC STEERING ASSIST	NOT INCLUDED	REQUIRED	3,435.00
VIP TEXTURED STEERING WHEEL	NOT INCLUDED	REQUIRED	110.00
ONSPOT DROP DOWN AUTOMATIC CHAINS	NOT INCLUDED	NOT REQUIRED	-
GAUGES IN ENGINE COMP'T	ELECTRIC PROGRAMMABLE GAUGE	ELECTRIC PROGRAMMABLE GAUGE	-
ELECTRIC HYDRAULIC PUMP	INCLUDED	REQUIRED	-
SWAT SWITCH	NOT INCLUDED	NOT REQUIRED	-
ELECTRICAL TOW CONNECTION	NOT INCLUDED	NOT REQUIRED	-
AD-IP AIR DRYER FOR EBUS APPLICATION	INCLUDED	REQUIRED	-
REAR CHASSIS EXTENDED TOW EYES / SKID PLATES W/ 1" SKID PLATES	NOT INCLUDED	REQUIRED	519.00
A-POST SKID PLATES	NOT INCLUDED	REQUIRED - CS & SS	236.00
HORN SPLASH SHIELD	NOT INCLUDED	REQUIRED	50.00
LEVEL 2 INSULATION	INCLUDED	REQUIRED	-
BATTERY TYPE	(2) ODYSSEY AGM GROUP 31	(2) ODYSSEY AGM GROUP 31	-
BATTERY JUMP START CONN	INCLUDED (REAR CONNECTION)	REQUIRED (REAR CONNECTION)	-
WHEELCHAIR RAMP	LIFT-U LU18	LIFT-U LU18	-
TK ELECTRIC HVAC SYSTEM TE18	INCLUDED	REQUIRED	-
REFRIGERANT	R407C	R407C	-
REFRIGERANT PRESSURE DISPLAY	NOT INCLUDED	NOT REQUIRED	-
FRESH AIR MAKE-UP	NOT INCLUDED	REQUIRED	789.00
EBUS COLD WEATHER PACKAGE W/ DIESEL & ELECTRIC FIRED AUXILIARY COOLANT HEATER	NOT INCLUDED	NOT REQUIRED	-
DRIVERS HEATER MOTORS	BRUSHLESS	BRUSHLESS	-
DRIVERS HEATER FRESH AIR MAKE-UP	NOT INCLUDED	NOT REQUIRED	-
FRONT THRESHOLD HEATER	NOT INCLUDED	NOT REQUIRED	-
STREETSIDE HEATER	NOT INCLUDED	NOT REQUIRED	-
REAR CURBSIDE HEATER	NOT INCLUDED	NOT REQUIRED	-
UNDERSEAT HEATER	NOT INCLUDED	NOT REQUIRED	-
DASH FAN(S)	NOT INCLUDED	NOT REQUIRED	-
SENSITIVE EDGE	INCLUDED - REAR DOOR ONLY	INCLUDED - REAR DOOR ONLY	-
DOOR CONTROLS (FRONT & REAR)	34" AIR OPEN/SPRING CLOSE, FULL DRIVER CONTROL	48" ELECTRIC OPEN/CLOSE- VAPOR AMERIVIEW SLIDE GLIDE	12,445.00

PRICE VARIANCE
10/29/2025
SF MUNI, CA OFF OF STATE OF WASHINGTON RFP# 2020 06719-01
(5) 40' BATTERY ELECTRIC LOW FLOOR PLUS BUSES, SN: TBD

