

TECHNICAL SPECIFICATION

FOR THE OVERHAUL OF NEW FLYER LOW-FLOOR EMISSION CONTROLLED DIESEL (ECD) BUSES (OPTION FLEET)

Technical Specification No. VE15-044

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**Massachusetts Bay Transportation Authority
Vehicle Engineering
Boston, Massachusetts**

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ATTACHMENTS

- Attachment No. 1 MBTA Drawings Miscellaneous Technical Information
 - 1a) Color and Paint scheme
 - 1b) Decals and Special Signage
- Attachment No. 2 New Flyer Open ITS Campaigns
- Attachment No. 3 Fluids Listing
- Attachment No. 4 Tracking & Request Forms
 - 4a) Hidden Damage Approval Form
 - 4b) Hidden Damage Tracking Form
 - 4c) Major Component Tracking Form
 - 4d) Request for Approved Equal Form
 - 4e) Approved Equal Tracking Form
- Attachment No. 5 HVAC Overhaul
- Attachment No. 6 Minuteman Camera System
- Attachment No. 7 Battery Management System

SECTION 2.0 TECHNICAL SPECIFICATION

2.1.0 GENERAL BUS OVERHAUL REQUIREMENTS:

2.1.1 SCOPE OF WORK

2.1.1.1 General Requirements: The New Flyer D40LF bus is a 40-foot, low-floor design with a stainless steel structure and diesel propulsion. The designated buses shall be overhauled/remanufactured in accordance with the requirements detailed in this Technical Specification. The Technical Specification includes several new systems and in order to ensure these systems are installed properly and these vehicles perform appropriately to the end of their service life, certain documentation requirements have been identified. The appropriate advanced engineering and documentation preparation is specified to ensure that the proper design approval, procedures and quality systems have been identified and implemented by the Contractor.

To assist the Contractor in the preparation of their bid, electronic copies (CDs) of the New Flyer Maintenance and Parts Manuals will be made available with the bid package. Please note that manuals are for reference purposes only. Discrepancies which are identified by the Contractor shall be brought to the attention of the Authority for discussion and appropriate resolution. Items identified by a specific part number are the parts currently being used on the vehicle, and will be open to the “Approved Equal” process (Section 2.1.2.4).

2.1.1.2 Project Schedule and Deliveries: Upon issuance of the Notice to Proceed (NTP), within 5 days a representative New Flyer bus (designated as the Pilot bus) shall be made available to the Contractor. A pre-production meeting shall be scheduled and held within 4 weeks of NTP. A follow-up Initial design review meeting shall be held within 8 weeks of NTP. Final design review shall be held within 12 weeks from NTP. Pilot bus First Article Inspection and release for shipment shall be completed within 18 weeks after NTP. The Pilot bus shall then undergo a one week review period at the MBTA in Boston.

Four (4) additional “float” buses (5 total including Pilot) shall be made available within 2 weeks of NTP, for Structural Inspection and completion of a Structural Teardown Report (reference sections 2.1.2.11 and 2.1.2.12). Fifteen (15) additional “float” buses shall be made available within 6 weeks of NTP. At no time shall more than twenty two (22) total vehicles be out of revenue service as part of this program, including any vehicle undergoing incoming inspection, acceptance testing, and commissioning. Upon return to the Authority of an overhauled vehicle, the Contractor shall be entitled to receive one (1) additional vehicle.

Serial deliveries shall commence no later than 25 weeks after NTP. The last bus (155th) shall be delivered within **87** weeks from NTP (based on an average delivery rate of 2.5 buses per week).

2.1.2 PRE-PRODUCTION PROCESS: The Pre-Production process defined herein includes a Pre-Production meeting and a three stage Design Review, which consists of an Initial Design Review, Follow Up Design Review, and a Final Design Review. At these meetings, the Contractor shall provide sufficient information to define the proposed remanufacturing processes and procedures, present qualifications for proposed subcontractors and present design proposals for the new systems specified. All materials to be reviewed at each pre-production meeting must be provided to the Authority for review a minimum of three (3) working days prior to the meeting. The process shall result in the production of a Pilot Bus which will undergo a First Article Inspection (FAI) to ensure full compliance to the Technical Specification, drawings and Authority Approvals. The Approved Pilot Bus design will serve as the “Baseline Design Configuration” for production.

2.1.2.1 Authority Approvals and Deliverables: Included in Exhibit 2-1 is a listing of items identified within this Technical Specification which must be prepared and delivered by the Contractor and approved by the Authority during the design review process. The items on this listing must be completed and at a minimum receive Conditional Approval from the Authority prior to the FAI. This listing is provided solely for the convenience of the Contractor and does not purport to be complete. This listing remains subject to modification by the Authority during contract execution if needed.

The Contractor bears the responsibility for submitting a complete and comprehensive contract deliverables schedule with the bid in accordance with **Section C5.00** for the Authority’s review and approval. The schedule shall include the following:

- a) Item Number
- b) Quantity to be Submitted
- c) Title and Description
- d) Contract Specification Reference
- e) Reason for Submittal (information or approval)
- f) Required Submittal Date
- g) Actual Submittal Date
- h) Current Status and Any Other Pertinent Information.

Following schedule approval, the Contractor shall continue to provide monthly status reports to the Authority no later than the 7th day of the following month. The monthly status report shall include the most recent updated Major Component Tracking Matrix included in Attachment 4.

Exhibit 2-1: Authority Approvals and Contract Deliverables Requirements (CDRs)

Item	Authority Approvals/CDR's	Spec./Contract Reference
1	Project Schedule	A1.14 & C4.03
2	Production Schedule	A1.14
3	Pilot Bus Program Plan	2.1.2.11
4	Test Plan and Schedule (Including Test Procedures)	3.3.1
5	Contract Deliverables Requirements (CDRs) Schedule	2.1.2.1
6	Quality Assurance Plan and Inspection Systems	3.4.3
7	Safety Practices and General Workshop Procedures	3.2.3.3
8	Conformed Receiving Inspection Records	3.2.7.1
9	Approved Equal and Hidden Damage Submittal Processes / Procedures	2.1.2.4
10	AWS Welding Certifications / Procedures	2.1.10.4
11	Paint Systems and Procedures	2.2.1.1
12	Parts Renewal & Maintenance Manuals for New Assemblies / Systems (including upgrades)	2.1.10.5
13	Subcontractor Qualifications and Procedures	2.1.2.10
14	All New and Improved Items	2.1.3
15	Special Tools / Test Equipment	2.1.10.7
16	Coach History Record	3.4.2
17	Core / Scrap Credits	2.1.2.8
18	First Article Inspections	2.1.2.9

2.1.2.2 Pre-production Meeting(s): The pre-production meeting is for the purpose of resolving design issues where the Authority requires prior approval. Those requirements that cannot be resolved will be deferred to the design review process for resolution. The Contractor shall be prepared to present any and all items critical to design, delivery, testing, acceptance, and overall contractual performance (refer also to Section C5.16 of these contract documents). A line item review of the Technical Specification will be performed during the Pre-Production meeting. The Pre-production Meeting will be held at an MBTA designated location. The agenda for each meeting shall be submitted by the Contractor to the Authority at least 1 week prior to the meeting date. All materials to be reviewed at each pre-production meeting must be provided to the Authority for review a minimum of three (3) working days prior to the meeting. An FAI shall be required for all “New Systems” (see exhibit 2-2) and an appropriate schedule for these FAIs shall be agreed to at the Pre-production meeting(s).

2.1.2.3 Engineering Design Review Process: All new and improved items, “approved equals”, and any other, systems, parts, or procedures as determined by the Authority shall be presented by the Contractor to the Authority for review and approval through the Engineering Design Review Process. At a minimum, the Contractor shall provide the Authority with a complete engineering drawing package and assembly / installation procedures. Where appropriate or as required by the Authority, the Contractor shall provide supplementary information including but not

limited to materials specifications, operator certifications / qualifications, testing data, etc.

In addition, any deviations from this specification or its attachments, including but not limited to proposed improvements, enhancements, or cost savings initiatives shall be presented to the Authority through the Engineering Design Review Process.

All requests for “approved equal” shall be presented by the Contractor to the Authority’s Technical Project Manager for review and approval using the “Approved Equal Request Form” included in Attachment 4. In addition, the Contractor shall track all requests for “approved equal”, whether approved or rejected, using the Approved Equal tracking spreadsheet included in Attachment 4.

The Contractor shall submit the Approved Equal Tracking Spreadsheet at an appropriate interval, as agreed to at the first Pre-Production meeting.

2.1.2.4 Approved Equal Process: Throughout this specification, specific products have been identified which are known to satisfy the Authority’s requirements for service proven performance, durability, and overall value. In cases where a specific product is identified by name and/or part number, the Contractor may elect to submit service proven alternative products for the Authority’s consideration. These submittals shall be known as “Requests for Approved Equal” and will be formally submitted for the Authority’s approval.

When submitting a Request for Approved Equal, the Contractor shall develop a line item compliance matrix which defines the “key characteristics” by which the Contractor can demonstrate that the alternative product being proposed is equivalent or better than the product originally specified.

The Contractor shall provide appropriate supporting documentation (including drawings, a parts sample, materials specifications, product “cut sheets”, test reports, standard warranty statement, and current transit bus fleet users with contact name / phone number / quantity in use) as required to demonstrate equivalence to the Authority’s satisfaction.

Requests for Approved Equal shall be submitted as early in the Design Review Process as possible, so as to minimize disruptions to the overall process and to maximize time to evaluate / discuss the Request.

2.1.2.5 Initial Design Review: The objective of the Initial Design Review shall be for the Contractor to present the outstanding design details of the new coach systems for the Authority’s review and approval.

The Initial Design Review will be held at the Contractor's overhaul facility. The Contractor shall be prepared to present any and all items critical to design, delivery, testing, acceptance, and overall contractual performance that were not resolved at the Pre-production Meetings, (**refer also to Section C5.16 of these contract documents**).

2.1.2.6 Follow-Up Design Review: The objective of the Follow-Up Design Review shall be for the Contractor to gain Authority approval for all those items not approved during the Pre-production Meetings and at the Initial Design Review. During Follow-Up Design Reviews, any open issues as a result of the documentation submitted to the Authority shall also be discussed along with any new submittals such as, but not limited to design, schedule and documentation issues.

2.1.2.7 Final Design Review: A final review of all the design drawings, required analysis, Authority Approvals and Contract Deliverables shall be conducted. Items closed during earlier reviews need not be addressed again. The objective of the review is to freeze the design of the Pilot Bus and to assure both the Authority and the Contractor that there is total agreement as to the configuration of the Pilot Bus.

2.1.2.8 Core / Scrap Credits: The Authority is aware that certain major components and systems being replaced in this overhaul retain a significant amount of value. Therefore, the Contractor is required to provide the Authority an appropriate core or scrap credit for these items. The credit shall be equivalent to the value recovered by the Contractor, less a 15% handling fee. A listing of components and the fair and appropriate related credits shall be presented to the Authority as part of the design review process.

2.1.2.9 First Article Inspections: The First Article Inspections (FAI) process is outlined in section 3.3.2. FAIs shall be conducted on the items / systems listed in Exhibit 2-2; additional items may be added at the Authority’s discretion.

Exhibit 2-2: First Article Inspection (FAI) Items

Item	Description	Spec. Reference
1	Structural Modifications / Welding	2.2.1.2
2	Cummins Engine	2.3.1.2.1
3	Allison Transmission	2.3.1.2.2
4	Radiator/CAC System	2.3.1.2.4
5	Rear C/S Corner Access Panel	2.2.1.10
6	Integrated Powertrain, Exhaust, and Cooling Installation	2.3.1
7	Passenger Compartment LED Lighting Installation	2.2.2.1.2
8	Exterior LED Lighting Installation	2.2.2.1.1
9	All New and Improved Items	2.1.3
10	Paint / Paint Procedures	2.2.1
11	Front Axle	2.3.2.1
12	Rear Axle	2.3.2.2
13	Axle Installation	2.3.2
14	Complete Vehicle Review (Baseline Design Approval)	2.1.2.11
15	Electrical System Upgrade (Battery Management System)	2.3.6.5
16	Camera System Upgrade	2.3.6.8

2.1.2.10 Subcontractor Qualifications and Procedures: The Authority requires that all subcontractors performing work on the vehicle fleet (or conducting the overhaul of sub-systems) be appropriately qualified. The Authority reserves the right to require documentation of qualification, as well as copies of work procedures, parts lists, and other supplementary information for any subcontractor. The Authority (or their designee) also reserves the right to conduct site visits to any sub-contractor facility. These requirements apply to subcontractors performing work both on-site and off-site, and include but are not limited to the following areas:

Exhibit 2-3: Subcontractor Qualifications

Item	Description	Spec. Reference
1	Engine Remanufacturer	2.3.1.2.1
2	Transmission Remanufacturer	2.3.1.2.2
3	Electric Cooling System Supplier	2.3.1.2.4
4	Front and Rear Axle Overhaul	2.3.2
5	HVAC Supplier	2.3.7

2.1.2.11 Pilot Bus Program: The Pilot Bus Program Plan shall be developed by the Contractor and shall clearly define the issues, CDRs, Authority Approvals and FAIs that require approval. The initial version of the Plan shall be submitted to the MBTA at the Pre-Production Meeting. Updated versions of the Plan shall be submitted during Design Reviews as the design progresses, and a final Plan submitted prior to the Complete Bus FAI. The Contractor’s plan shall outline a comprehensive schedule for these activities, including the identification of the critical path and high risk areas. The objective of the Pilot Bus Program Plan is to ensure that an acceptable design configuration and vehicle performance is achieved and to lessen the probability of costly and inconvenient retrofits. Because of scheduling constraints, the Contractor may proceed at their own risk to start serial production prior to the Pilot bus review.

Upon completion of the Pilot Bus FAI, the Pilot bus shall be delivered to the Authority and shall be used for testing and demonstration on the Authority's property for a one (1) week period. At the end of the one (1) week Pilot bus test period, the MBTA’s Technical Project Manager shall solicit feedback from the MBTA Operations and Maintenance Departments and convey to the Contractor any known problems and required modifications. The design configuration defined at that time shall become the “Baseline Design Configuration” and the basis for the production of buses 2 through the end of production under this Contract. The Contractor shall submit for Authority approval a detailed Pilot Bus Program Plan as part of the design review process.

2.1.2.12 Structural Inspection Plan and Procedure: The structure of all buses shall be thoroughly inspected, to identify structural issues so that they can be corrected. Attachment 2 addresses known structural issues on the fleet. Refer to Section 2.2.1.2 for welding and weld repair requirements.

The Contractor is required to provide a detailed Inspection Plan for the Pilot Bus and four additional “Float” buses as part of the design review process. The Pilot Bus and four additional “Float” buses structural inspection shall be comprehensive in scope, and shall be used to establish appropriate inspection protocols for the balance of the fleet. This Inspection Plan shall describe how the Contractor will clean and inspect the structure for cracks, corrosion, and water/condensation build up, in areas including but not limited to:

- All window and door corners (top and bottom) and headers
- All suspension mounts (for shock absorbers, suspension rods, and air bags), and nearby support framing
- Rear sway bar mounts
- Underframe structure under and near all doorways
- Equipment mounting frames and mounts
- Roof beams
- Roof seams
- Front tow eyes, front ram’s horn, rear tow eyes and all bumper mounts
- Damage due to accidents or aggressive towing/lifting.

2.1.2.13 Structural Teardown Report: The Contractor shall follow the Structural Inspection Plan and based upon the documented findings, prepare a detailed Structural Teardown Report on the Pilot Bus and four additional buses. This report shall provide detailed descriptions and photographic documentation of all damage found, with an emphasis on that damage which had not been previously identified or anticipated.

The Structural Inspection shall follow the Plan as described above (Reference Section 2.1.2.12) and include visual and nondestructive methods as needed, and shall include thickness checks of all structural areas with visible corrosion. Interior equipment and panels/liners shall be removed as needed to expose structure. Any panel/liner or equipment removed shall be documented. Exterior panels do not require removal unless they are showing signs of delamination, or structural issues are discovered during the removal of the interior panels. In key areas of the structure (including those listed above), undercoating shall be removed to facilitate inspections. All work performed under the Structural Inspection shall be performed as Basic Work. However, Repairs identified through the Structural Inspection shall be addressed as Hidden Damage.

Based on the findings of the Structural Inspection and Structural Teardown Report, a detailed inspection procedure shall be developed for the balance of the fleet. For the remainder of the fleet, visual inspection efforts, opening compartments, and removal of belly pans shall be considered basic work. Removal of undercoating, disassembly of equipment / panels, and the actual repair of any damage found shall be addressed as Hidden Damage.

All inspection findings on all buses shall be presented to the Authority, and complete inspection records shall be included in the Coach History Book.

