# ATTACHMENT F: SPECIAL CONDITIONS

**1.1. VEHICLE TECHNICAL INFORMATION FORM**

Bidders must provide technical data information for the buses quoted in their bid. The "Vehicle Technical Information Form" provided herein as Attachment C must be completed and submitted with the bid for review by the City. A separate Vehicle Technical Information form is required for each bus type quoted in the submitted bid. The Vehicle Technical Information Form does not preclude the Bidder from including additional or supplemental technical information, descriptive literature, or equipment brochures in their own format, which further describes their bus.

**1.2. FEDERAL CONTRACT REQUIREMENTS**

The bid award and subsequent purchases will be financed, in part, by grants provided under programs of the Federal Transit Administration. Vendors awarded federally funded bid contracts by City of Raleigh must comply with the "Federal and State Provisions and Requirements" provided herein as Attachment D. These terms and conditions are hereby incorporated into any resulting contract.

**1.3. PERIOD OF PERFORMANCE AND QUANTITIES**

1.3.1. The term of this contract will be for a period of five (5) years from the date of award.

1.3.2. There is no guarantee of the minimum or maximum number of buses to be purchased under this contract. The quantities listed below are estimates only and may vary based on factors including but not limited to Federal, State, and local funding.

| Time Period | Bus Estimated Qty |
|---|---|
| Year 1 | 20 |
| Year 2 | 5 |
| Year 3 | 14 |
| Year 4 | 2 |
| Year 5 | 12 |

**1.4. PRICES**

Prices for base Buses with standard features and additional options/upgrades are listed herein as Attachment A entitled "Price Schedule." As new technology unfolds, options/upgrades will be updated on Attachment A.

**1.5. PRICE ADJUSTMENTS**

The Prices submitted on the Price Schedule – Attachment A shall remain fixed for any orders issued within the first 1-year from the bid award date. The price adjustments must be presented in writing to the Contracting Officer for final approval. The respective Contracting Officer will notify the Contractor in writing of the approval. Prices after the first year period shall be price provided on the Price Schedule plus any escalation or de-escalation which will be calculated based on the formula which utilizes the U.S. Department of Labor/Bureau of Labor Statistics Producer Price Index ("PPI") Category 1413, "Trucks and Bus Bodies". The escalation in this index will be used to adjust the Base Bus Prices and Optional Equipment. It is understood and agreed that orders will be shipped at the established Contract prices in effect on the date orders are placed. Invoicing at variance with this provision will subject the contract to cancellation.

## 1.6. INCLUDE ALL STANDARD & COMMON FEATURES

Each vehicle identified on the Price Schedule – Attachment A shall be considered to have all standard and common features. Each vehicle identified on the Price Schedule – Attachment A shall have back-up product literature, cut/sheets or another form of product brochure that indicates or describes exactly what all the common or standard features are for each Base Item Product. These brochures shall be identified as to Product Code. Some features will be related to safety and others to driver and for passenger convenience, which are generally provided in a transit vehicle without customer stipulation. Those features include but are not limited to; adjustable instrument lights, interior sun visors, exterior backup lamps, two-speed windshield wipers, windshield washers, windshield defroster, coolant recovery system, etc.

Standard and other common features if not specifically stated shall not be interpreted as items that can be omitted to reduce price or to provide any other bidding advantage.

## 1.7. PERFORMANCE BOND

The successful bidder shall furnish a 100% performance bond executed by a corporation surety licensed under the laws of North Carolina to execute such bonds, conditioned that the surety will, upon demand, forthwith make the payments to the oblige upon said bond if the bidder fails to perform the duties on the contract in accordance with the contract documents. The performance bond must be furnished within thirty (30) days after award, which guarantees performance of all terms and conditions of the contract and of the Basic One (1) Year Limited Warranty agreement. The performance bond shall specifically cover the performance of the contract according to its terms and conditions, as well as payment of all related bills and encumbrances. This performance bond shall be issued by a surety company who is listed by the U.S. Treasury Department's list of approved sureties, as published in Circular 570, as of the bid date. The performance bond shall be issued in an amount equal to 100% of the bid amount and shall be dated concurrent to, or subsequent to, the date of the purchase order. Notwithstanding any document or assertion to the contrary, any surety bond related to the sale of a vehicle shall apply only to the Basic One (1) Year Limited Warranty for such vehicle. Any surety bond related to the sale of a vehicle shall not apply to any other warranties that are included within this bid (OEM or otherwise) or to the warranties (if any) of any third party of any part, component, attachment or accessory that is incorporated into or attached to the vehicle. In the event of any contradiction or inconsistency between this provision and any other document or assertion, this provision shall prevail.

## 1.8. ADDITION/DELETION OF PRODUCTS /SERVICES

The City recognizes that Products and Product line additions and/or Services to the Supplier's standard commercial offerings during the term of the bid contract are likely to occur. The City considers these additions as enhancements to the previous bid items and product line. Additions of this nature will be considered as follows:

1.8.1. Any and all new Products will be categorized with similar Products or Product lines into existing market categories previously defined and agreed to by the City and with respect to discount structure, net price or grand total of the Product. The City shall be notified of new item(s) and/or Product line(s). Amendment or modification to the bid contract will not be required for addition of new Product(s) to the Supplier's offerings that are consistent with pre-established categories and discount structure.