ITEM	STATE OF WASHINGTON, WA	SF MUNI, CA	VARIANCE
VAPOR CLASS W/ DRIVER OVERRIDE CONTROL & GREEN LAMP	NOT INCLUDED	VAPOR CLASS W/ VOICE ANNOUNCEMENT	5,934.00
EXTERIOR OPEN/CLOSE PUSH BUTTON NEXT TO REAR DOOR (MOUNTING LOCATION ON SKIRT PANEL TBD)	NOT INCLUDED	REQUIRED	2,198.00
EXTERIOR FRONT DOOR RELEASE	NOT INCLUDED	NOT REQUIRED	-
ELECTRICAL EQUIPMENT CABINET	44" W/(2) FANS	44" W/(2) FANS	-
VANNER 120V AC POWER INVERTOR 700 WATT MOUNTED IN EE BOX	NOT INCLUDED	REQUIRED	750.00
ELECTRICAL EQUIPMENT STORAGE BOX LIGHTING	NOT INCLUDED	REQUIRED	175.00
CS WHEELWELL STORAGE BOX	NOT INCLUDED	NOT REQUIRED	-
PASSENGER INFO STATION	NOT INCLUDED	INNOCOM (2) 17" X 11" SCHEDULE HOLDERS W/ (3) TAKE ONE BOXES	575.00
SCHEDULE RACKS	NOT INCLUDED	NOT REQUIRED	-
INTERIOR AD FRAMES	NOT INCLUDED	NOT REQUIRED	-
EXTERIOR AD FRAMES	NOT INCLUDED	NOT REQUIRED	-
CURBSIDE WHEELWELL PACKAGE RACK	NOT INCLUDED	REQUIRED	175.00
STREETSIDE WHEELWELL PACKAGE RACK	NOT INCLUDED	NOT REQUIRED	-
PASSENGER SEATS	AMSECO INSIGHT W/ A.R.M, Q'STRAIT RESTRAINTS	USSC GEMINI W/ 2 QPODS DOC 90 (PER UPDATED SF MUNI SPECS)	22,693.00
DUAL USB PORTS MOUNTED ON PASSENGER SEATS	NOT INCLUDED	REQUIRED PER LAYOUT	4,286.00
WHEELWELL 36" SSTL GRAB HANDLE MOUNTED ON STREET SIDE WHEELWELL	NOT INCLUDED	REQUIRED	145.00
FRONT WHEELWELL VERTICAL STANCHIONS	NOT INCLUDED	REQUIRED (CS & SS)	275.00
DRIVERS SEAT	RECARO ERGO METRO AM80 W/ HEADREST & 2-PT BLACK BELT	RECARO ERGO METRO AM384 W/ HEADREST & 2-PT ORANGE BELT W/ SEAT BELT & CUSHION ALARMS	2,479.00
SEAT ARMREST	NOT INCLUDED	NOT REQUIRED	-
PASSENGER SIGNALS	PULL CORDS	PULL CORDS	-
STOP REQUEST SYSTEM	NOT INCLUDED	NOT AVAILABLE	-
STOP REQUEST LAMP AT DASH	NOT INCLUDED	REQUIRED	52.00
DRIVERS BARRIER	WRAPAROUND W/ OUT SCHEDULE HOLDERS	WRAPAROUND W/ OUT SCHEDULE HOLDERS	-
DRIVERS PROTECTION BARRIER	NOT INCLUDED	AROWGUARD MAX W/ EXTENDED SLIDING GLASS (MV320)	11,266.00
MODESTY PANEL FWD OF REAR DOOR	NOT INCLUDED	REQUIRED W/ UPPER PANEL	750.00
OVERHEAD GRAB STRAPS	NOT INCLUDED	(20) BENTECH GREY VINYL STRAPS W/ 2 PIECE MOUNTING CLAMP	1,559.00
STANCHIONS	YELLOW POWDER COATED	SSTL	
PASSENGER WINDOWS	AROW STD FRAME / UPPER TRANSOM	AROW GLOBAL, BONDED FRAME / UPPER TRANSOM (W/ SERVICEABLE FEATURE)	19,549.00
GLAZING GUARDS	NOT INCLUDED	ACRYLIC LINERS W/ 6 MIL FILM INCLUDED W/ PASSENGER WINDOWS	-
HEADLAMPS	LED LOW & HIGH BEAMS	LED LOW & HIGH BEAMS (DIAL-LITE) W/ SUPPLEMENTARY LOWER/INNER (90MM)	1,379.00
STOP/TAIL/TURN/BACK UP LAMPS	4" ROUND DIALIGHT LED	4" ROUND DIALIGHT LED	-
REAR CAP AUX STOP LAMPS	(2) 4" RED DIALIGHT LED LAMPS	(2) 4" RED DIALIGHT LED LAMPS	-
(2) ADDITIONAL TURN SIGNALS AT EACH SIDE OF BUS	NOT INCLUDED	REQUIRED W/ FLOYD BELL PEDESTRIAN TURN WARNING AUDIO INDICATOR	1,803.00
CORNERING LAMP RECESSED ON CURB SIDE AT REAR WHEEL	NOT INCLUDED	REQUIRED	1,175.00
CURB LAMPS LED AT FRONT & REAR DOORS	NOT INCLUDED	REQUIRED	525.00
REAR CAP MOUNTED YIELD SIGN	NOT INCLUDED	NOT REQUIRED	-
EXTERIOR PORCH LAMPS	NOT INCLUDED	NOT REQUIRED	-