As subsequent buses are inspected and additional defects are discovered, any new areas found shall be incorporated into a revised procedure as appropriate.

Approval of the Structural Teardown Report will be required to achieve Milestone A (see section C10.01B1).

2.1.3 NEW AND IMPROVED ITEMS: Any items which the contractor either newly designs or changes as part of an improvement shall be submitted for review by the Authority in line with section 2.1.2.3. They include at a minimum the items identified in Exhibit 2-3, as well as any additional items proposed for design modification by the Contractor.

Exhibit 2-3: New and Improved Items

Item	Description	Spec. Reference
1	Steering Box Access Panel	2.2.1.9.1
2	Rear C/S Corner Access Door	2.2.1.10
3	Electric Radiator/CAC System	2.3.1.2.4
4	Belly Pan Hardware	2.2.1.2.2.1
5	Rear electrical cabinet locks	2.2.1.9.2
6	Exterior LED Lighting Installation	2.2.2.1.1
7	Passenger Compartment LED Lighting Installation	2.2.2.1.2
8	ADA Seat Stop Request Chime	2.2.5.4.2
9	Power Steering Fittings / Jumper	2.3.4
10	Automatic Passenger Counter (APC) System	2.4.4
11	Camera System Upgrade	2.3.6.8
12	Interior S/S Wheel Tub Guard	2.2.1.7
13	Electrical System Upgrades (Battery Management System)	2.3.6.5

2.1.4 Hidden Damage: This specification describes the base level of work to be performed on all buses. It is understood that over the course of the program buses will enter the program which are found to have damage and/or require repairs beyond the level identified in the Technical Specification. In addition there are many areas of the bus where repairs will be required on an as-needed basis. To the greatest extent practical, items to be repaired as-needed will be identified at the Departure Inspection prior to the bus being turned over to the Contractor.

This is in addition to the basic work described in this Technical Specification. Hidden Damage is identified as summary line item 2 in Section B4, with the cost build up on Section B5. The examples of additional work items eligible for Hidden Damage compensation noted in Exhibit 2-4 does not purport to be complete, and additional items

are specified within the body of the Technical Specification. All work identified in the specification will be considered basic work, unless specifically noted as Hidden Damage. Any work **not** identified in the specification which is discovered by the contractor shall be presented to the Authority as Hidden Damage for review and/or approval. The exemption or omission of an item from the specification does **not** absolve the Contractor of the responsibility of bringing it to the attention of the Authority for consideration as Hidden Damage.

Hidden Damage may be identified at the Departure Inspection, Receiving Inspection (reference 3.2.7.1), or found to be required during the overhaul of the vehicle. Prior to performing any Hidden Damage repairs, a quote for the labor hours and estimated parts will be provided by the Contractor to the Authority’s Technical Project manager using the Hidden Damage Approval Form included in Attachment 4. The Authority’s Technical Project Manager or his designee must provide approval prior to work proceeding.

At the Authority’s discretion, they may provide the Contractor with replacement components to address any Hidden Damage items.

All repairs shall be performed in accordance with standard industry practices.

Exhibit 2-4: Hidden Damage Items

Item	Description	Spec. Reference
1	Understructure Repairs	2.2.1.2.2
2	Structural Hidden damage	2.2.1.2.1
3	Roof Damage	2.2.1.3
4	Interior Body Damage	2.2.1.5
5	Floor Repairs (major)	2.2.1.6
6	Stop Requests	2.2.5.3
7	HVAC System (except as noted)	2.3.7
8	Windows	2.2.4
9	Window latches, hinges, transom window pistons, window glazing	2.2.4
10	Passenger seats	2.2.3.1
11	ADA Flip Seat Locking Mechanism	2.2.3.3
12	Rear Axle Housing	2.3.2.2
13	Steering Column Covers	2.3.4
14	Roof Hatches	2.2.1.3
15	Fender Rubber Trim	2.2.1.4.1

2.1.4.1 Hidden Damage Tracking: For each bus, the Contractor shall maintain the real-time tracking spreadsheet included in Attachment 6, to track all Hidden Damage work performed. This spreadsheet, as well as the Hidden Damage Approval Form cover sheets, shall be provided to the Authority’s Resident

Inspector for verification prior to the release of each bus for shipment, and shall be included in the Coach History Record.

2.1.5 DEFINITIONS: The following are definitions of special terms used in Section 2.0.

Americans with Disabilities Act (ADA): Refers to requirements of the Americans with Disabilities Act of 1990, as published in the Federal Register, 49 CFR Parts 27, 37, and 38, Transportation for Individuals with Disabilities, and as further amended.

Approved or Approved Type (signifying Approval): Design, type of material, procedure, or method given written acceptance by the Authority.

Authority (or MBTA): The Massachusetts Bay Transportation Authority is a regional transportation provider in the Boston metropolitan area created by Chapter 563, Section 18 of the Acts of 1964 of the Commonwealth of Massachusetts, the Party of the First Part to the Contract.

Baseline Design Configuration: The design configuration Approved by the Authority at the First Article Inspection of the Pilot bus and defines the configuration of the serial production buses.

Bidder: The Contractor submitting a proposal in response to the MBTA RFP for the overhaul of the New Flyer 40 foot ECD buses.

Bus (also Coach): A complete vehicle, that conforms to these Technical Specifications and ready to operate.

Coach (also Bus): A complete vehicle that conforms to these Technical Specifications and is ready to operate.

Contractor: The prime contractor is solely responsible to the Authority for the quality and proper functioning of the vehicles and all components. The person or persons, firm, partnership, corporation, or combination thereof which has entered into a procurement contract with the Authority to supply the vehicles.

Contractor's Drawings: Items such as general arrangement drawings, detail drawings, graphs, diagrams, and sketches that are prepared by the Contractor to detail its work.

Days: All reference to days in the Technical Specification shall be calendar days unless specifically stated.

Electronic Media: Electronic storage device such as USB storage device or Authority approved equal.

Engineering Drawings: A formal engineering document, fully dimensioned with tolerances, materials specifications, etc. that adequately defines a part for manufacture / assembly. Engineering Drawings must be revision controlled and formally approved by appropriate Contractor staff.

Equal: Whenever the words “equal”, “equivalent” or “approved equal” are used in connection with make or quality of material or equipment, the proposed alternative shall be functionally compatible with and of equal or better quality than the item it is proposed to replace. The Contractor must provide for Authority Approval appropriate technical documentation to verify equivalence, including a dimensioned drawing, detailed material specifications and testing documentation. The Authority’s Technical Project Manager’s decision as to whether any material or equipment proposed is equal to that specified shall be binding and final.

Fireproof Materials: Materials that will not burn or melt at temperatures less than 2,000 degrees Fahrenheit (2000°F).

Fire-Resistant Materials: Materials that have a flame spread index less than 150, as measured in a radiant panel flame test per ASTM-E 162-90.

Fire Retardant Materials: Materials that have a flame-spread index less than 35, as measured in a radiant panel flame test per ASTM-E-162-90.

First Article Inspection (FAI): The physical examination, functional and commercial testing and acceptance/Approval by the Authority of an initial part, major assembly, subassembly, system, subsystem, apparatus or material, manufactured or assembled by either the Contractor or Subcontractors. The FAI shall also include a maintainability and quality review of the component/system.

Hardware: Includes but is not limited to nuts, bolts, screws, rivets, fittings, clamps, washers, lock washers, orange insulated p-clips, etc.

Hinge: The term “hinge” shall be interpreted as an arrangement of retaining brackets with a flexible member or pin used to facilitate motion of one item relative to the other. Examples include but are not limited to brackets with hinge pins, brackets with hinge pins and springs, brackets with a rubber membrane in place of a hinge pin, etc. In the event that the term “hinge” is used, unless otherwise specified, it shall include all hardware securing the hinge in place.

Hose: The term “hose” shall be interpreted as any flexible vessel used to transport lubricant, fuel, compressed air, or any other fluid from one part of the vehicle to another. This shall be interpreted as including all flexible “lines” and “tubes”, regardless of material (rubber, plastic, braided steel, etc.). Pipes, which are hard plumbed, are not included in this definition (See also “Pipe”).

Latch: When used, the term “latch” shall include the latch itself, the latch striker (if applicable), and all hardware used to secure the latch and striker.

Line: See Hose.

Maintenance Manual(s): Detailed instructions for servicing and maintaining the bus, electrical prints, pneumatic diagrams and hydraulic diagrams. All manuals shall be provided in both the electronic and hard copy formats. All manuals are assumed to apply to both the electronic and hard copy formats. Reference section 2.1.1.1.

Mean Mileage Between Failures (MMBF): The mean operating mileage between independent failures.

New System: Any system that is specified to be incorporated into the New Flyer ECD bus fleet, as outlined in these technical specifications which was not incorporated in the buses when they arrived at the Contractor’s facility.

Overhauled : Remanufactured/rebuilt in accordance with an approved procedure as outlined in the Technical Specifications. If not specifically stated, all equipment requiring overhaul shall be performed in accordance with approved original OEM or supplier specifications.

Pilot Bus: The first bus to be provided to the Contractor for overhaul. See sections 2.1 and 2.1.2.10.

Pipe: Any rigid tubing, piping, or ducting which is hard plumbed in place shall be considered “pipe” and is not to be confused with hose, tube, etc. Examples of pipe are: copper tubing, and exhaust ducting / piping.

Proof (used as a suffix): Apparatus is designated as “splash-proof,” “dustproof,” etc., when so constructed, protected, or treated that its successful operation is not interfered with when subjected to the specified material or condition.

Reliability: The probability of performing a specified function without failure and within design parameters for the distance, under actual operating conditions.

Remanufactured: Overhauled/rebuilt in accordance with an approved procedure as outlined in the Technical Specifications. If not specifically stated, all equipment requiring overhaul shall be performed in accordance with approved original OEM or supplier specifications.

Resident Inspector or Inspector: The person or firm designated by the Authority as its quality assurance representative. A representative(s) of the Authority assigned to inspect materials and workmanship. The Resident Inspector shall confirm all extra work, witness tests and approve all buses prior to shipment from the Contractor’s production facility.

Safe: The condition in which passengers, operators, or maintenance personnel are secure from threat or danger, harm, or loss arising from improper design, manufacture, assembly, malfunction, or failure of the coach or any of its components or systems.

Self-Extinguishing: Materials in which flame propagation is limited to 4.0 inches when tested in accordance to FMVSS 302.

Significant (Repairs): Any repair that will exceed 75% of the cost to replace with new, and is at the discretion of the Authority.

Standard Configuration Coach: The 40-foot coach described in this Technical Specification.

Standards: Standards referenced in these Technical Specifications are the latest revisions unless otherwise stated.

Special Listings: Technical Documentation regarding the Operation and Maintenance of a vehicle or the vehicle subcomponents which is not provided as part of the OEM or OEM vendor Maintenance and Parts Manuals.

Stainless Steel: All stainless steel materials used on the vehicles, not limited to structure, hinges, fasteners, etc., shall be grade 304 stainless steel or better.

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

Subcontractor: An individual, firm, partnership, corporation, or joint venture to whom the Contractor sublets any part, subsystem, component or hardware for the Contract.

Supplier (or Sub supplier): Person(s), firm, partnership, corporation or combination thereof who builds, produces services, or supplies materials, equipment or apparatus for installation on the vehicle. Supplier-furnished materials or services shall comply with all contract requirements.

Tamperproof: Fasteners are designated as tamperproof when they are selected so that they cannot be easily loosened by hand or with common tools such as a flat blade or cross-recessed head screwdriver or pliers. Tamperproof Fasteners shall be tamper resistant Torx type.

Technical Project Manager: The person designated by the Authority to be its liaison with the Contractor on all technical matters pertaining to the work. The Technical Project Manager is empowered to act on behalf of the Authority in such matters as acceptance of Contractor's drawings, test procedures, First Article approvals, and coach acceptance. The Technical Project Manager is responsible for technical issues on behalf of the Authority, and shall be designated as such on official MBTA letterhead.

Tight (used as a suffix): Apparatus is designated as “watertight,” “dust-tight,” etc., when so constructed that the enclosing case will exclude the specified material.

Time Down: The lapsed time during which equipment is not capable of doing useful work because of maladjustment, malfunction, or maintenance-in-progress.

Tube: See Hose.

2.1.6 ACRONYMS & ABBREVIATIONS: The following is a list of abbreviations used in Section 2, Technical Specifications.

AVL	Automated Vehicle Location
°F	Degrees Fahrenheit
°C	Degrees Celsius
CAD	Computer Aided Dispatch
CDR	Contract Deliverables Requirements
cfm	Cubic Feet Per Minute
DC	Direct Current
DOC	Diesel Oxidation Catalyst
DPF	Diesel Particulate Filter
EMI	Electromagnetic Interference
fpm	Feet Per Minute
fpsps	Feet Per Second Per Second
FRP	Fiber reinforced plastic
GPS	Global Positioning System
GVWR	Gross Vehicle Weight, Rated
HCFC	Hydro chlorofluorocarbon
HP	Horsepower
HVAC	Heating Ventilation and Air Conditioning
Hz	Hertz
ITS	Instruction to Service
kHz	Kilohertz
LED	Light Emitting Diode
lbs.	Pounds
mA	milli-ampere
MBTA	Massachusetts Bay Transportation Authority
MHz	Megahertz
mph	Miles Per Hour
mphps	Miles Per Hour Per Second
MMBF	Mean Mileage Between Failures
MTTR	Mean Time To Repair
NTP	Notice to Proceed
OEM	Original Equipment Manufacturer
PA	Passenger Announcements
PLC	Programmable Logic Controller
psi	Pounds Per Square Inch

psig	Pounds Per Square Inch, Gauge
RFI	Radio Frequency Interference
rpm	Revolutions Per Minute
SLW	Seated Load Weight
ULSD	Ultra Low Sulfur Diesel
VMS	Vehicle Messaging System

2.1.7 ACRONYMS, STANDARDS AND CODES: The following is a list of acronyms, standards and codes used in Section 2. All standards and codes that are specified in these Technical Specifications are the latest revisions unless otherwise noted. The latest revision in effect for each standard at the time of Notice to Proceed (NTP) shall be used in conjunction with the Technical Specifications. The Contractor shall be responsible for obtaining all applicable standards and for supplying copies to all subcontractors/sub suppliers. If the Contractor proposes to use a substitute standard (i.e., international standard), the Contractor is required to provide proof-of-equivalency for the Authority’s review and approval for each substituted standard. The following is a list of standards and codes that must be met, whether or not they are specifically referenced in these Technical Specifications.

ADA	Americans with Disabilities Act
ANSI	American National Standards Institute
APA	American Plywood Association
APTA	American Public Transit Association
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASCII	American Standard Code for Information Interchange
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	Air Transport Association of America
AWG	American Wire Gauge
AWS	American Welding Society
BMCS	Bureau of Motor Carrier Safety
CFR	Code of Federal Regulations
DOT	United States Department of Transportation
DPU	Massachusetts Department of Public Utilities
EIA	Electronic Industries Association
EPA	Environmental Protection Agency
FCC	Federal Communications Commission
FMCSR	Federal Motor Carrier Safety Regulations
FMVSS	Federal Motor Vehicle Safety Standards
FTA	Federal Transit Administration (formerly UMTA), an agency within the DOT
IEEE	Institute of Electrical and Electronics Engineers
ISO	International Standards Organization
JIC	Joint Industrial Council
MIL	Military Specification
NEC	National Electrical Code

NEMA	National Electrical Manufacturers' Association
NFPA	National Fire Protection Association
NHTSA	National Highway Traffic Safety Administration
PCMCIA	Personal Computer Memory Card International Association
PTI	Pennsylvania Testing Institute at Altoona, PA
SAE	Society of Automotive Engineers
SPI	Society of the Plastics Industry
UL	Underwriters Laboratories Incorporated
USDOT	United States Department of Transportation

2.1.8 LEGAL REQUIREMENTS: The coach shall meet and the Contractor shall comply with all applicable Federal, State, and local regulations in effect for motorbuses at the date of manufacture. These include but may not be limited to FMVSS, ADA, EPA and all applicable FMCSR and NFPA regulations in effect at the time the NTP is issued. Local regulations are defined as those below the state level. In the event of any conflict between the requirements of this Specification and any applicable legal requirement, then the legal requirement shall prevail.

Notwithstanding, anything in the Contract to the contrary, it is understood and agreed to by the Contractor that the Massachusetts Bay Transportation Authority, herein referred to as the Authority, provided the Technical Specification for the sole purpose of describing in general terms the performance required from each coach, each coach's systems and the discrete subsystems that make up the coach. The specification provided by the Authority does not in any way constitute a design of the coach or of such subsystems or discrete components. It is further understood that the Authority makes no representations regarding the Technical Specifications. It shall be incumbent on the Contractor to verify the accuracy of the Technical Specifications prior to the time of the bid.