1.8.2. In the event the Supplier adds a new specialty Product line which represents Product(s) that are consistent with the type and class of Products covered under this bid contract, but differ sufficiently from Products or brands represented in the existing Product categories,

so that a separate pricing structure is appropriate, the City and the Supplier may enter into negotiations to modify the contract to establish a discount structure, net price, or grand total for the Product(s). Pricing must be competitive in order to add Products to this Contract. The Contractor shall provide appropriate documentation to support its position for separate pricing. Negotiations must be completed prior to order placement. Amendment or modification to the bid contract will be required in order to add negotiated items that are sufficiently different from pre-established categories and discount structure.

1.8.3. Contractor shall develop new business opportunities and market its services by meeting current and potential clients, discussing their needs and opportunities for improvement.

**1.9. BUS DELIVERY PROCEDURE**

Delivery of buses shall be determined by signed receipt of the City of Raleigh's designated agent(s) at a designated point of delivery and may be preceded by a cursory inspection of the bus. Such agents and delivery points will be identified on individual purchase orders to be issued under this contract.

**1.10. DELIVERY DATE AND DELIVERY SCHEDULE**

The successful Contractor will complete delivery within approximately 365 consecutive calendar days after receipt of purchase order, unless otherwise approved by the City of Raleigh.

1.10.1. A delivery date shall be established for each order of buses completed under this contract based on the maximum delivery period quoted by the successful offeror and the date of receipt by the manufacturer of actual purchase orders. The buses shall be delivered at a rate not to exceed 4 buses per day. Hours of delivery shall be 8:00 am through 4:00 pm, Monday through Friday, unless modified in writing by the City of Raleigh. The City of Raleigh expects that the delivery schedule offered herein to be firm and requires full compliance with the City of Raleigh delivery schedule.

**1.11. PRE-DELIVERY TESTS AND INSPECTIONS**

The pre-delivery tests and inspections shall be performed at or near the Contractor's plant; they shall be performed in accordance with the procedures defined in the "inspection" sections found on pages 11, 12 and 13. They may be witnessed by a resident inspector who shall authorize release of the bus upon successful completion of these tests and inspections.

**1.12. ASSUMPTION OF RISK OF LOSS**

The City of Raleigh shall assume risk of loss of the bus after delivery, as defined in "Bus Delivery Procedure", if delivered by common carrier or driveway. Prior to this delivery or release, the Contractor shall have risk of loss of the bus, including any damages sustained during the common carrier or driveaway operation regardless of the status of title or any payments related to the bus. Drivers shall keep a maintenance log enroute and it shall be delivered to the City of Raleigh with the bus.

**1.13. ACCEPTANCE OF BUS**

Within 30 (thirty) calendar days after arrival at the designated point of delivery, the bus shall undergo the City of Raleigh's tests. If the bus passes these tests or if the City of Raleigh does not notify Contractor of nonacceptance within 30 (thirty) calendar days after delivery, acceptance of the bus by the City of Raleigh occurs on the thirtieth day after delivery. Acceptance may occur earlier if the City of Raleigh notifies the Contractor of early acceptance or places the bus in revenue service. If the bus fails these tests, it shall not be accepted until the repair procedures defined in "Repairs After Nonacceptance" have been carried out and the bus retested until it passes.

## 1.14. REPAIRS AFTER NONACCEPTANCE

The Contractor, or its designated representative shall perform the repairs after nonacceptance. If the Contractor fails or refuses to make the repairs within 5 (five) days, then the work may be done by the City of Raleigh's personnel with reimbursement by the Contractor. The Contractor or its designated representative shall perform the repairs after non-acceptance. At its sole discretion, the City of Raleigh may decide to make such repairs with reimbursement by the Contractor or the City of Raleigh may refuse the bus, deny payment and return the bus to the Contractor at Contractor's expense. If the City of Raleigh is able to successfully complete the repairs to the mutually acceptable specifications, the bus will be accepted.

## 1.15. REPAIRS BY CONTRACTOR

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

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

## 1.16. REPAIRS BY CITY OF RALEIGH

1.16.1. Parts Used: If the City of Raleigh performs the repairs after nonacceptance of the bus, it shall correct or repair the defect and any related defects using Contractor-specified parts available from its own stock or those supplied by the Contractor specifically for this repair. Monthly, or at a period to be mutually agreed upon, reports of all repairs covered by this procedure shall be submitted by the City of Raleigh to the Contractor for reimbursement or replacement of parts. The Contractor shall provide forms for these reports.

1.16.2. Contractor Supplied Parts: If the Contractor supplies parts for repairs being performed by the City of Raleigh after nonacceptance of the bus, these parts shall be shipped prepaid to the City of Raleigh from any source selected by the Contractor within 10 (ten) working days after receipt of the request for said parts.