PRICE VARIANCE
10/29/2025
SF MUNI, CA OFF OF STATE OF WASHINGTON RFP# 2020 06719-01
(5) 40' BATTERY ELECTRIC LOW FLOOR PLUS BUSES, SN: TBD

ITEM	STATE OF WASHINGTON, WA	SF MUNI, CA	VARIANCE
BATTERY COMPARTMENT LAMPS	NOT INCLUDED	NOT REQUIRED	-
INTERIOR LAMPS	LED I/O CONTROLS	LED I/O CONTROLS	-
PLEASURE RADIO	NOT INCLUDED	NOT REQUIRED	-
2-WAY RADIO & ANTENNA	PRE-WIRE ONLY	PRE-WIRE ONLY	-
PA SYSTEM/VOICE ANNUNCIATOR	STD REI	VIA ITS SYSTEM	-
INSIDE SPEAKERS	(6) SIX	(6) SIX	-
HAND HELD MIC	INCLUDED	NOT REQUIRED	(50.00)
BOOM MIC	INCLUDED	SOUNDVIEW SVA505F W/ REMOTE SWITCH	250.00
DRIVERS SPEAKER	NOT INCLUDED	NOT REQUIRED	-
CAD / AVL ITS SYSTEM	NOT INCLUDED	CONDUENT CAD/AVL ITS SYSTEM (PER SF MUNI SPECS) (PER CONDUENT THE CRADLE POINT ROUTER NOT INCLUDED)	48,741.00
AUTOMATIC PASSENGER COUNTER	NOT INCLUDED	INCLUDED W/ ITS SYSTEM	-
TELAMATICS SYSTEM	2-YEAR SUBSCRIPTION VIRICITI CLOUD BASED SYSTEM	5-YEAR SUBSCRIPTION VIRICITI CLOUD BASED SYSTEM	5,143.00
HEATED FRONT GLAZING	NOT INCLUDED	REQUIRED	265.00
DESTINATION SIGNS	TWIN VISION AMBER - FRONT, CURBSIDE & REAR RUN SIGN	LUMINATOR FRONT FULL COLOR TITAN W/ AMBER CURB SIDE, STREET SIDE & REAR	10,219.00
FRONT RUN SIGN	NOT INCLUDED	LUMINATOR AMBER	1,283.00
FAREBOX	PRE-WIRE ONLY	PRE-WIRE ONLY	-
FAREBOX GUARD	INCLUDED	REQUIRED	-
CEILING MTD FAREBOX LAMP	NOT INCLUDED	REQUIRED	121.00
PRE-WIRE FOR CLIPPER CARD II	NOT INCLUDED	REQUIRED (BUDGETARY ONLY)	3,500.00
TRANSFER CUTTER	NOT INCLUDED	NOT REQUIRED	-