The Technical Specification is intended to leave the Contractor free to provide its own detail design application for the "New Systems" and the Contractor shall assume complete and overall responsibility for the satisfactory operation of the "New Systems. The Contractor's responsibility includes, but is in no way limited to; ensuring that the overhaul of the vehicle and the vehicles component parts are appropriate, coordinated, compatible and that they perform correctly, whether together or individually.

The Contractor shall ensure that each subcontractor who will remanufacture major items of equipment (for example, engine, transmission, brakes, air conditioning, heating and cooling controls, doors and controls) has a complete copy of the Technical Specifications. Sub-suppliers shall approve of and sign-off on the Contractor's specific application of their components. Proof of sub-suppliers installation approval, for the "New Systems", shall be provided to the Authority. All Subcontractors proposed by the Contractor to remanufacture part / systems are subject to the Authority's approval (reference also Section 2.1.2.9).

2.1.8.1 MBTA Safety and Regulatory Requirements: The Contractor shall incorporate appropriate Safety Certification functions, processes and activities to ensure that all hazards have been effectively identified, analyzed, and eliminated or mitigated to the lowest practical level of risk. Design, changes or modifications that may impact safety shall be defined, appropriately documented, and submitted to the Authority for review and approval.

In addition, the Contractor shall comply with all MBTA Safety Certifications and regulatory requirements in effect at the time the NTP is issued as defined within the Contract documents. The Contractor shall collaborate with MBTA to ensure that safety concerns and hazards have been effectively addressed, eliminated, or mitigated to the lowest practical level of risk.

2.1.9 OVERALL REQUIREMENTS

2.1.9.1 Accessibility / Maintainability: All new systems or components installed on the bus requiring service as part of periodic maintenance/service, repair and replacement and inspection shall be readily accessible and must be capable of being performed within one half hour. To the extent practical, removal or physical movement of components unrelated to the specific maintenance and/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 / Maintainability shall be considered by the Contractor throughout the design process and will be a significant criteria used by the Authority when evaluating / approving Contractor proposals.

2.1.9.2 Interchangeability: Components with identical function shall be interchangeable to the extent practical. These components shall include passenger window hardware, interior trim, lamps, lamp lenses, and seat assemblies. Components with non-identical functions shall not be, or appear to be, interchangeable.

2.1.9.3 Operating Environment: The ‘New Systems’ shall be capable of being operated at the specified performance levels, and stored and maintained without impairment resulting from the natural or induced environmental conditions within which the Authority intends to operate the coach in revenue service.

The following climatic factors shall be used as design guidelines and shall be considered as operational requirements.

- a) Temperature and Solar Load:
 - Ambient air temperature:
 - Minimum..... -20°F
 - Maximum..... 120°F

- b) Humidity:
 - Minimum.....5%
 - Maximum.....100%
- c) Precipitation:
 - Maximum rainfall rate 4 inches per hour
 - Maximum snowfall rate 5 inches per hour
 - Maximum snow accumulation..... 18 inches
- d) Wind:
 - Maximum sustained speed..... 40 mph
 - Maximum gust speed 70 mph
- e) Air contamination: The vehicle shall operate as specified under air contamination levels which occur in the coastal environment that exists in the Authority’s service area.
- f) Road contamination: The vehicle shall operate as specified under the dust, trash, and leaf accumulation conditions experienced in the Authority’s service area. Salt and other chemicals are frequently applied to streets during adverse winter weather conditions.

The coach shall achieve normal operation in temperature ranges of -20°F to 115°F, at relative humidity between 5 percent and 100 percent. Degradation of performance due to atmospheric conditions shall be minimized at temperatures below -20°F or above 120°F.

Actual localized temperatures and conditions within and under the coach body may be more severe than those listed. The Contractor shall be responsible for evaluating and advising the Authority if there are any special environmental factors to which its equipment may be sensitive, and that are not listed in this section.

2.1.9.4 Vibration: The “New Systems” shall have components (electrical, mechanical, and other connections) designed to operate without degradation during and after exposure to vibration as encountered in normal service. Mechanical components shall be mounted to minimize transfer of vibrations to passengers.

2.1.9.5 Service Proven Materials and Equipment: The Authority is willing to take advantage of new technologies when practical and risks are low. The Bidder shall demonstrate the benefit of using any new materials and technology being proposed and provide assurances that the Authority will not end up with a problematic design. The Authority requires that all coaches; coach systems and component designs shall be service-proven. A service-proven design shall meet all the following criteria:

- a) Used in revenue service for at least 3 years.
- b) Used in revenue operation for at least 5,000,000 miles with at least 100,000 miles per coach.
- c) Used on a minimum fleet size of 50 coaches.
- d) Has achieved a MMBF consistent with the Authority's goal of 20,000 miles.
- e) Demonstrated as reliable with appropriate Quality service history that includes documentation reflecting performance in previous applications. The Authority will make all appropriate determinations in regard to acceptable service history.

2.1.9.6 Fire Safety: The bus shall be remanufactured, utilizing equipment and materials which meet all applicable fire safety and smoke emissions regulations.

All new or replacement materials used in the overhaul of the passenger compartment of the bus shall be in accordance with the Recommended Fire Safety Practices defined in FTA Docket 90, dated October 20, 1993. Materials entirely enclosed from the passenger compartment need not comply, unless otherwise specified. In addition, smaller components and items, such as switch knobs and small light lenses, shall be exempt from this requirement. The contractor shall identify and submit for review at the pre-production meeting, the smoke and flammability characteristics certification for all new or replacement material used in the passenger compartment.

2.1.10 MISCELLANEOUS REQUIREMENTS

2.1.10.1 Guards: Piping, pumps, wiring, control rods, and equipment located within the coach shall be adequately protected against damage or interference by, or hazard to, passengers or the operator. Inclusive of this requirement shall be fluids and other related materials.

When a shield or guard is placed around a unit requiring inspection and/or lubrication, the shield shall be so secured as to provide for easy access to the unit.

All electronic and electrical systems shall function properly without degradation from electromagnetic sources and without degrading the electromagnetic environment. All electronic and electrical systems shall not be susceptible to temporary or permanent malfunctions subject to electromagnetic sources, either transient or steady state in nature. Electromagnetic interference arising from sources such as transmitters or other equipment located either on-board or adjacent to the coach or from component parts of the coach's ignition or electrical power supply system shall not degrade the operating life expectancy of the on-board electronic equipment.

2.1.10.2 Dipsticks: All engine and transmission dipsticks and dipstick tubes on the overhauled vehicles shall be verified to be the correct lengths to ensure correct fluid filling. Dipstick / dipstick tube length shall be validated on the Pilot Bus by the performance of a fluid capacity test, and documented as part of the First Article Inspection. Dipstick / dipstick tube length shall be documented as part of the final

inspection of all subsequent production vehicles and recorded in the Coach History Book.

2.1.10.3 Materials General: Upon request of the Authority the Contractor shall submit samples of materials for examination, tests, and concurrence. All samples requested in this Specification, to be sent to the Authority, shall be delivered F.O.B. destination as designated by the Authority.

All parts used by the Contractor in the remanufacturing process shall be new unless specifically approved by the Authority. In no case shall obsolete or discontinued parts be used. Repairs or corrective actions to parts and components supplied under this Technical Specification shall be agreed upon in advance by the Authority. The remanufactured buses may incorporate product improvements and upgrades with Authority approval.

2.1.10.4 Materials and Workmanship: The following requirements apply to all new equipment/systems, the remanufacturing of existing bus equipment, as well as the installation/application of materials and equipment to the buses by the Contractor. All piping, pumps, tubing, cables, and wiring shall be properly bracketed. All pass through holes for piping, tubing, cables, and wires shall be free of sharp and rough edges, protected by grommets, solid sleeve P-clamps or by other means to prevent damage over the life of the coaches. To the maximum extent possible all piping, tubing and cables located underneath the bus shall have provisions to protect the systems from road debris, salt and sand via a protective plate or other suitable means. Final approval of the protective provisions will be provided by the Authority during the First Article Inspection.

All mounting of assemblies and subassemblies including the power plant and accessories shall be mechanically isolated to minimize the transmission of vibration of the body structure.

All pipe fittings shall be of heavy-duty type and shall be designed to withstand the maximum pressure that could be generated under normal or overload conditions, within the air or fluid system of which they are a component.

All coolant and water lines routed through the interior of the bus will be done in a method that prevents leaks into the interior of the bus. Provisions shall be made to retain all fluid leaks, which have the potential of entering the passenger and driver's area of the bus in a manner as approved by the Authority.

All burrs and sharp edges shall be dressed so as to prevent damage to other vehicle components (e.g.: wiring) and/or injury to passengers, operators, and maintenance personnel.

All clevises shall be removable.

All painted aluminum sheets shall be thoroughly cleaned and coated on the outside with zinc-chromate protective paint, or approved equal, prior to installation on the coach. All aluminum surfaces not otherwise protected and installed in areas subject to corrosion shall be anodized. Anodizing specifications shall require concurrence of the Authority.

Wood of any type shall not be used except where specified herein and approved by the Authority.

All welding performed on the structure shall conform to AWS standards for quality and fitness for purpose. Welding procedures, welding materials, and qualifications of welding operators and inspectors shall be in accordance with AWS and ASTM standards. Welds shall have a finished appearance where visible. For all welded connections, the contact surfaces shall be free of scale, grease, and paint. The Contractor shall provide for review documentation of their welding processes, set up sheets and procedures to the Authority as part of the design review process, for production inspection purposes. The Contractor shall not perform any welding on Authority buses until the above documentation has been submitted and approved.

All surfaces to which springs are attached shall be of such a pattern as to prevent excessive grooving or wear of the parts.

All joints shall be protected by application of zinc-chromate metallic compound, butyl tape sealer, or approved equal, at assembly. All bolts, nuts, washers and exposed linkage shall be zinc- or cadmium-plated carbon steel, or stainless steel, except where specified. Zinc plating shall conform to the latest revision of ASTM-B-633, Type II, SC3 or SC4. Cadmium plating shall conform to the latest revision of Federal Specification QQ-P-416b, Class 2 or 3, Type II.

All bolted connections shall be designed to a minimum strength value of SAE Grade 8 or metric equivalent nuts and bolts using a minimum design margin of 1.5 based on proof load of the bolt. Bolts and nuts shall be SAE Grade 5 or better and marked according to SAE Standards J429 and J995 or metric equivalent. Any deviations from this standard will require Authority approval during Design Review.

Bolt projections through nuts shall exceed 1-½ threads and shall not exceed thickness of a standard nut. Should there be a reason for excessive bolt projection, the bolts shall be double nipped.

All sheet metal screws shall comply with ASTM and SAE recommendations relative to quality and installation. Phillips headed fasteners, self-tapping and sheet metal screws, blind rivets and rivnut-type fasteners shall not be used without prior approval of the Authority for each specific application.

Specific manufacturer's recommendations as to the adjustment and settings of components shall be provided to the Authority before delivery of the first coach. Items such as air spring heights, voltage regulator, governors, engine tune-up data and

any other pertinent data shall be furnished to allow time to prepare service and inspection forms for initial coach inspection.

Fiber reinforced components shall not have sections that are fiber or matrix rich, or fiber or matrix poor. Plastic components shall not have resin rich, or resin poor sections. New fiber reinforced components installed on any vehicle shall be Resin Transfer Molded using appropriate reinforcement techniques / materials. All fiber and matrix materials used in the coaches shall require prior approval by the Authority at the pre-production meeting. “Spray up” fiberglass shall not be used.

All air, oil, HVAC, and water lines and openings into equipment units shall be sealed, plugged, or adequately protected against entrance of contaminants until connected.

Mounting of major assemblies including engine, transmission, axles, power steering and suspension components shall be such that dismounting shall be easily carried out by conventional shop methods.

Drainage shall be provided in all body structure members. Enclosed structural cavities shall be vented to prevent condensation build up. Any enclosed structural cavities of steel members shall be treated with a rust-inhibiting coating.

2.1.10.5 Torque: All fasteners shall be torqued in line with OEM specifications. As part of the Design Review process, the Contractor shall develop a torqueing procedure(s) for Authority review and approval.

The torqueing procedure(s) shall identify torque values for all fasteners, including an appropriate tolerance in line with manufacturer’s recommendations and/or industry standards. The Contractor shall provide torque procedure(s), including a list of all Safety Critical torque locations (to be proposed by the Contractor for Authority approval). Safety Critical torque locations must be witnessed and verified by Quality Assurance personnel.

All suspension component fasteners, wheel nuts, steering system fasteners, and other fasteners as appropriate or as required by the Authority shall be torque striped to verify proper torque values have been applied. Safety Critical torque locations shall be torque striped by both the installer and (using a different color) the Quality Assurance representative who witnesses the torqueing.

2.1.10.6 Manuals and Records: The Authority requires both maintenance and parts manuals for all new systems/equipment installed on the buses (including but not limited to those items referenced in section 2.1.3). Maintenance and parts manuals for new systems / equipment shall be “slide in” supplemental inserts to the existing New Flyer Parts / Maintenance manuals.

The manuals including all text and images, shall be provided in an electronic media consistent with industry standards. The Authority’s preferred format is Adobe PDF.

Appropriate navigation and frame structures shall be provided within these documents. It is encouraged that electronic linkages exist with the vendor to enhance customer support opportunities, including e-mail. Concept design of this electronic documentation will be submitted within 8 weeks of contract award by either CD-ROM or available via a secure download. Two (2) draft copies of all manuals and records shall be furnished with the delivery of the Pilot Bus. A copy of the manuals for similar equipment with notation to reflect required changes for the MBTA buses are acceptable for this submittal.

Concurrent with the delivery of the first serial production bus, the Contractor shall furnish to the Authority five (5) copies (on approved electronic media) of interim manuals (model specific content) for all applicable “Special Listings”, “Maintenance Manuals” and “Parts Manuals” for the new equipment furnished under the Specification. This shall include electrical prints, pneumatic diagrams and hydraulic diagrams.

Four (4) weeks after the delivery of the first production coach, the Contractor shall provide ten (10) printed copies of all final Manuals complete with all applicable revisions included and inserted. At this time, ten (10) electronic copies of these manuals shall be submitted in Adobe PDF or approved equal format on separate electronic media devices. This PDF document shall allow footnotes, updates, comments or clarifications to be made and saved. Electronic files, regardless of format shall allow updates or changes at a later date by the Authority.

In the event that any significant changes to the vehicle (components, systems, or configuration) are made after the approval of the final manuals, updated manuals or modified page inserts shall be provided by the Contractor.

See also section 3.4.2 – Coach History Book.

2.1.10.7 Lubrication and Fluids: Attachment 3 details a listing of lubricant and fluids to be used on the Authority’s vehicles. Any deviations from this listing must be presented to the Authority for review and approval. Any fluids or lubricants which do not appear on this listing must also be presented to the Authority prior to fabrication of the first bus.

All grease / lubrication fittings shall be replaced with new. New fittings shall be appropriately masked during production in order to keep them free from paint and undercoating. All lubricant sumps shall be fitted with magnetic-type drain plugs. Fittings shall be located to be conveniently reached from a pit and/or hoist. All grease / lubrication fittings shall be of the threaded type without using special adapters.

2.1.10.8 Technical Support and Special Tools: If special tools are identified by the sub-supplier of a new system, the Contractor shall supply six (6) complete set of all special tools and test equipment necessary to service and maintain each “New

System”. These special tools shall be provided at the time of delivery of the first production coach. Special tools are defined as those not readily available from Sears or Snap-On. Examples of standard tools are combination wrenches, screws drivers, hammers or tools that would normally be found in a mechanic tool box. Examples of special tools are temperature adapter, tachometer readers, valve driver, pressure probe, etc.

In addition, the Authority requires:

- Ten (10) each “semi-rugged” laptops (Dell Latitude or approved equal). Laptops shall be preloaded with Microsoft Office Professional 2013, or latest version, and shall be compatible with / capable of operating all diagnostic / maintenance software and hardware (including harnesses, cables, etc.) used in the maintenance of the New Flyer ECD fleet. Laptops shall be equipped with appropriate Cummins Diesel diagnostic software (including any required licenses). Software licenses shall be covered through the warranty period of the last production bus.
- Sixteen (16) each of all datalinks / cables (Cummins Comm. Cable Adapter)
- Four (4) sets of Vansco interface equipment

2.1.10.9 Transportation / Shipping: For all parts and assemblies provided by the Authority for use in this program (including “float” components for use as rotatable spares), the Contractor shall arrange for and is responsible for the cost of transport from the Authority’s property to the Contractor’s facility. Examples of parts and assemblies which shall require transportation include but are not limited to: engines, transmissions, and passenger door panels.

2.1.10.9.1 Transportation of Vehicles: The Contractor shall arrange for and is responsible for the cost of the transportation for all vehicles from the Authority’s property to the Contractor’s facility and back. The Authority may approve the option to allow the bus to be driven to and from the Contractor’s facility, if the distance from the Authority to the Contractor is less than 100 miles each way.

2.2.0 BODY

2.2.1 SHELL:

2.2.1.1 Finish & Color: All exterior surfaces shall be painted in line with the paint scheme included in Attachment 1. Roof anti-skid tape strips shall be removed and the entire roof shall be painted with Durabak 18 UV resistant, anti-skid paint (Color – White), or Authority approved equal.

In preparation before painting, all painted exterior surfaces shall be sanded to a feathered edge, properly cleaned and primed with a self-etching primer, Dupont Variprime 615S, or Authority approved equal. Colored paint shall be applied using PPG DUHS acrylic urethane paint, or Authority approved equal. Clear coat shall be

applied using PPG Evolution acrylic urethane paint, or Authority approved equal. Proper adhesion between the basic surface and successive coats of the original paint shall be measured using a Cross Hatch Adhesion Test as outlined in ASTM D3359B. Adhesion testing must be completed by the Contractor on every 10th bus. All paint shall be applied smoothly and evenly with the finished surface free of dirt, runs, orange peel, and other imperfections. Each vehicle shall be measured for paint gloss per ASTM E97-92. An average gloss reading of 90 as measured in a minimum of ten locations on the vehicle shall be the minimum acceptance criterion. No paint gloss test point reading shall measure less than 85. A paint gloss procedure including proposed testing locations shall be presented by the contractor for Authority's review and approval.

The Contractor shall prepare a paint coating and application document containing procedures for surface cleaning and preparation, priming, surfacing, and painting for the coach body and all equipment that is painted or powder coated. A detailed paint schedule showing the equipment painted, paint type and manufacturers, recommended thickness, and other pertinent information shall also be included. This document shall be submitted for review at the pre-production meeting.

Any equipment or parts of equipment which would be damaged or suffer impaired operation from painting shall not be painted and shall be corrosion-resistant. Excluding original manufacturer painting the following items shall not be painted:

- a) Wire and cable
- b) Heat transfer surfaces
- c) Electrical insulators
- d) Elastomeric portions of air and refrigerant lines
- e) Grounding pads
- f) Elastomeric parts
- g) Grease fittings
- h) Linkages
- i) Threaded parts used for adjustments
- j) Electrical equipment
- k) Wearing surfaces

Colors and paint scheme shall be in accordance with Authority Drawings included in Attachment 1, with the exceptions of the clear coat and non-skid roof coating, which has been upgraded (see table below). The bus paint scheme is detailed in Attachment 1. The five color paints and anti-graffiti clear coat to be applied shall be as listed in the table below.

<i>Color</i>	<i>PPG Paint code</i>
<i>White</i>	<i>DUHS 2058</i>
<i>Yellow</i>	<i>DUHS 81998</i>
<i>Black</i>	<i>DUHS 9000</i>
<i>Blue</i>	<i>DUHS 19186</i>
<i>Galaxy Silver</i>	<i>DUHS 36864</i>
<i>High Build Clear</i>	<i>F3906 (Evolution)</i>
<i>White (Roof)</i>	<i>Durabak 18UV</i>

Three sets of sample chips of each paint color shall be provided to the Authority by the Contractor for review and approval prior to the Final Design Review or the painting of the Pilot Vehicle (whichever occurs first).

2.2.1.1.1 Numbering & Signage: Seifert Graphics Inc. monograms, numbers and other special signage specified shall be applied to the inside and outside of the coach as detailed in Attachment No. 1. Included in Attachment 1 is a listing of decals and special signage which have been replaced or added and are not reflected in these original drawings. One set of decals shall be provided to the Contractor prior to the Final Design Review Meeting.

Certain decals on the vehicle interior will be replaced with placards as designated in Attachment 1. The signage and placard configuration shall be submitted to the Authority for review and approval as part of the engineering design review process.

All graphics applied to the vehicle interior and exterior shall be an approved adhesive backed, vinyl film or placard, applied in accordance with the manufacturer's instructions. The location, size, text, color and application shall be as identified in Authority drawings and subject to Approval at the pre-production meeting. All text shall be Helvetica medium and in accordance with CFR Part 38.75.

Signs shall be durable and fade-, chip-, and peel-resistant; they may be painted signs, decals, placards, or pressure-sensitive appliqués. All signage shall comply with ADA reference 49 CFR Part 38.

Paint must be allowed to properly outgas prior to the application of any decals.

2.2.1.2 Structural Repair: All welding performed on the structure shall conform to AWS standards for quality and fitness for purpose and meet all requirements defined in Section 2.1.10.4.

2.2.1.2.1 New Flyer Structural Work: To date there are five (5) outstanding New Flyer *Instruction To Service* (ITS) campaigns which must be performed on the fleet. This work is detailed in Attachment 2. Parts required to perform the outstanding work will be provided by either New Flyer or the Authority. Labor performed by the Contractor to complete the ITS work shall be billed directly to New Flyer Industries for payment.

The Contractor shall inspect all buses and perform the outlined ITS campaigns in accordance with the New Flyer work instructions. The Contractor shall also create and maintain a tracking matrix to verify all ITSs have been performed on all 155 buses, and provide the tracking matrix to the Authority.

New Flyer approval of all ITS work must be obtained and documented by the Contractor as part of the Pilot Bus Program. The Contractor is responsible for coordinating this support with New Flyer Industries.

2.2.1.2.2 Structural Hidden Damage: Structural damage that is uncovered in the course of remanufacturing the bus (with the exception of that identified in Attachment 2) shall be brought to the attention of the Authority's Resident Inspector and addressed as Hidden Damage.

In addition to a general inspection for structural damage, the Contractor shall pay particular attention to the structural attachment points for the front and rear torque rods, as well as all airbag / shock mounting structures. Any structural damage identified in these areas shall be brought to the attention of the Authority's Resident Inspector and addressed as Hidden Damage.

Structural corrosion is not anticipated, due to the stainless steel frame construction. However, in the event that structural components are found to be corroded, they shall be brought to the attention of the Resident Inspector and addressed as Hidden Damage. Areas where more than twenty-five (25) percent of the original material thickness is removed by corrosion reduces the structural integrity of the component. When this is determined by use of an ultrasonic thickness tester, (to measure metal thickness compared to the original component thickness) these parts are to be either reinforced or replaced with a new component. If there is visible surface rust, it is to be removed, and the metal treated with a rust inhibitor to prevent further rust. All repairs shall be performed according to OEM and standard acceptable industry practices. Cracks are to be repaired. Repair methods shall be presented to the Authority for review and approval prior to implementation on any bus.

2.2.1.2.3 Understructure, Engine Compartment, and Attic Compartment: The understructure (with all belly pans removed), engine compartment, and attic compartment shall be thoroughly cleaned by high pressure steaming and visually inspected. Any area where the undercoating is missing/damaged, or there is visible corrosion shall be repaired. Exposed hoses, tubes, wires shall be covered and/or protected during the cleaning process. The undercoating is to be removed in the suspect areas and carefully inspected for cracks, corrosion, loose or missing fasteners and structural or accident damage.

The fuel tank undercoating has signs of excessive failure and needs to be cleaned, and have new Authority approved undercoating applied.

Any surface rust discovered shall be removed and the metal treated with POR-15 rust inhibitor (or Authority approved equal) to prevent further rust, and addressed as part of Basic Work. Cracks or other structural damage found shall be brought to the attention of the Resident Inspector and addressed under Hidden Damage.

Once the structural repairs are completed, all areas (where the undercoating had been removed or where the undercoating has been damaged) shall be undercoated with heavy duty corrosion preventive compound, to be proposed by the Contractor for Authority approval. The Contractor shall provide a sample of the undercoating applied to an approximately 8 1/2" x 11" sheet of carbon steel as part of the engineering design review process. The compound shall not be applied to mechanical, rubber, electrical components, air system components, or in the engine compartment.

2.2.1.2.3.1 Belly Pan Hardware: With all belly pans removed, all under-bus equipment (including lines and fittings) shall be thoroughly cleaned and inspected. Any damage, leaking, etc. shall be brought to the attention of the Resident Inspector and addressed as Hidden Damage as appropriate.

Belly pans shall be remounted, using new, appropriately sized and robust stainless steel fasteners with inserts designed to prevent spinning (such as a Rosan fastener or approved equal). All belly pans shall be properly drained. Damaged belly pans shall be brought to the attention of the Resident Inspector and replaced under Hidden Damage.

The revised fastener configuration and draining modifications shall be submitted to the Authority for review and approval as part of the design review process and will be reviewed as part of the First Article Inspection.

2.2.1.3 Roof: The roof trim that cross sections the bus by the rear exit doors, sealing the seam of the two roof panels, is to be removed, the roof panel seams are to be properly cleaned, and the seam trim is to be replaced with new. The new roof seam trim is to be reattached/sealed to create a water tight seal along the roof panel seam. Roof panels shall be inspected for damage and proper securement. The contractor shall supply to the Authority a proper roof panel securement method, including any wider and/or upgraded roof seam materials available, for review during the design review process.

All roof mounted antennas penetrating the roof skin shall be cleaned, inspected and resealed to a leak proof state.

All roof emergency exit hatches shall be inspected for damage and proper operation. Any roof hatch needing repairs/replacement shall be addressed under Hidden Damage.

The Contractor shall verify the integrity of the roof as part of the basic work. The roof shall be inspected and confirmed to be intact and leak-proof. Any damage to the

roof (except as specifically noted), including leaks, roof tears, impact damage, broken fasteners, etc. shall be repaired and addressed as Hidden Damage.

2.2.1.4 Body Side Panels: Minor dings and dents in metal panels shall be repaired as part of the basic work on all buses. Repairs shall be made with an Authority approved body-filler using industry standards for preparation and repair.

Dings, scratches, and cracks to fiberglass panels are to be repaired with fiberglass resin and cloth per OEM standard fiberglass repair practices as part of basic work.

Body side impact panels that are damaged shall be replaced under Hidden Damage. Due to the difficulty of color matching new panels to old, it is understood that all panels on an individual side of the bus may need to be replaced 100%.

Any significant body damage, or metal panels that show signs of significant rust, cracking or corrosion shall be identified as requiring replacement at the Departure Inspection or brought to the attention of the Resident Inspector and addressed as Hidden Damage.

Corroded or damaged structure shall be addressed as described in 2.2.1.2.

2.2.1.4.1 Fender Rubber Trim: The contractor shall inspect all fender rubber trim for damage. Any damaged fender trim shall be replaced with new, New Flyer P/N 275639 or approved equal, and addressed as Hidden Damage.

2.2.1.4.2 Mud Flap Assembly: All mud flap assemblies shall be replaced per OEM specification. They shall be composed of 1/4-inch minimum rubberized fabric, shall be installed behind each wheel and shall extend downward to within three (3) inches of the road surface. Flap widths shall extend across the width of the coach. Mud flap assemblies shall be bolted to the coach understructure using original mounting locations and a suitable backing plate configuration. Static strap shall be replaced with new. Mud flap assemblies and static straps shall be submitted to the Authority for review and approval as part of the design review process.

2.2.1.5 Interior Body: The full cleaning of the bus is considered basic work. The entire interior must be thoroughly cleaned of graffiti, stains, chewing gum, etc.

2.2.1.5.1 Interior Body Damage: Interior moldings, modesty panels, side wall panels, etc., requiring significant repair/rework shall be identified at the Departure Inspection and addressed as Hidden Damage. An estimate of labor and materials for completing the repairs shall be prepared for the Authority's Technical Project Manager. Missing or damaged interior side panels, ceiling panels/headliners, and headers shall be replaced with new OEM panels. "Anti-squeak" tape shall be used between interior trim panels and any structure. Miscellaneous trim and any

functionally damaged components are to be replaced with new to OEM specifications.

2.2.1.6 Flooring: The rear upper deck floor covering shall be thoroughly cleaned as part of the basic work on each bus. Areas where floor covering seams have split shall be addressed under Hidden Damage in line with Altro recommendations. This requires cutting away peeled floor covering on either side of the split and welding in an Altro replacement patch. The Contractor's specific cleaning products/procedure, repair procedure, including standard repair patch sizes, shall be presented to the Authority as part of the design review process.

The lower deck floor covering is to be replaced 100% as part of Basic Work. The Contractor shall remove all existing lower deck floor covering, clean all residual glue from the plywood subfloor, and properly install new flooring per OEM recommendations. The flooring material shall be installed in a way to minimize the amount of cold welded seams. The Contractor's installation procedure and all associated documentation shall be presented to the Authority as part of the design review process.

The yellow standee line shall be replaced with an Authority approved new larger 6 inch yellow standee line as part of basic work. The yellow nosing strip, plastic extrusion and floor covering sections at the rear steps and doorways shall be replaced 100% as part of basic work using the pre-fabricated Altro nosing / flooring patches.

Areas of floor covering which are significantly damaged and in need of repair / rework shall be identified at the Departure Inspection and addressed as Hidden Damage. An estimate of labor and materials for completing the repairs shall be prepared for the Authority's Technical Project Manager.

Any flooring repairs not identified during the Departure Inspection will be brought to the attention of the Resident Inspector for review.

All floor access hatches will be replaced 100% under Basic Work with NF P/N 328119, or Authority approved equal, and retrofitted with an appropriate stainless steel locking mechanism. Any replaced floor hatch identified to be in good condition during the Departure Inspection or by the Resident Inspector shall be returned to the Authority.

2.2.1.6.1 Sub-Floor Repairs: Floor areas that are identified as needing significant repair/rework shall be identified at the Departure Inspection and addressed as Hidden Damage. An estimate of labor and materials for completing the repairs shall be prepared for the Authority's Technical Project Manager. Replacement sub-floor sections shall be plywood nominal 3/4-inch, seven (7) ply-thick AB marine grade plywood installed with the A side up and with all edges sealed. The APA markings or certification must be visible from the underside of the bus before undercoating is applied. Floor panels shall be comprised of pieces

as large as possible with joints located only over structural members. No transverse joints shall be used in the entrance and exit ways. All exposed edges of the floor panels, including openings for ducts and conduits, and joints between panels, shall be waterproofed and sealed prior to installation. The Authority shall approve the floor installation and sealing method at one of the pre-production meetings.

Corrosion resistant fasteners and appropriate adhesive (approved by the Authority) shall be used to retain the floor and all floor fasteners shall be serviceable from one side only. The flooring shall be mounted to the existing tapping plates.

Any damaged flooring shall be repaired as per OEM specifications. Before applying the floor covering, all voids, fastener heads, and cracks in floor panels surface shall be filled with a fire retardant, two-part epoxy, leveling compound, and the floor sanded smooth. The methodology and the type of adhesive used to bond the floor covering to the coach floor shall be as recommended by the manufacturer of the floor covering. All seams and edges of the floor covering shall be welded / sealed to prevent water from entering between floor and covering. The floor covering seams shall be a minimum of 8 inches from seams in the sub-floor material, unless specifically approved otherwise by the Authority.

2.2.1.7 Interior Wheel Housing: Floor covering over the front curb side wheel housings shall be replaced with new. The Contractor shall also install a new stainless steel wheelchair guard around the street side front wheel tub as part of Basic Work. The wheel tub guard and attachment method will be reviewed during the design review process.

2.2.1.8 Passenger Doors: The passenger entrance and exit doors shall be refurbished to an “as new” condition. All existing door panels shall be removed from the vehicles, bead blasted or sanded, refurbished, repainted, and reinstalled as part of Basic Work.

Any door beyond repair that is in need of replacement shall be presented to the Authority and, if appropriate, shall be provided by the Contractor under “Hidden Damage”.

All panels, whether new or reused, shall be properly treated and painted. In order to avoid paint adhesion / life issues, the paint application must be in line with Vapor’s paint standards. (reference sections 2.2.1.1, 2.2.1.1.1).

Door seals, brushes, and covers shall be replaced on both entrance and exit doors. All door control valves shall be replaced with new and the front and rear door motors shall be rebuilt per manufacturer's recommendations. All mounting hardware shall be replaced with new stainless steel hardware. Door shaft bushings, bearings, and mountings shall be replaced with new to OEM specifications. The floor mounted pivot plates shall be replaced with stainless steel. All sensitive edges components, including wave switches, are to be replaced with OEM (Vapor) components. Any

other door or door control components which require replacement shall be addressed as Hidden Damage. If existing door glass is damaged, it is to be replaced with new and addressed as Hidden Damage. All door glass glazing is to be replaced with new as part of Basic Work.

Door shafts are to be inspected and checked for straightness as basic work. If a door shaft is identified as requiring replacement it shall be brought to the attention of the resident inspector. The replacement of door shafts shall be addressed as Hidden Damage.

Note: On previous overhaul contracts, the Authority has experienced passenger doors falling out of alignment, binding, etc. soon after limited use in service. Therefore, appropriate steps shall be taken to ensure robust operation of doors in revenue service.