FULL COMPOSITE FLOOR	INCLUDED	REQUIRED	-
FLOORING MATERIAL	ALTRO	ALTRO	-
ROOF HATCHES	REAR - MANUAL	REAR - MANUAL	-
EXTERIOR MIRRORS	SAFE FLEET 8" X 8" 1-PC, NON-HEATED W/ REMOTE	8" X 15", 2-PC, W/ CONVEX REMOTE HEATED	494.00
TURN SIGNAL INDICATORS ON MIRROR HOUSING (CS & SS)	NOT INCLUDED	REQUIRED (CS & SS)	250.00
SAFE FLEET MIRRORLESS VIDEO SYSTEM	NOT INCLUDED	REQUIRED (PER SF MUNI SPECS)	13,102.00
SAFE FLEET INTERIOR REAR VIEW MIRROR W/ VIDEO FOR BACKUP CAMERA & REAR DOOR VIEW	NOT INCLUDED	REQUIRED	983.00
FIRE SUPPRESSION WITHOUT ESS SUPPRESSION	AMEREX V-25 W/O ESS FIRE SUPPRESSION W/ 24HR BATTERY BACKUP	AMEREX V30 W/ OUT ESS FIRE SUPPRESSION W/ 72 HOUR BATTERY BACK-UP W/ CAN/J1939 MODULE	2,741.00
TRAFFIC LIGHT PREEMPTION	NOT INCLUDED	NOT REQUIRED	-
VIDEO SURVEILLANCE	NOT INCLUDED	RSM SECURITY CUSTOM 11 CAMERA VIDEO SYSTEM W/ CRADLE POINT ROUTER W/ TRANSIT ONLY LANE ENFORCEMENT (TOLE) COLOR CAMERA (PER SF MUNI SPECS)	56,070.00
BACK UP CAMERA (STAND ALONE CAMERA)	NOT INCLUDED	NOT REQUIRED	-
BIKE RACK	SPORTWORKS MOUNTING BRACKETS ONLY	BYK-RAK 3 POSITION BLACK POWDER COATED W/ OCTA HEADLIGHT BEZEL (FMVSS REGS)	4,851.00
BIKE RACK MIRROR	NOT INCLUDED	NOT REQUIRED	-
BIKE RACK DEPLOYED LAMP	NOT INCLUDED	REQUIRED	275.00
RAIN GUTTER SPOUTS (CS & SS)	NOT INCLUDED	REQUIRED	250.00
MEDICAL AID KIT	NOT INCLUDED	NOT REQUIRED	-
BLOODBORN PATHOGEN KIT	NOT INCLUDED	NOT REQUIRED	-
BIO-HAZARD KIT	NOT INCLUDED	NOT REQUIRED	-
WHEEL CHOCKS (SET)	NOT INCLUDED	NOT REQUIRED	-