2.2.1.9 Service Compartments & Access Doors:

2.2.1.9.1 Exterior: All access door parts including but not limited to: prop rods; safety stops / chains; handles / pockets; latches / locks; gas cylinders; bumpers; hinges / hinge assemblies; and hardware, are to be replaced with new OEM components, or Authority Approved Equal components. All seals, bumpers and stops shall be replaced with new and doors properly adjusted.

Both the engine compartment door and attic compartment access door have evidence of corrosion, and shall be repaired as Basic Work.

The front street side underbody steering box access panel is displaying excessive rust/corrosion. The access panel, hinge, and fasteners are all to be replaced with stainless steel under Basic Work.

All other access doors shall be reworked as required to straighten, remove dents, etc. as part of basic work. They shall be cleaned of corrosion and re-used. If doors require significant rework, they shall be presented to the Authority and replaced under Hidden Damage.

2.2.1.9.2 Interior: The current rear electronic equipment access door locking latches are not adequate and are prone to releasing in service. All latches are to be replaced with a new redesigned lock. New locking mechanisms shall be submitted to the Authority for approval during the design review process.

2.2.1.10 Rear Corner Panel Access Door: To obtain better accessibility to refrigerant lines obstructed behind the rear curb side upper corner panel, an access door is to be installed. The new design shall be sufficiently robust and shall be subject to Authority review and approval in accordance with section 2.1.3. The new access door shall be presented to the Authority during the design review process.

2.2.1.11 Front End Mask: The contractor shall repair any damage to the front end cap, as well as clean out and re-seal the seam between the front cap and roof, and will be addressed as Basic Work.

Damage to the front end which cannot be addressed with basic fiberglass repair shall be presented to the Authority’s Resident Inspector and addressed as part of Hidden Damage.

2.2.2 OPERATING COMPONENTS:

2.2.2.1 Lighting, Controls & Instruments:

2.2.2.1.1 Exterior Lighting: The existing incandescent (high and low) headlamps shall be replaced with new 4” x 6” LED (high and low) headlamps, Dialight P/N HLC 434 CB and HLB 424 CB or Authority approved equal. Damaged housings shall be identified on the departure inspection and replaced as Hidden Damage. New headlamps shall be adjusted to proper settings and the new lighting / installation shall be tested as part of the Pilot FAI to confirm compliance with appropriate illumination / safety standards.

Retarder indicator light shall be replaced with LED light, Dialight P/N 556 1303 809, or Authority approved equal. The connector on the bus wiring harness is to be replaced with a compatible 2 pin Weather Pac connector. The retarder light mounting hole diameter shall be increased as needed to install the larger diameter LED light.

The auxiliary coolant heater (Webasto) indicator light shall be replaced with a new LED light, Dialight P/N 556 1303 809, or Authority approved equal.

All reflective tape decals shall be replaced with new, New Flyer P/N 021180 and 021181, or Authority approved equal, upon completion of exterior painting.

All Dialight exterior LED lights are covered under a 12 year warranty for parts. Any Dialight LED with a warrantable failure shall be replaced with new under the Dialight warranty as part of the basic work. The Contractor is responsible for removing the Dialight lamps with a method consistent with maintaining the Dialight warranty.

2.2.2.1.2 Passenger Interior Lighting: All passenger interior fluorescent lighting shall be replaced with Pretoria LED lighting or Authority approved equal. Lens covers shall mask individual LEDs, and shall provide even light levels without “hot” or “dark” spots.

The new lighting / installation shall be tested as part of the Pilot FAI to confirm compliance with appropriate illumination / safety standards.

2.2.2.1.3 Engine Compartment Lighting: All engine compartment LED lighting will be cleaned and inspected for proper operation. Any lighting that is functioning improperly will be replaced under warranty, if covered, or addressed under Hidden Damage.

2.2.2.1.4 Driver Controls: The headlight high/low beam, hoodlum alarm, left directional and right directional switches shall be replaced with new. The floor mounted microphone switch shall be replaced with new. Accelerator pedals shall be replaced with new in line with OEM requirements as Basic Work.

Brake pedal and valve assemblies shall be replaced with new in line with OEM requirements as part of Basic Work.

The complete five position door controller assembly, including the selector lever, shall be replaced with new as part of Basic Work.

2.2.2.1.5 Driver's Area: Driver's windshield and side window sunshades shall be replaced with new. Front sunshade shall be NABI P/N 6332162 and the side sunshade shall be NABI P/N 6332163. Installation is subject to Authority approval and shall be reviewed at the FAI.

The overhead panels above the driver's seat have become detached from the support structure due to rivet failure on a number of vehicles. The contractor is responsible for removing all existing rivets and appropriately securing the panel to the structure using stainless steel rivets. This work is to be addressed as Basic Work on all buses.

2.2.2.1.6 Destination Signs: Front, rear and side destination signs shall be protected from incidental damage during all body work performed on the coach. The front destination sign compartment shall be thoroughly cleaned to remove dirt / dust.

2.2.2.1.7 Windshield Wipers: The windshield wiper assemblies shall be replaced complete with new to OEM specifications. Components to be replaced include but are not limited to wiper motors, transmissions, linkage, wiper arms, idlers, blades, hardware, etc. Windshield wiper operator control switches and control knobs, shall also be replaced with new.

2.2.2.1.7.1 Washer System, Windshield: The windshield washer system shall be restored to operating condition. The following components shall be replaced with new as part of Basic Work:

- Chamber, Diaphragm
- Tubing, Plastic
- Valve, Purge

- Tubing, Rubber
- Assy, Washer Control Valve

Other required components shall be replaced as Hidden Damage.

2.2.2.2 Other Operating Components: Other operating components, including the manual operator’s vent, gauges, indicator panel lights, instrumentation, switches, horn and horn button, and steering wheel requiring repair will be identified at the Departure Inspection and shall be addressed as Hidden Damage.

2.2.3 SEATING:

2.2.3.1 Passenger Seats: All seats shall be cleaned and scuffs and scratches in gel coat shall be repaired and/or buffed out as basic work. The cleaning and repair method / procedure shall be proposed by the Contractor and approved by the Authority.

Passenger seats and mounting track shall be inspected 100% to verify they are securely attached at the sidewall. Any seat rail attachments which are not properly secured shall be presented to the Authority’s Resident Inspector and addressed under Hidden Damage in line with a method approved by the Authority.

2.2.3.2 Driver's Seat: The driver's seat shall be removed and replaced with a new Recaro ERGO Metro 8H-01-722-VC11 or Authority approved equal. When identified on the Departure Inspection as being in good condition, the Contractor is responsible to set aside and return driver’s seats to the Authority in a reasonable time frame.

2.2.3.3 ADA Flip Seats: All ADA flip seats shall be tested for proper operation, and verified that they lock in both the “up” and “down” positions. Any inoperable or malfunctioning locking mechanism shall be replaced with new and addressed appropriately as Hidden Damage

2.2.4 WINDOWS: Passenger side windows, destination sign glass and driver's left-hand side window will be cleaned.

Both curb side and street side windshields have shown signs of “hazing” between the panes of glass. All windshields and gaskets shall be replaced with new as part of Basic Work. The Contractor shall submit an installation/sealing method to the Authority for approval.

Window glazing that is cracked or broken shall be replaced with new as identified during departure inspection and addressed under Hidden Damage. Damaged frames shall be repaired or replaced under “Hidden Damage”.

The five rear windows (three on the street and two on the curb side), as well as the five rear transom windows, shall have the existing graffiti protective film removed and

replaced with multi-layer vandal resistant surface, 3M Transit Film 1004, or approved equal as part of Basic Work. All graffiti protective film shall be installed in line with appropriate manufacturer’s recommended procedures.

Graffiti protective film on all other windows shall be replaced with 3M Transit Film 1004 if damaged, and shall be addressed under “Hidden Damage” at the discretion of the Authority. All new windows installed aft of the yellow standee line shall be equipped with 3M Transit Film 1004, or approved equal, polyester film.

All “Emergency Push Out” window latches and cables shall be lubricated. Operation and functionality of windows shall be confirmed in line with OEM recommendations. Any damaged or non-functioning latches, hinges, or transom window pistons shall be replaced with new as identified during departure inspection and addressed as Hidden Damage.

All transom and emergency push out window bulb seals shall be cleaned and appropriately lubricated to prevent sticking. Any missing / damaged seals shall be replaced under Hidden Damage.

2.2.5 ANCILLARY FEATURES

2.2.5.1 Passenger Assist Stanchions: Any broken stanchion supports shall be replaced as required and addressed as Hidden Damage.

All stanchion cup gaskets shall be replaced with new as part of Basic Work.

All passenger assist components, including brackets, clamps, screw heads, and other fasteners used on the passenger assists, that are replaced or removed during the overhaul process, shall be designed to be vandal-proof and designed to eliminate pinching, snagging and cutting hazards and free from burrs or rough edges, and inspected for proper securement and addressed as Hidden Damage.

2.2.5.1.1 Passenger Door Windscreens/Modesty Panels: All rear door passenger Plexiglas windscreens are to be replaced with new upgraded scratch resistant Plexiglas material, and will be reviewed during the Design Review.

Rear passenger modesty panels are to be inspected and cleaned, and if replacement is needed, shall be addressed under Hidden Damage.

2.2.5.1.2 Radio Box / Emergency Equipment Box: The exterior of both the radio locker and emergency equipment locker are to be cleaned and painted.

Due to the weight of the equipment and lack of support by the existing drawer slides and locks, the upper two trays inside the radio locker are to have all tray slides and locks replaced with a new upgraded slide/locking mechanism under Basic Work. The new slides and locking mechanisms shall be robust and able to properly support the weight of the installed equipment, and will be

reviewed during the pilot bus FAI. Any removed tray slide/lock that is still in good working condition is to be returned to the Authority.

2.2.5.2 Passenger Assist Straps: Existing hanging passenger straps shall be removed and replaced with New Flyer P/N 047520 or Authority approved equal. Six (three per side) hanging passenger straps, shall be installed in the wheelchair area as approved at the FAI. Two additional hanging passenger straps shall be installed in the exit door area in a location to be approved by the Authority.

2.2.5.3 Stop Request Chime: All Passenger stop request tape switches and stanchion switches shall be tested for correct operation. Defective switches shall be identified at the Departure Inspection, and shall be replaced with new and addressed as Hidden Damage.

2.2.5.4 Accessibility Provisions

2.2.5.4.1 Wheelchair Ramps: All wheelchair ramp assemblies shall be replaced 100% with a New Flyer OEM 1:7 slope ramp assembly or Authority approved equal. The Contractor shall make all necessary modifications to the wheelchair area structure in line with OEM recommendations to accommodate the new ramp. The Contractor shall develop appropriate procedures for this work.

2.2.5.4.1 Mobility Aid Accommodations: All wheelchair securement belts shall be replaced with new as basic work. Belts shall be replaced using American Seating P/Ns 136980000 (WHEELCHAIR, LARGE HOOK), 136851001 (WHEELCHAIR, SMALL HOOK), and 134615001 (BELT ASSY, LAP & SHOULDER), or Authority approved equals.

2.2.5.4.2 Mobility Aid Stop Request Chime: The under seat stop request tape switch in the wheelchair seating areas shall be replaced with a Tape Switch, horizontal 3" x 7" touch pad (with 18" lead, wheelchair symbol on face, complete with stainless steel mounting trim ring) Tape Switch P/N SP-1115-1, or Authority approved equal. The location of this switch shall be approved by the Authority as part of the design review process.

2.3.0 CHASSIS

2.3.1 PROPULSION SYSTEM:

2.3.1.1 Engine Cradle: Cradle mounted engine/transmission shall be removed. All cradle mounted components shall be removed from the cradle. The cradle shall be thoroughly cleaned, bead blasted or sanded, inspected for corrosion / cracks, and painted with corrosion inhibiting paint. All new hardware, bushings, and mounts shall be used.

Cracked, heavily corroded, or otherwise damaged engine cradles shall be brought to the attention of the Authority’s Resident Inspector and addressed as Hidden Damage.

2.3.1.2 Power plant:

2.3.1.2.1 Engine: The existing Cummins ISL07 diesel engine shall be removed and replaced by the Contractor with a remanufactured Cummins ISL07 diesel engine. The remanufactured engine shall be procured from an authorized Cummins dealer.

The Contractor is also responsible for installing a new, appropriate sized OEM dipstick on the remanufactured engine. (Reference Section 2.1.10.2)

All engine serial numbers (original and replacements) shall be tracked and documented in the Departure Inspection and in the Coach History Book to determine what engines are in each vehicle.

2.3.1.2.1.1 Engine Starter and Alternator: The current starter shall be replaced with a Mitsubishi gear-reduction starter P/N AM4479 (or Authority approved equal) on all buses. The current alternator shall be replaced with a new EMP Aircool 450 on all buses.

2.3.1.2.1.2 Engine Air Compressor: The existing engine mounted air compressor shall be replaced with the new, larger, 2 cylinder model, with a redundant cooling loop, Cummins P/N 5286681, or Authority approved equal. Any and all associated modifications (including a redundant cooling supply) required to integrate the new air compressor onto the engine and integrated into the bus will be the responsibility of the Contractor and selected engine remanufacturer, in line with section 2.1.8. The governor shall also be replaced with new, Bendix P/N 275491.

2.3.1.2.1.3 Engine Sensors: All engine sensors and corresponding wire harnesses shall be replaced 100% and covered under Basic Work.

2.3.1.2.1.4 Exhaust Gas Recirculation (EGR) Cooler: As part of the remanufactured engine the Authority requires that the current EGR cooler be upgraded with the improved robust vertical plate OEM design, Cummins EGR Cooler Kit P/N 4352444RX, per Cummins recommended Technical Service Bulletin - TSB140008.

2.3.1.2.1.5 Coolant Fill Port: The quick connect coolant fill port located under the interior engine hatch, under the rear bench seat, is to be relocated for easier access. The quick connect filling port is to be relocated so it can be accessed from the rear engine access door. The relocation of this coolant filling port shall be approved by the Authority as part of the design review process, and will be reviewed during the pilot bus FAI.

2.3.1.2.2 Transmission: All transmissions shall be removed and replaced by the Contractor with an OEM remanufactured Allison 4th Generation transmission, prognostics equipped but “disabled”. The transmission shall be procured from an authorized Allison transmission remanufacturer.

The Contractor is also responsible for installing a new, appropriate sized OEM dipstick on the remanufactured transmission. (Reference Section 2.1.10.2)

As part of the transmission remanufacturing, the integral hydraulic retarder shall be overhauled to Allison factory specifications. The vendor shall adjust the retarder to provide the first third of the retarder braking effort when the throttle pedal is released using retarder valve body control spring (Allison P/N 29529299) and O-ring (P/N 23019664). The retarder Accumulator shall also be overhauled to factory specifications, including the valve and solenoid assembly. The proposed re-manufacture specification/processes shall be subject to Authority approval.

Also included in the transmission remanufacturing, the Authority requires that both the retarder plug and transmission harness shall be replaced with new.

2.3.1.2.2.1 Transmission Oil Cooler: The transmission oil cooler shall be removed and replaced with new. All transmission cooler elbows, hoses, lines, hardware, and fittings shall also be replaced with new. Cooler lines shall be replaced with single length components.

2.3.1.2.3 Drive Shaft: The drive shaft assembly shall be rebuilt in line with OEM specifications.

2.3.1.2.4 Cooling System: The existing cooling system shall be retrofitted with a complete new cooling system, EMP MH-4 Mini Hybrid Thermal Management System or an Authority approved equal. The system shall have an electronically-controlled electric fan array and shall have demonstrated both fuel economy and power savings at no less than four major North American transit bus operators. The radiator and charge air cooler shall be of durable corrosion resistant construction. All coolant tubing/piping between EMP MH system and engine shall be replaced with new. The Contractor shall present to the Authority for approval the new system design and installation procedure for review during the design review process.

The contractor shall provide installation drawings for the EMP radiator including all hoses and mounting brackets/hardware. Both an electronic copy and six (6) paper copies of all Maintenance and Part Manuals for the EMP radiator cooling system shall be provided to the Authority.

2.3.1.2.5 Exhaust System: The exhaust system shall be overhauled with the replacement of all clamps, flex bellows connector, pressure sensors (including the exhaust back-pressure monitor assembly), temperature sensors, exhaust blankets, and the Diesel Particulate Filter (DPF) / Diesel Oxygen Catalyst (DOC) muffler assembly. Damaged mounting brackets shall be repaired / replaced as necessary as part of the Basic Work. Any OEM upgrades shall be brought to the attention of the Authority for review and approval. Damaged exhaust piping found shall be replaced under Hidden Damage.

2.3.1.3 Power Plant Mounting & Accessories: The engine compartment shall be thoroughly cleaned and the compartment interior inspected and treated for corrosion and minor damage as part of the basic work. See also section 2.2.1.2 – Structural Repair.

All engine compartment hoses and hardware shall be replaced with new in accordance with OEM specifications. Hoses shall be individually supported using stainless steel insulated p-clamps where appropriate. A minimum separation of ½” shall be present between hoses, and a minimum clearance of ½” shall be present between hoses and any part of the coach. Configuration shall be reviewed and approved as part of the Pilot Vehicle First Article Inspection.

All attic compartment coolant hoses and hardware shall be replaced with new in accordance with OEM specifications.

Bus-side engine wiring harness shall be cleaned, inspected, and tested. The transmission wiring harness shall be replaced. Unless otherwise specified, all damaged / non-functioning harnesses shall be replaced in accordance with OEM specifications under Hidden Damage.

2.3.2. AXLES:

2.3.2.1 Front Axle Assembly: Front axle assemblies shall be removed, cleaned, inspected, painted, and rebuilt to OEM specifications. The following front axle components shall be inspected and, if found out of specification, shall be brought to the attention of the Resident Inspector and replaced under Hidden Damage:

New Flyer P/N	Description
6340841	Beam, Front Axle
6313052	Left Hand Knuckle
6313056	Right Hand Knuckle
6337834	Steering Arm

All remaining front axle components (including all associated hardware) shall be replaced with new OEM components as part of Basic Work.

Front brakes shall be overhauled (reference section 2.3.5), including the replacement of all ABS sensors with new.

Overhaul procedures and contractor qualifications shall be submitted to the Authority for review and approval.

2.3.2.2 Rear Axle Assembly: A sample of the gear oil from each differential shall be obtained during the Contractor’s Conformed Inspection, and evaluated by an independent laboratory for metal shavings or other evidence of differential damage. Oil sample reports shall be presented to both the Authority’s Technical Project Manager and Resident Inspector for review.

Rear axle assembly shall be removed, cleaned, magnafluxed for cracks and weld integrity, inspected, and painted. The rear axle shall be disassembled and rebuilt to OEM specifications.

The following rear axle components shall be inspected and, if found out of specification, replaced under Hidden Damage:

New Flyer P/N	Description
6345758	Shaft, Axle, L.H.
6345759	Shaft, Axle, R.H.

Defective or non-repairable axle housings (P/N 6347683) will be replaced with new under Hidden Damage. Particular attention shall be paid to the radius rod mount threads.

All remaining rear axle components (including all associated hardware, as well as all differential vents and plugs) shall be replaced with new OEM components as part of basic work.

Rear brakes shall be overhauled (reference section 2.3.5) including the replacement of all ABS sensors with new.

Overhaul procedures and contractor qualifications shall be submitted to the Authority for review and approval.

2.3.2.2.1 Differential Carrier Assembly: Rear differential shall be drained and refilled with new synthetic gear oil (reference Attachment 3). A copy of the laboratory oil report shall be included in the Coach History Record. If evidence of differential damage is found, it shall be presented to the Authority’s Technical Program Manager and Resident Inspector for evaluation and appropriate direction. Any action beyond draining, refilling and inspection of the oil shall be addressed as Hidden Damage. If replacement is needed, a remanufactured differential assembly will be used.

2.3.2.3 Hubs: All hubs shall be rebuilt with new components, including rear hub planetary gears, bearings and races, seals, gaskets, washers, wheel studs, nuts and associated hardware. Front wheel studs shall be New Flyer P/N 6313127 (MBTA04595002). Rear wheel studs shall be New Flyer P/N 6389830

(MBTA04545013). Front and rear lug nuts shall be New Flyer P/N 103603NFA (MBTA04595020).

2.3.2.3.1 Hubodometer: Hubodometers shall be replaced with new Veederroot P/N 777717-520 or Authority approved equal.

2.3.3 SUSPENSION:

2.3.3.1 Front Suspension: The front suspension shall be rebuilt in line with OEM specifications. All torque / radius rods, shock absorbers, shock absorber bushings and hardware, bellows assemblies, bumpers, and hardware shall be replaced with new. Shock absorber mounts and bellows plates shall be repaired or replaced as necessary (and addressed as Hidden Damage), to bring the front suspension to OEM specifications. All fasteners are to be torqued to OEM specifications.

2.3.3.2 Rear Suspension: The rear suspension shall be rebuilt in line with OEM specifications. All torque / radius rods, shock absorbers, shock absorber bushings and hardware, bellows assemblies, bumpers, and hardware shall be replaced with new. All rear upper shock mounts (P/N 277149 and 277150) and associated hardware shall be replaced with new.

The rear axle cross tube assembly (NF P/N 244508) and rear suspension cross brace members (NF PN 268540 & 237411) as well as all associated hardware shall be replaced with new.

The rear radius rod mounting points that are cracked, worn, or damaged shall be brought to the attention of the Authority’s Resident Inspector and addressed as Hidden Damage.

2.3.4 STEERING: The power steering pump shall be replaced with new. All hoses shall be replaced and properly routed and secured with p-clips or Authority approved alternative method. Power steering filters shall be replaced with new. Steering fluid reservoirs shall be inspected for leaks and corrosion. Steering fluid reservoirs shall be cleaned (interior and exterior), and addressed as needed.

All power steering lines, fittings, and connections shall be inspected for leaks, corrosion, and other damage. Fittings exhibiting surface corrosion shall be cleaned of corrosion and treated with corrosion resistant paint, Extend or Authority approved equal, as part of basic work. Any significant corrosion or other damage to fittings and lines shall be brought to the attention of the Resident Inspector and addressed as Hidden Damage. The power steering fittings at the steering gear are significantly corroded and must be replaced as part of basic work. In order to minimize impact to the balance of the system, the fitting and an appropriate section of piping adjacent to it shall be replaced with a “jumper” section comprised of stainless steel piping and fittings. The new configuration shall be submitted for Authority review and approval as part of the design review process.

New drag link assemblies and tie rod assemblies are to be installed. The coach shall be aligned to OEM specifications (all wheel alignment). The steering gear shall either be new, or be rebuilt by the OEM to OEM specifications. The horizontal steering shaft, vertical steering shaft (from mitre box to steering column), and mitre box shall be replaced with new to OEM specifications.

The steering column shall be replaced to OEM specifications. Any damaged steering column covers shall be replaced under Hidden Damage.

A front end alignment shall be performed on the bus to OEM standards. The Contractor shall provide an alignment procedure to the Authority for review.

2.3.5 BRAKES

2.3.5.1 Front Brakes: All components of the front brake system (including hardware) shall be replaced with new OEM components. Brake drums shall be replaced with NF (MANN) P/N 6312397. Brake shoes shall be replaced with NF P/N 6312396. Brake linings shall be replaced with new Brake Pro (P/N FT1234656DU) or Marathon (P/N KVT 4656DU).

Front brake chambers shall be replaced with new NF P/N 249869 (Bendix P/N 5015153KO39650). The front curb side slack adjuster shall be replaced with Haldex P/N 419-79225. The front street side slack adjuster shall be replaced with Haldex P/N 419-79226.

2.3.5.2 Rear Brakes: All components of the rear brake system (including hardware) shall be replaced with new OEM components. Brake drums shall be replaced with NF P/N 6312400. Brake shoes shall be replaced with NF P/N 6312399. Brake linings shall be replaced with new Brake Pro (P/N FT1234657DU) or Marathon (P/N KVT 4657DU).

Rear brake chambers shall be replaced with new, rear curb side Haldex P/N KSM3060GCS46175, and rear street side Haldex P/N KSM3060GCS46176. The rear street side slack adjusters shall be replaced with Haldex P/N 419-79772. The rear curb side slack adjusters shall be replaced with Haldex P/N 419-79772.

2.3.5.3 Air System: All air hoses comprising the bus air system shall be inspected and replaced with new if required and addressed as Hidden Damage. No air hose splicing is allowed unless specifically approved by the Authority. The rubber hoses connecting the brake valves to the brake chambers on both front and rear axles shall be replaced with new OEM hoses and addresses as Basic Work.

Any pre-existing airline splices shall be brought to the attention of the Authority and Resident Inspector, and if needed, replaced under Hidden Damage.

All air system valves, including but not limited to: brake system valves, modulator valves, leveling valves, kneeling valves, kneeling recovery valves, check valves, etc. shall be replaced with new OEM valves.

Leveling valve linkages shall be properly configured in line with OEM instructions to prevent “flipping” in service.

The existing air dryer shall be replaced with a new Twin Tower air dryer assembly, Bendix AD9 or Authority approved equal.

Flexible air hoses shall meet material requirements of SAE Standard J844-Type 3B for nylon tubing if not subject to temperatures over 200° F. Accessory and other non-critical lines may use Type 3A tubing. Nylon tubing shall be installed in accordance with the following color-coding standards:

- | | |
|------------|--------------------------------------|
| a) Green | Indicates primary brakes and supply |
| b) Red: | Indicates secondary brakes |
| c) Brown: | Indicates parking brake |
| d) Yellow: | Indicates compressor governor signal |
| e) Black: | Indicates accessories |
| f) Blue: | Indicates suspension. |

Lines shall be supported to prevent movement, flexing, tension strain, and vibration at no more than 2-foot intervals, and if replaced, the securement method shall be inspected by the Resident Inspector.

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

2.3.5.3.1 Air Tanks: All air tanks shall be inspected, cleaned, and drained as part of basic work. If found to be leaking, tanks shall be replaced as required under Hidden Damage. All air tank drain valves/petcocks shall be replaced with new as part of Basic Work.

2.3.5.3.2 Air Leak Test: Production buses shall be Air Leak Tested for 8 hours and air pressure will not be allowed to drop more than 10 psi.

2.3.6 GENERAL CHASSIS:

2.3.6.1 Wheels & Tires:

2.3.6.1.1 Wheels: All six (6) rims on each bus shall be replaced with new. Rims shall be ten hole ventilated tubeless hub piloted and shall be integral formed steel drop center construction. Rims shall be Accuride P/N 28440PKBLK21, or Authority approved equal. Rims shall be powder coated black with a paint thickness of no greater than 3.5 mils on all wheel mating/mounting surfaces.

Wheel rim paint thickness shall be certified by the wheel rim manufacturer. The Contractor is responsible for auditing / verifying the paint thickness at an appropriate interval, utilizing industry standard testing methodology. The Authority reserves the right to verify wheel rim paint thickness at any time.

All removed rims shall be returned to the Authority.

2.3.6.1.2 Tires: Two new tires will be provided by the Authority for use on the front axle of each coach. The four tires for the rear axle shall be selected by the Contractor from tires removed on production coaches.

All six tires shall be mounted / remounted and balanced in accordance with the manufacturer's recommended practices. All appropriate safety precautions shall be taken for mounting and inflating tires.

The Contractor is responsible for tracking and returning all tires to the Authority.

2.3.6.1.3 Valves: All valves and valve stems shall be replaced with new. High temperature valves and seals shall be used, Dill Air Controls P/N TR570E14GNC, and alligator style inflate through valve caps shall be installed.

2.3.6.2 Bumper System:

2.3.6.2.1 Front and Rear Bumpers: Front center and corner bumper assemblies shall be inspected for damage and replaced under Hidden Damage.

Rear bumper assemblies shall be replaced with new, including new mounting hardware, under Basic Work. Authority approved insulating material shall be installed between the bumper and the bumper mount to prevent corrosion.

2.3.6.2.2 Skid Plates: The bolted on skid plate on the curb and street side shall be replaced with new, and installed with new mounting hardware.

2.3.6.2.3 Bike Rack: The bike racks are displaying significant rust and corrosion on the framing. All bike rack assemblies are to be replaced with a new *Byk-Rak (P/N B403-2G)*, *Sportworks (NF P/N 296706)*, or Authority approved equal, as part of Basic Work.

2.3.6.3 Electrical System: All relays, circuit breakers, and fuses located on the vehicle shall be replaced with new.

All ground studs on the vehicle shall be cleaned, inspected, and reassembled using new hardware. Dielectric grease shall be applied to all ground studs after reinstallation.

All terminals and connections in battery compartment, auxiliary electrical compartment, and engine compartment shall be cleaned, inspected, and coated with dielectric grease. The 24V terminal block in the engine compartment shall be replaced with new.

Any other terminals blocks, studs, electrical junctions, etc. shall be inspected and if requiring replacement, will be addressed under Hidden Damage.

All speakers must be tested to verify proper functionality. Speakers found to be not functioning properly shall be replaced under Hidden Damage.

The Contractor shall confirm that the Vansco multiplex system software is configured to the latest program revision. The Authority will provide the latest configuration program module to the Contractor for installation if required.

All Vansco modules shall be cleaned and inspected. All fuses on the modules shall be replaced and the modules shall be tested to confirm proper operation. Any fuse covers found to be missing shall be replaced under Hidden Damage. Any module found defective shall be replaced as Hidden Damage. All harness pin connections shall be inspected. When re-assembled, harnesses shall be properly routed to avoid strain on the connections.

2.3.6.4 Batteries: Batteries shall be replaced with new AGM Glass Mat, 1400 CCA, or Authority approved equal.

Battery trays shall be modified / replaced to accommodate the new AGM Glass Mat 1400 CCA batteries as part of Basic Work. The modified/new battery tray design shall be presented to the Authority for approval during the design review process.

All cables associated with the battery and charging system shall be replaced to accommodate the new stud and SAE battery system terminal layout. This includes the connections on the outside of the supercapacitor box, and **excludes** connections internal to the supercapacitor box. The new battery cable installation shall be presented for approval during the design review process.

The equalizer shall be replaced with new Vanner P/N 70-100, 100a Equalizer. All connectors shall be properly rated for the application. The proposed replacement connectors shall be reviewed and approved as part of the design review process.

2.3.6.4.1 Supercapacitor: The Contractor shall service/clean the supercapacitor in line with OEM specifications. The Contractor is responsible for ensuring that all appropriate safety steps are followed when handling the vehicle electrical system, supercapacitor, etc. Due to the potential safety implications of improper handling of the supercapacitor, this issue shall be discussed at the pre-production meetings.

2.3.6.5 NFI “Battery Management System”: The vehicle shall be retrofitted with the New Flyer “Battery Management System”. As part of the Design Review process, the Contractor shall develop an installation and test procedure for the Battery Management System.

Included in the installation of the new Battery Management system, the master run switch circuit will also need to be replaced. The existing master run circuit has constant power, and this will counter act the purpose of the Battery Management system.

The Contractor is responsible to work with New Flyer for appropriate system integration support and installation/debugging support as required on the Pilot Bus.

2.3.6.6 Fire Suppression System: The fire detection/suppression system shall be refurbished to the Amerex OEM specifications. All fire detection thermostats shall be replaced. Replacement thermostats shall be manufactured by Kiddie Fenwall only, and shall be confirmed to be appropriately temperature rated and waterproof. Fire suppression nozzles shall be replaced with new. The agent dispersal system shall be blown out. Nozzles shall be fitted with new dust caps. New end of line modules shall be installed.

The agent canister shall be removed, cleaned, evacuated and recharged in accordance with the OEM's 6 year re-certification specifications and procedures. The agent canister must be tagged and have an additional decal affixed to the tank per the certification requirements, in such a way that the certification is easily visible without removing the tanks from the vehicle. The actuator shall be replaced with new.

Appropriate system certification documentation / test results shall be provided in the coach history book.

Fire suppression system refurbishment procedure shall be submitted to the Authority for review and approval.

2.3.6.7 Camera System Upgrade: The existing Safety Vision security camera system shall be removed from the vehicle and the equipment returned to the Authority.

The Contractor shall install all wiring harnesses which are required for the installation of the Minuteman Security camera system. The camera system will be installed at a later date by the Authority, and is not part of this program. The Contractor shall install appropriate protective / cosmetic "blank" plates over wiring harness locations.

As part of the Pilot Bus program, the Contractor shall work with Minuteman Security to develop appropriate installation procedures including the definition of camera locations. In addition, the Contractor shall work with Minuteman Security to develop an appropriate test procedure and testing modules to validate the installation of harnesses as part of the vehicle testing / inspection process.

2.3.7 INTERIOR CLIMATE CONTROL: The HVAC system shall be overhauled, inspected, and tested in line with OEM recommendations by appropriately qualified personnel as part of basic work. Certifications for all personnel working on the HVAC system must be provided to the Authority by the Contractor.

The "L-Bracket" inside the curb side engine access door that supports cooling and refrigerant lines shall have additional "U-bolt" clamps attached to the lines to reduce vibration and deter line failures. Approximately 50% of the fleet have already had the additional clamps installed. The remainder of the fleet shall be upgraded to the standard of these buses.

In conjunction with the HVAC system overhaul, all corroded and rusted refrigerant fittings and bullseye sight glasses in the attic compartment are to be replaced with new.

Refer to Attachment 5 for detailed overhaul requirements and supplementary documentation.