PRICE VARIANCE

10/29/2025

SF MUNI, CA OFF OF STATE OF WASHINGTON RFP# 2020 06719-01
(5) 40' BATTERY ELECTRIC LOW FLOOR PLUS BUSES, SN: TBD

ITEM	STATE OF WASHINGTON, WA	SF MUNI, CA	VARIANCE
FIBEROPTIC DASH PANEL BACKLIGHTING	NOT INCLUDED	NOT REQUIRED	-
ELECTRONIC MFD MULTI FUNCTION DASH DISPLAY (MFD II)	INCLUDED	REQUIRED	-
CUP HOLDER	NOT INCLUDED	NOT REQUIRED	-
WASTE CONTAINER	NOT INCLUDED	REQUIRED	234.00
I/O PROGRAM MODULE	NOT INCLUDED	NOT REQUIRED	-
ADJUSTABLE PEDALS	NOT INCLUDED	REQUIRED	1,556.00
EXTERIOR PAINT	1-COLOR	6-COLORS	14,805.00
CLEAR COAT	NOT INCLUDED	(6) COLORS REQUIRED	3,702.00
EXTERIOR GRAPHICS	BUS NUMBERS ONLY	SF MUNI, CA CUSTOM GRAPHICS (PER NEW PAINT LAYOUT)	4,884.00
INTERIOR DECALS & GRAPHICS	STANDARD GILLIG DECAL PACKAGE	INTERIOR BUS NUMBER PLATES W/ BRAIL BUS NUMBER PLACARDS	785.00
ROOF NUMBERS	NOT INCLUDED	REQUIRED	175.00
WARRANTY (BASIC BUS)	24 MONTHS / 100,000 MILES	24 MONTHS / 100,000 MILES	-
WARRANTY (BODY STRUCTURAL)	36 MONTHS / 150,000 MILES	36 MONTHS / 150,000 MILES	-
WARRANTY (STRUCTURAL INTEGRITY CORROSION)	144 MONTHS / 500,000 MILES	144 MONTHS / 500,000 MILES	-
WARRANTY (WATER LEAKS)	12 MONTHS / 50,000 MILES	12 MONTHS / 50,000 MILES	-
WARRANTY - ESS (BATTERIES)	72 MONTHS / 300,000 MILES	72 MONTHS / 300,000 MILES (150 MWH GROSS THROUGHPUT PER BATTERY PACK) (75% USABLE CAPACITY)	-
WARRANTY - (TRACTION MOTOR)	36 MONTHS / 100,000 MILES	36 MONTHS / 100,000 MILES	-
WARRANTY - (HVAC TK ELECTRIC)	36 MONTHS / UNL MILES	36 MONTHS / UNL MILES	-
WARRANTY (ALL OTHERS)	BASE COVERAGE PER WASHINGTON CONTRACT	BASE COVERAGE PER WASHINGTON CONTRACT	-
TRAINING	NOT INCLUDED	NOT REQUIRED	-

TOTAL SF MUNI, CA VARIANCES	315,119.00
STATE OF WASHINGTON, WA 40' LOW FLOOR PLUS ELECTRIC BASE UNIT PRICE (APRIL 2021)	813,044.00
DELIVERY	750.00
SF MUNI, CA 40' LOW FLOOR PLUS ELECTRIC NON-ADJUSTED UNIT PRICE	1,128,913.00
PPI 1413 ADJUSTMENT PER WA STATE CONTRACT AMENDMENT #1 = 11.78%	95,777.00
PPI 1413 ADJUSTMENT PER WA STATE CONTRACT AMENDMENT #3 = 15%	136,323.00
PPI 1413 ADJUSTMENT PER WA STATE CONTRACT AMENDMENT #4 = 7.15%	74,728.00
SPARES & TOOLING BUDGET	-
SF MUNI, CA 40' LOW FLOOR PLUS ELECTRIC BUS CURRENT ADJUSTED PRICE (10/29/2025)	1,435,741.00

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Appendix I

Project Delivery Schedule

Item	Expected Delivery
1) Submittal of baseline schedule	30 days after NTP
2) Delivery of prototype Bus	270 days after NTP
3) Submittal of draft operations, maintenance, parts manuals, recommended spare parts	By delivery of prototype Bus
4) Conditional acceptance of 40-ft prototype Bus (estimated)	Within 20 days after prototype Bus delivery
5) Submittal of final operations, maintenance, and parts manuals	By delivery of last production Bus
6) Production buses line-entry ¹	Within 140 days after acceptance of prototype Bus
7) Delivery of first production Bus	Within 30 days after production bus line-entry
8) Completion of Bus delivery	Within 30 days after production bus line-entry

¹ Approval to deliver production Vehicles will not be granted until after the submittal of draft operations, maintenance, and parts manuals, and after the submittal of all test reports.

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 1 - Coach Price

Milestone	Maximum Percent of Line Item 1 of Schedule 1 as applicable
(a) Authorization by the SFMTA to ship each Vehicle and authorization by Contractor to release each Vehicle for shipment to the SFMTA	55% of Unit Price
(b) Conditional Acceptance of each Vehicle by SFMTA	38% of Unit Price
(c) Full Acceptance of each Vehicle by SFMTA	5% of Unit Price
(d) Buses are fully Accepted and final operation, maintenance, and parts manuals are received by the SFMTA	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 4 – Special Tools Separate from Coach

The City shall pay for special tools and other maintenance equipment upon their Acceptance by the SFMTA.