2.3.8 DESTINATION SIGN UPGRADE: The Contractor shall modify the existing Twin Vision Destination signs to incorporate the Twin Vision “Fast Upload Option” (with USB) on all buses. The Contractor shall purchase and install the Twin Vision Sign System Operator’s Control Unit (OCU) Kit (P/N 906-2111-000). In addition, the Contractor shall provide ten (10) Sandisk 8GB USB “thumb drives”, or Authority approved equal.

Existing OCU’s have a residual value if returned to Twin Vision. An appropriate credit shall be documented and provided to the Authority (Reference Section 2.1.2.7).

2.3.9 AUXILIARY COOLANT HEATER: The auxiliary coolant heater assembly (Webasto P/N 5000102B) shall be replaced with new in line with OEM specifications. All hoses, lines, fittings, valves, and hardware associated with the auxiliary coolant heater shall be replaced with new. The fuel line shall be upgraded to an appropriate stainless steel braided line which complies with all industry standards.

The auxiliary coolant heater (Webasto) indicator light shall be replaced with LED light, Dialight P/N 556 1303 809, or Authority approved equal.

2.4.0 OPTIONAL WORK SCOPE

2.4.1 GENERAL: Work described in the following sections shall be either included or excluded from the Contract work scope at the Authority’s option. The determination whether to include some or all of this “Optional Work Scope” shall be made by the Authority at the time of Contract Award.

Changes made to the “Optional Work Scope” following the initial determination made at the time of Contract Award will be addressed through the Change Order process.

2.4.2 AUTOMATIC PASSENGER COUNTER (APC): The vehicles shall be retrofitted to OEM standards with an Automatic Passenger Counter system (APC). A new APC system, manufactured by Urban Transportation Associates (UTA) or approved equal, shall be installed and integrated on all buses.

The APC system monitors passengers entering and exiting at both front and rear doors by means of a pair of infrared (IR) light beams mounted horizontally across the vehicle doorway. Entering and exiting counts are collected in the SmartSensor module and a formatted message is transmitted via a RS232 serial link to the vehicles existing GPS/AVL location system. The merged APC data is then sent to the APC server through a Wi-Fi connection. The APC equipment required for this system installation shall include the SmartSensor RS232 Interface (P/N 6P232), Cable Set (P/N CS-SLV), and

APC Sensors for 2 doors (P/N RS-1). The APC OEM shall provide appropriate system integration support as well as installation/debugging support as required.

2.4.3 EXTENDED WARRANTY - ENGINE: The Authority requires a proposal for an additional two (2) year extended warranty on all remanufactured Cummins ISL7 diesel engines. (Refer to Section 4.2.5)

2.4.4 EXTENDED WARRANTY - TRANSMISSION: The Authority requires a proposal for an extended warranty for an additional two (2) years on all remanufactured Allison transmissions. (Refer to Section 4.2.5)

SECTION 3.0

QUALITY ASSURANCE, TESTING & DOCUMENTATION PROVISIONS

3.1.0 DEPARTURE INSPECTION : A detailed Departure Inspection shall be conducted (by an MBTA representative and at the Contractor’s option, with the participation of a Contractor representative) on each of the MBTA’s New Flyer ECD buses at the Authority’s Lynn and Quincy garages (or other appropriate facility) prior to release for shipment from the MBTA. To the maximum extent possible, all known extra work, (beyond the basic work defined by the Technical specification) , Hidden Damage, shall be identified on each bus prior to shipment from the MBTA. The Authority shall develop an appropriate check list / procedure and documentation package including photographs. The Contractor is encouraged to provide feedback / input to help optimize this documentation process and form.

3.2.0 CONTRACTOR’S IN-PLANT QUALITY ASSURANCE REQUIREMENTS:

3.2.1 QUALITY ASSURANCE ORGANIZATION (QAO): The Contractor shall establish and maintain an effective in-plant, QAO. The QAO shall be a specifically defined organization with dedicated staff, and shall report directly to the Contractor's top management.

3.2.1.1 Control: The QAO 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.

3.2.1.2 Authority And Responsibility: The QAO 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 overhaul of the transit coaches.

3.2.2 QAO FUNCTIONS: The QAO shall include the following minimum functions.

3.2.2.1 Work Instructions: The QAO shall verify by inspection and/or measurement that all work is performed in accordance with appropriate, task-specific work instructions, to ensure that the overhauled vehicle meets all prescribed requirements.

3.2.2.2 Inspection Instructions: The QAO shall conduct all required inspections and testing to ascertain the overhauled vehicle meets all prescribed requirements.

3.2.2.3 Records Maintenance: The QAO 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 or other members of the Authority’s project team. Inspection and test records for this procurement shall be available for a minimum of three (3) years after inspections and tests are completed.

3.2.2.4 Corrective Action: The QAO shall detect and promptly assure correction of any conditions that may result in the production of defective transit coach(es). The QAO shall investigate the root cause of recurring defects discovered by the QAO, the Authority’s Resident Inspector, or the MBTA inspection team in Boston.

Based on the outcome of thorough root cause investigations, the QAO is responsible to develop and implement appropriate Corrective Action(s). Potential Corrective Actions include but are not limited to: addressing vendor quality issues, employee training / retraining, revision / clarification of workshop procedures, development of improved tooling / fixtures, etc.

Root cause investigation and Corrective Actions shall be appropriately documented and shall be reported to the Authority in a timely manner.

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

3.2.3.1 Configuration Control: The Contractor shall maintain drawings, overhaul procedures, and other documentation that completely describe the overhaul activities. The QAO shall verify that each bus and all equipment is overhauled in accordance with these controlled drawings, procedures, and documentation.

3.2.3.2 Measuring and Testing Facilities: The Contractor shall provide and maintain the necessary gauges and other measuring and testing devices for use by the QAO to verify that the coaches conform to all specification requirements. These devices shall be calibrated at established periods against certified measurement standards that have known valid relationships to national standards.

3.2.3.3 Safety Practices and General Workshop Procedures: The Contractor shall provide the Authority with all appropriate Safety Practices and General Workshop Procedures which will be in effect throughout this program. Examples include but are not limited to: rooftop equipment hoisting, fall restraints, vehicle jacking and securement, high voltage safety, etc.

3.2.3.4 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 verified for accuracy at formally established intervals and adjusted, replaced, or repaired as required to maintain quality.

3.2.3.5 Equipment Use By Resident Inspectors: The Contractor’s gauges and other measuring and testing devices shall be made available for use by the Resident Inspectors to verify that the coaches 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.

3.2.4 CONTROL OF PURCHASES: The Contractor shall maintain quality control of purchases.

3.2.4.1 Supplier Control: The Contractor shall require that each supplier maintains a quality control program for the services and supplies that it provides. The Contractor's QAO 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.

At the Authority's request, the Contractor shall coordinate communications, conference calls, or meetings between the Authority, the Contractor, and any sub-suppliers. The Contractor shall coordinate and/or participate in source inspection(s) of sub-supplier parts, processes, and facilities as appropriate and at any time requested by the Authority.

3.2.4.2 Purchasing Data: The Contractor shall verify that all applicable specification requirements are properly included or referenced in purchase orders of articles to be used in this program.

3.2.4.3 Authority Supplied Materials: The Contractor's materials control system must be capable of identifying and tracking materials supplied by the Authority for the project. Each component shall be specifically identified by which bus it has been installed on. The contractor shall provide an explanation of this system and a proposed tracking method as part of the design review process.

3.2.5 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 formally documented work instructions, adequate production equipment, and (if necessary) special working environments.

3.2.5.1 Completed Items: A system for final inspection and test of buses that have completed the overhaul program shall be provided by QAO and included in the coach history book. It shall demonstrate the overall quality of each completed bus.

3.2.5.2 Control of Transferred Materials: In order to maintain a production flow, it is acceptable for the contractor to transfer materials from one vehicle to another if new or refurbished parts are not immediately available. This movement of material shall be tracked / documented by the contractor, and an updated report of this transferred material shall be provided to the Authority on a monthly basis.

3.2.5.3 Nonconforming Materials: The QAO shall monitor the Contractor's system for controlling nonconforming materials. The system shall include procedures for identification, segregation, and disposition.

3.2.5.4 Statistical Techniques: Statistical analysis, tests, and other quality control procedures shall be used when appropriate in the quality assurance processes.

3.2.5.5 Inspection Status: A system shall be maintained by the QAO for identifying the inspection status of components and completed transit coaches. Identification shall include cards, tags, or other normal quality control devices.

3.2.5.6 Major Component Tracking: The Contractor is responsible for tracking serial numbers of major components / systems installed on all vehicles using the tracking document provided in Attachment 4. This tracking document shall be updated and included as part of the regular project status updates. Modifications to the tracking requirements (additional systems / parts) shall be made at the discretion of the Authority.

3.2.6 INSPECTION SYSTEM: The QAO 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.

3.2.6.1 Inspection Personnel: Sufficient trained inspectors shall be used to ensure that all materials, components, and assemblies are inspected for conformance with the qualified coach design.

3.2.6.2 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 Authority's coaches. 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 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, the Authority shall approve the modification, repair, or method of correction to the extent that the contract specifications are affected.

3.2.6.3 Quality Assurance Audits: The QAO shall establish and maintain a quality control audit program. Records of this program shall be subject to review by the Authority.

3.2.7 INSPECTIONS

3.2.7.1 Receiving Inspection and Inspection Stations: Upon receipt of buses at the Contractor's facility, a detailed receiving inspection shall be jointly conducted (MBTA Inspector - Contractor) to review the Departure Inspection documentation, identify any shipping damage and identify any additional discrepancies noted at that time. A Final Conformed Receiving Inspection Report shall be prepared by the Contractor and submitted to the Authority for Approval within 1 week of vehicle arrival at the Contractor's facility. At this time, estimates for any Hidden Damage identified by the Contractor shall be presented to the Authority for review and approval (reference section 2.1.4.2). The Approved Final Receiving Inspection Report shall be included in the Coach History Book.

A sample Receiving Inspection Report and a sample Conformed Inspection Report shall be provided to the Authority for review and approval as part of the design review process.

Inspection stations shall be at the best locations to provide for the work content and characteristics to be inspected. Stations shall provide the facilities and equipment to inspect structural, electrical, hydraulic, and other components and assemblies for compliance with the design requirements.

Stations shall also be at the best locations to inspect or test characteristics before they are concealed by subsequent fabrication or assembly operations. These locations shall include at a minimum underbody structure completion, body framing completion, body prior to paint preparation, water test before interior trim and insulation installation, engine installation completion, underbody dress-up and completion, coach prior to final paint touchup, coach prior to road test, and coach final road test completion. A full listing of inspection stations shall be prepared by the Contractor and provided to the Authority for review and approval as part of the design review process.

3.2.7.2 Resident Inspector: The Authority shall be represented at the Contractor's plant by Resident Inspector(s), who shall monitor the re-manufacturing of the transit coaches. The Resident Inspector shall be authorized to approve the pre-delivery acceptance tests and release the coach for delivery. The presence of these Resident Inspectors in the plant shall not relieve the Contractor of its responsibility to meet all of the requirements of this procurement. Upon request to the quality assurance supervisors, the Resident Inspectors shall have access to the Contractor's quality assurance files related to this procurement. These files shall include but not be limited to drawings, assembly procedures, material standards, parts lists, inspection processing and reports, and records of defects.

The initial arrival of the Resident Inspector at the Contractor's facility shall be at the discretion of the Authority. In order to maximize the effectiveness of the Resident Inspector's time, certain milestones should be completed prior to the Inspector's arrival. These requirements shall be coordinated with the Contractor during the initial project meetings. During the initial teardown phase of the project and/or at other parts of the project, the Authority may substitute alternate personnel for the Resident Inspector at their discretion.

The Contractor shall provide appropriate office space for the Resident Inspectors in close proximity to the final assembly area. This office space shall be equipped with desks, outside and interplant telephones, file cabinet, chairs, internet access, and clothing lockers sufficient to accommodate the resident staff. The office shall be appropriately heated in the winter and air conditioned in the summer (Ref. C4.06).

3.3.0 TESTING REQUIREMENTS

3.3.1 GENERAL

The Authority may direct the contractor to demonstrate, by physical test, conformance to any requirement in the specification.

At the Authority's discretion, test reports that demonstrate full compliance on identical configuration components, may be submitted by the contractor for Authority acceptance.

A Test Plan and Test Schedule shall be presented for Authority review and approval as part of the design review process. When changes to the Test Plan and Test Schedule are made, updates shall be submitted to the Authority.

3.3.2 FIRST ARTICLE INSPECTION (FAI)

The First Article Inspection (FAI) involves the physical examination, internal / independent testing of, and acceptance by the Authority of an initial part, major assembly, subassembly, system, subsystem, apparatus or material, manufactured or assembled by either the Contractor or Subcontractors. Although the exercise of FAI shall be at the Authority's option, the Contractor shall assume that the Authority shall subject all major overhauled systems, including the first bus to an FAI and acceptance process.

The FAI permits the Technical Project Manager to evaluate each of the major systems whether overhauled by the Contractor or by a Subcontractor. If the FAI is of a component that the Contractor is purchasing, rather than manufacturing, the FAI is intended to evaluate form, fit, and function of the component before installation into the next level assembly. The FAI is usually the first point at which maintainability of the component can be evaluated, inasmuch as it is the first point at which relationships between elements can be appreciated. The Technical Project Manager may approve the design that is revealed at the FAI, or may require changes in order that the component can meet the requirements of the Contract.

At the Authority’s discretion, the FAI for purchased components / assemblies may include a source inspection of the Subcontractor / supplier’s facilities.

The FAI is also used to establish the quality level of workmanship that will be maintained for the balance of the program. The level is established by the Technical Project Manager.

3.3.3 TEST PROGRAM PLAN, TEST PROCEDURES, AND TEST REPORTS

The Contractor is required to provide a detailed Test Plan as part of the design review process. This Test Plan shall describe how the Contractor will validate the satisfactory completion of the bus through testing, and shall contain a listing of all tests to be conducted by the Contractor (or sub-contractors).

In order to be accepted as proof that the overhauled vehicles have met the requirements of the contract, all testing must be conducted in accordance with written Test Procedures and documented on an acceptable Test Report by the QAO or an appropriate designee. Test Procedures shall be submitted to the Authority for review and approval a minimum of one week prior to the anticipated start of the relevant testing.

Within one (1) week after successful completion of each test, a report shall be provided by the Contractor which summarizes the test results, analyses, and corrective actions. Reports shall include photographs, charts, and additional data to support the test results. Reports must include a statement that certifies conformance to specified requirements. Should the Authority find the data submitted not to be acceptable, the Contractor shall complete the tests as directed by the Authority with no increase in contract cost or extension of the delivery schedule. Notations of the successful completion of each test shall be included in the appropriate Coach History Book. (see 3.4.2 Coach History Book).

3.3.4 PILOT BUS TESTS

The Pilot Bus shall undergo qualification testing in order to verify that the requirements of this Specification are being met.

3.3.4.1. Pilot Bus Tests at the Contractor’s Facility: In addition to all specified pre-delivery testing, the completed Pilot Bus shall be dynamometer tested to certify engine and transmission ratings and confirm proper brake balancing.

3.3.4.2 Pilot Bus Tests at the Authority: The pilot coach will be tested at the Authority for one week. While instrumented and loaded, the pilot coach will be tested by the Authority to verify that the performance requirements in this Specification are being achieved. Interfaces with Authority-provided equipment will also be tested at this time. The Authority will approve the pilot coach after it has

successfully passed an Authority audit of its conformance with the specified configuration and has successfully completed the pilot testing activities.

3.3.5 PRE-DELIVERY TESTS: The Contractor shall conduct acceptance tests at its plant on each coach following completion of overhaul and before delivery to the Authority. These pre-delivery tests shall include visual and measured inspections, as well as testing the total coach operation. The tests shall be conducted and documented in accordance with written test procedures, approved by the Authority.

The pre-delivery tests shall be scheduled and conducted with a minimum of twenty-four hours' notice so that they may be witnessed by the Resident Inspectors, who may accept or reject the results of the tests. Tests must be conducted during regular business hours. The Resident Inspector will make all reasonable efforts to accommodate the Contractor's schedule. However, at the Authority's request, the Contractor shall repeat or delay testing to allow the Resident Inspector to witness and appropriately document results. 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 available for inspection by the resident inspectors, using a pit or coach hoist provided by the Contractor. A hoist, scaffold, or elevated platform shall be provided by the Contractor to easily and safely inspect coach roofs and roof mounted equipment. Delivery of each coach shall require written authorization of the Resident Inspector. Authorization forms for the release of each coach for delivery shall be provided by the Contractor. An executed copy of the authorization shall accompany the delivery of each coach and shall be included in the Coach History Record.

3.3.5.1 Inspection – Visual and Measured: Visual and measured inspections shall be conducted with the coach in a static condition. The purpose of the inspection testing is to verify that overhauled components are included and are ready for operation.

3.3.5.2 Water Test: As part of the final inspection of the body exterior work, each bus must undergo a water test proposed by the Contractor and approved by the Authority. This water test shall replicate the pressure and direction of water flow seen during operation and cleaning with the bus wash equipment in use at the Authority. Each bus shall be tested to assure that the body, floor, windows, doors, lamps, destination signs, and other openings do not admit water into the interior of the bus or into any compartments covered by exterior doors. Underside tests shall be conducted to simulate water splash by tires and other objects as a result of heavy rain. Buses that fail the test shall be repaired and retested until they pass.

3.3.5.3 Air Leak Down Test: Each bus will be tested to verify the integrity of the air system. Once the vehicle air system has been fully charged, the vehicle shall be monitored for 8 hours. Within that time period the air system pressure shall not drop more than 10 psi. Buses that fail the test shall be corrected and retested by the Contractor until they pass.

3.3.5.4 Alignment / Turning Radius Verification: The Contractor shall ensure the proper axle alignment of all the overhauled vehicles to OEM specifications. The Contractor shall perform a complete alignment on all buses and provide the results in the Coach History Book.

The Contractor shall also verify the turning radius of the vehicle is in compliance with OEM specification requirements. The Contractor shall perform a turning radius test on all buses. Turning radius testing must be conducted on the completed coach and result included in the Coach History Book.

3.3.5.5 Brake/Stopping Test: The contractor shall verify that the bus brake systems operate as required by Massachusetts General Laws. The braking system shall be capable of stopping the bus within a distance of 25 feet when moving at a speed of 20 miles per hour on a dry, level road. The emergency brake system shall be capable of stopping the bus within a distance of 60 feet when moving at a speed of 20 miles per hour.

3.3.5.6 Total Coach Operation: Total coach operation shall be evaluated during road tests. The purpose of the road tests is to observe and verify the operation of the coach as a system and to verify the functional operation of the subsystems that can be operated only while the coach is in motion, as well as those subsystems which are typically operated in revenue service (lights, stop requests, doors, etc.).

At the time of the road test, the vehicle shall be evaluated for excessive noise during operation. The noise evaluation shall include but is not limited to inappropriate and abnormal engine, transmission, and axle noise; rattling and squeaking; etc.

Prior to release, each coach shall be driven for a minimum of fifty (50) miles, the final fifteen (15) miles of which shall be the road performance test. Observed Defects shall be recorded on the test forms. The coach shall be retested when Defects are corrected and adjustments are made. This process shall continue until Defects or required adjustments are no longer detected. Results shall be pass/fail for these coach operation tests.

3.3.5.7 Verification of Critical Torques: The Contractor shall supply a torquing procedure including a list of all Safety Critical torque locations and values and include this inspection in the Coach History Book (Section 3.4.2).

3.3.5.8 Other Tests: In order to ensure the overhauled coach is in compliance with the specification requirements, additional testing shall be required. This additional testing includes but is not limited to testing of: Paint Gloss / Thickness, Battery / Electrical System, ABS Systems, Fire Suppression System, HVAC System, Fastener Torque Values, and Wheel Torque Verification.

3.3.6 POST-DELIVERY TESTS: The Authority shall conduct acceptance tests on each delivered coach including all testing required by the Authority’s safety oversight agency. These tests shall be completed within one week after coach delivery. The purpose of these tests is to identify Defects that have become apparent between the time of coach release and delivery to the Authority. The post-delivery tests shall include visual inspection and coach operations.

Coaches that fail to pass the post-delivery tests are subject to non-acceptance. The MBTA shall record details of all Defects on the appropriate test forms and shall notify the Contractor of non-acceptance of each coach within one week after completion of the tests. The contractor is responsible for the repair of all work scope defects in a timely manner.

3.3.6.1 Visual Inspection: The post-delivery inspection is similar to the inspection at the Contractor's plant and shall be conducted with the coach in a static condition. Any visual delivery damage shall be identified and recorded during the visual inspection of each coach.

3.3.6.2 Coach Operation: Road tests will be used for total coach operation similar to those conducted at the Contractor's plant. In addition, the Authority may elect to perform chassis dynamometer tests. Operational deficiencies of each coach shall be identified and recorded.

3.4.0 DOCUMENTATION

3.4.1 DRAWING AND DATA APPROVAL PROCESS

The Authority will disposition drawings as "Approved", "Conditionally Approved", "Not Approved", or "Approval Not Required" within one (1) month after acknowledged receipt. In the case of a “Conditionally Approved” or “Not Approved” disposition, the Authority shall note the required changes. The Authority will respond to an address within the United States designated by the Contractor. If more than one drawing is submitted at a time, the drawings shall be listed in the transmittal according to numerical drawing sequence.

Coach framing structure drawings and computations requiring review of the stress analysis will be reviewed and dispositioned within one (1) month after acknowledged receipt.

Drawings shall be submitted in an orderly and logical sequence to enable the review of interfaces and relationships between all major elements and subassemblies. As agreed by the Authority and the Contractor, the Contractor may submit a limited number of drawings for approval during a specified time period (e.g., weekly, biweekly, or monthly).

In cases where the Contractor's drawings have been either "Not Approved" or "Conditionally Approved," the Contractor will not receive a delivery date extension.

The following classification will be used by the Authority during the design review and approval process:

3.4.1.1 Approved: The Technical Project Manager concurs with the information in its submitted form. The act of approval by the Authority means that the Contractor may proceed with the procurement of materials and components and with fabrication. It does not imply that the design is adequate or dimensions are correct, and it does not relieve the Contractor of responsibility to comply with all requirements of the Specification.

3.4.1.2 Conditionally Approved: The Technical Project Manager conditionally agrees with the submitted information. Additional information may need to be provided to allow a complete review, or details may need to be revised for approval. A revised information package must be submitted for approval.

3.4.1.3 Not Approved: The Technical Project Manager does not concur with the submitted details. The design shall be modified and resubmitted in its amended form.

3.4.2 COACH HISTORY BOOK

The Contractor shall provide a Coach History Book for each coach at time of delivery. Each Coach History Book shall contain the following information at a minimum:

1. Description of modifications and dates of completion
2. List of defects noted and the disposition of each
3. List of serial-numbered components
4. Documentation of Hidden Damage work performed on the coach
5. Shipping documents
6. Shipping exceptions and unresolved / open issues
7. Summary detail of each test performed on the coach or any part of the coach

At the Authority's discretion, additional documentation may be added to the requirements of the Coach History Book.

3.4.3 QUALITY ASSURANCE PLAN

In line with section C 4.05 of the Contract, the Contractor shall establish and maintain an effective Quality Assurance Program and staff. The Contractor shall submit to the Authority for approval a finalized and detailed written Quality Assurance Plan at the initial pre-production meeting or within eight weeks of Notice-to-Proceed.

SECTION 4.0 WARRANTY PROVISIONS

4.1.0. WARRANTY REQUIREMENTS:

4.1.1 CONTRACTOR WARRANTY: Warranties in this document are in addition to any statutory remedies or warranties imposed on the Contractor. Consistent with this requirement, the Contractor warrants and guarantees to the Authority each complete coach, and specific subsystems and components as follows:

4.1.1.1 Complete Coach: The described work under this specification, including all Authority approved Contractor work on the remanufactured bus shall be warranted to be free from Defects and Related Defects for one year or 50,000 miles, whichever comes first, beginning on the date of final acceptance of each coach. The warranty is based on regular operation of the bus under the operating condition prevailing in the Authority's locale. Buses must expressly pass the Massachusetts Motor Vehicle Code of Inspection and Massachusetts DTE requirements as an express condition of final acceptance by the Authority.

4.1.1.2 Propulsion System: Elements of propulsion system components, specifically the engine, transmission, and drive and non-drive axles, which are overhauled or upgraded by the Contractor, shall be warranted to be free from Defects and Related Defects.

The remanufactured Cummins diesel engine shall be provided with a minimum 3 year (unlimited miles) parts and labor warranty. The remanufactured Allison transmission shall be provided with a minimum 3 year (unlimited miles) parts and labor warranty.

Other propulsion system components shall be warranted for two years or 100,000 miles, whichever comes first. The warranty shall provide for service from MBTA's local Cummins Factory Authorized and Allison Factory Authorized dealers.

Warranties shall cover the removal and replacement of equipment, as well as road calls and towing related to warrantable failures.

4.1.1.3 LED Lighting: All LED lighting (interior and exterior) shall have a 12 year warranty passed through to the Authority from the LED manufacturer.

4.1.1.4 Extension of Warranty: If, during the warranty period, repairs or modifications on any coach, made necessary by defective design, materials or workmanship are not completed due to lack of material or inability to provide the proper repair for 30 calendar days, the applicable warranty period shall be extended by the number of days equal to the delay period.

Warranties specified herein shall not be prorated with the exception of extended or superior warranties that are passed on to the Authority. The Contractor shall pass on to the Authority any warranty, offered by a component supplier, that is superior to that required herein.

4.1.2 VOIDING OF WARRANTY: The warranties shall not apply to the failure of any part or component of the coach that directly results from misuse, negligence, accident, or that has been repaired or altered in any way so as to affect adversely its performance or reliability, except insofar as such repairs were repairs not conducted in accordance with the OEM maintenance manuals. The warranty shall also be void if the Authority fails to conduct normal inspections and scheduled preventive maintenance procedures as recommended in the OEM maintenance manuals and that omission caused the part or component failure. The Authority shall maintain documentation, auditable by the Contractor, verifying service activities in conformance with the OEM maintenance manuals.

4.1.3 EXCEPTIONS AND ADDITIONS TO WARRANTY: The warranty shall not apply to scheduled maintenance items and normal wear-out items such as light bulbs, belts, tires and friction material. The warranty shall not apply to items furnished by the Authority such as fareboxes, and other auxiliary equipment, except insofar as such equipment may be damaged by the failure of a part or component for which the Contractor is responsible.

4.1.4 DETECTION OF DEFECTS: If the Authority detects a defect within the warranty periods defined in “Warranty Requirements” (Section 4.1.1), it shall within 20 working days, notify the Contractor’s representative. Within 5 working days after receipt of notification, the Contractor’s representative shall either agree that the Defect is in fact covered by warranty, or reserve judgment until the subsystem or component is inspected by the Contractor’s representative, or is removed and examined at the Authority’s 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 Authority and the Contractor. Work shall commence to correct the Defect within 10 working days after receipt of notification and shall be conducted in accordance with “Repairs by Contractor” (Section 4.2.2).

4.1.5 SCOPE OF WARRANTY REPAIRS: When warranty repairs are required, the Authority and the Contractor’s representative shall agree within 5 working days after notification on the most appropriate course for the repairs and the exact scope of the repairs to be performed under the warranty. If no agreement is obtained within the 5-day period, the Authority reserves the right to commence the repairs in accordance with “Repairs by Authority” (Section 4.2.3).

4.1.6 FLEET DEFECTS – OCCURRENCE AND REMEDY: A fleet defect is defined as cumulative failures of any kind in the same components in the same or similar application where such items covered by the warranty and such failures

occur in the warranty period in the specified proportion of the coaches delivered under this contract. The proportion shall be 20 percent.

The Contractor shall correct a fleet defect under the warranty provisions defined in “Repair Procedures” (Section 4.2). After correcting the Defect, the Authority and the Contractor shall mutually agree to and the Contractor shall promptly undertake and complete a work program reasonably designed to prevent the occurrence of the same Defect in all other coaches and spare parts purchased under this contract. Where the specific Defect can be solely attributed to particular identifiable part(s), the work program shall include redesign and/or replacement of the defectively designed and/or manufactured part(s) in the entire fleet. In all other cases, the work program shall include inspection and/or correction of all of the coaches in the fleet via a mutually agreed to arrangement.

4.2.0 REPAIR PROCEDURES

4.2.1 REPAIR PERFORMANCE: The Contractor is responsible for all warranty-covered repair work. To the extent practicable, the Authority will allow the Contractor or its designated representative to perform such work. At its discretion, the Authority may perform such work if the Authority determines it needs to do so based on transit service or other requirements. Such work shall be reimbursed by the Contractor.

4.2.2 REPAIRS BY CONTRACTOR: The Contractor or its designated representative shall begin work on warranty-covered repairs, within 5 calendar days after receiving notification of a Defect from the Authority. The Authority shall make the coach available to complete repairs timely with the Contractor repair schedule.

The Contractor shall provide at its own expense all spare parts, tools, and space required to complete repairs. At the Authority's option, the Contractor may be required to remove the coach from the Authority's property while repairs are being effected. If the coach is removed from the Authority's property, repair procedures must be diligently pursued by the Contractor's representative. All costs incurred by the removal of the Authority's coaches to and from the Contractor's repair facility are to be borne by the Contractor and reimbursable under warranty if the Authority's personnel are utilized to shift the coaches.

4.2.3 REPAIRS BY AUTHORITY:

4.2.3.1 Parts Used: If the Authority performs the warranty-covered repairs, it shall correct or repair the Defect and any Related Defects utilizing parts supplied by the Contractor specifically for this repair. At its discretion, the Authority may use Contractor-specified parts available from its own stock if deemed in its best interest. Monthly, or at a period to be mutually agreed upon, reports of all repairs covered by this warranty shall be submitted by the

Authority to the Contractor for reimbursement or replacement of parts. The Contractor shall provide forms for these reports. The Authority will approve the warranty forms to be utilized on this contract at the pre-production meeting. Efforts shall be made by both the Contractor and the Authority to automate warranty claims processing and record keeping.

4.2.3.2 Contractor Supplied Parts: The Authority may require that the Contractor supply new parts for warranty-covered repairs being performed by the Authority. These parts shall be shipped prepaid to the Authority from any source selected by the Contractor within 10 working days of receipt of the request for said parts. Parts supplied by the Contractor shall be Original Equipment Supplier (OEM) equivalent or superior to that used in the coach original manufacture. All parts shall include hardware, bolts, nuts, washers and associated accessories that are normally supplied when replacement parts or kits are purchased.

4.2.3.3 Defective Components Return: The Contractor may request that parts covered by the warranty be returned to the manufacturing plant. The total cost for this action shall be paid by the Contractor. Materials should be returned in accordance with Contractor's instructions.

4.2.3.4 Failure Analysis: The Contractor shall, upon specific request of the Authority, provide a failure analysis of fleet defect- or safety-related parts, or major components, removed from coaches under the terms of the warranty, that could affect fleet operation. Such reports shall be delivered within 60 days of the receipt of failed parts.

4.2.3.5 Reimbursement for Labor: The Authority shall be reimbursed, by the Contractor, for labor. The amount shall be determined by multiplying the number of man-hours actually required to correct the Defect by a per hour, 5M mechanic, straight wage rate, plus 85.07% percent fringe benefits and 21.86% percent overhead, plus the cost of towing in the coach if such action was necessary and if the coach was in the normal service area.

Note: As of March 12, 2012, the hourly straight wage rate for 5M mechanic is \$35.09. Subsequent rates are subject to future negotiations between the applicable union and the Authority. Percentage stated for fringe benefits and overhead are subject to annual adjustments.

The resulting warranty labor rate is \$79.22. These wage and fringe benefit rates shall not exceed the rates in effect in the Authority' service garage at the time the Defect correction is made.

4.2.3.6 Reimbursement for Parts: The Authority shall be reimbursed by the Contractor for defective parts and for parts that must be replaced to correct the

Defect. The reimbursement shall be at the current price at the time of repair and shall include taxes where applicable and 15 percent handling costs.

4.2.3.7 Reimbursement Requirements: The Contractor shall reimburse the Authority for warranty labor and/or parts within 60 days of receipt of warranty claim.

4.2.4 WARRANTY AFTER REPAIR/REPLACEMENT: If any component, unit, or subsystem is repaired, rebuilt or replaced by the Contractor, or by the Authority with the concurrence of the Contractor, the component, unit, or subsystem shall have the un-expired warranty period of the original. Repairs shall not be warranted if Contractor-provided or authorized parts are not used for the repair; unless the Contractor has failed to respond within 5 days, in accordance with Section 4.1.5, Scope of Warranty Repairs.

The warranty on items determined to be fleet defects shall be guaranteed for the remainder of the warranty period or for one year, whichever period is greater. This extended warranty shall begin on the repair/replacement date for corrected items on each coach.

4.2.5 OPTIONAL EXTENDED WARRANTY

4.2.5.1 Optional Cummins Engine Extended Warranty: The Authority requires a proposal for an extended warranty for an additional two (2) years on all remanufactured Cummins ISL07 diesel engines.

4.2.5.2 Optional Allison Transmission Extended Warranty: The Authority requires a proposal for an extended warranty for an additional two (2) years on all remanufactured Allison transmissions.