1.16.3. Return of Defective Components: The Contractor may request that parts covered by this provision be returned to the manufacturing plant. The Contractor shall pay the total costs for this action.

1.16.4. Reimbursement for Labor: The City of Raleigh 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, including fringe benefits, of $140 per hour, plus the cost of towing in the bus if such action was necessary.

1.16.5. Reimbursement for Parts: The City of Raleigh shall be reimbursed by the Contractor for defective parts that must be replaced to correct the defect. The reimbursement shall include taxes where applicable and fifteen (15) percent handling costs.

## 1.17. DELAYS

If the delivery of the vehicles or equipment under this contract should be unavoidably delayed, the City of Raleigh shall extend the time for completion and delivery of such vehicles by a specific number of days for the excusable delay. A delay is unavoidable only if the delay relates to a natural disaster, war, or strikes and was substantial and in fact the cause for the Contractor to miss the established delivery dates.

1.17.1. The Contractor shall notify the City of Raleigh as soon as the Contractor has knowledge that an event has occurred that will cause a delay in deliveries. The Contractor must follow-up such notice within five (5) days with a written confirmation and explanation as to the cause of the delay.

1.17.2. The Contractor shall supply, as soon as such data are available, any reasonable proofs that are required by the City of Raleigh to make a decision on any request for extension of delivery dates. The City of Raleigh shall examine the request and related proof and determine if the Contractor is entitled to an extension and the duration of such extension. The City of Raleigh shall notify the Contractor of his decision in writing.

1.17.3. It is expressly understood and agreed that the Contractor shall not be entitled to damages or compensation and shall not be reimbursed for losses on account of delays resulting from any cause under this provision.

## 1.18. LIQUIDATED DAMAGES

Liquidated damages per unit will be assessed and deducted from the Contractor's invoice for failure to complete delivery within the delivery time bid.

## 1.19. TITLE

Adequate documents for registering the bus in the State of North Carolina shall be provided to the City of Raleigh upon delivery of each bus. Contractor warrants that the title shall pass to the City of Raleigh free and clear of all encumbrances.

## 1.20. PAYMENT

The City of Raleigh shall pay and the Contractor shall accept the amounts set forth in the price schedule as full compensation for all costs and expenses of completing the Work in accordance with the Contract, including but not limited to all labor and material required, overhead, expenses, storage and shipping, risks and obligations, taxes (as applicable), fees and profit, and any unforeseen and approved costs.

1.20.1. All payments shall be made as provided herein, less any additional moneys withheld as provided below and less any amounts for liquidated damages in accordance with "Liquidated Damages."

1.20.2. The City of Raleigh shall make payments for buses at the unit prices itemized in the Price Schedule within 30 (thirty) calendar days after the delivery and acceptance of each bus and receipt of a proper invoice. In the event that the bus does not meet all requirements for acceptance the City of Raleigh may, at its exclusive option, "conditionally accept" the bus and place it into revenue service pending receipt of Contractor furnished materials and/or labor necessary to effectuate corrective action for acceptance. For any conditionally accepted bus the payment shall be reduced by an amount to be withheld, and paid upon corrective action by the contractor, equal to the estimated cost for parts and labor for the corrective action.

1.20.3. The City of Raleigh shall make a final payment for all withholding within 30 (thirty) calendar days of receipt of a final proper invoice and the following:

1. Delivery and acceptance of all Contract deliverables, and other documentation required by the Contract.
2. Rectification of any deficiencies found during the acceptance of buses.
3. Contractor provision of any certifications as required by law and/or regulations.
4. Completion of post-delivery audits required under the Contract.

**1.21. ENGINEER / SERVICE REPRESENTATIVES**

The Contractor shall, at its own expense, have a competent engineering service representative(s) available on request to assist the City of Raleigh's staff in the solution of engineering or design problems within the scope of the specifications that may arise during the warranty period. This does not relieve the Contractor of responsibilities under "Warranty" provisions found on pages 15 and 16.

**1.22. DOCUMENTS**

The Contractor shall provide the City of Raleigh a one copy of all current maintenance manuals (in written form and electronically (if available)) with the first bus of each order. The parts manuals (in written form and electronically (if available)) shall be provided within 60 days of the first bus delivery of each order in the quantities of one per bus with a minimum of three copies for each separate purchase order.

1.22.1. Standard operator's manual(s) shall be provided in the quantities one per bus with a minimum of three copies for each separate purchase order for buses under this Contract. The Contractor shall keep maintenance manuals available for a period of three years after the date of acceptance of the buses procured under this Contract. The Contractor shall also exert its best efforts to keep maintenance manuals, operator manuals, and keep parts books up-to-date for a period of 15 (fifteen) years. The supplied maintenance and operator's manuals shall incorporate all equipment ordered on the buses covered by this procurement.

1.22.2. In addition, if not included in the parts manual, the Contractor shall also provide a complete list of all major components and sub-components provided by subcontractors used on the buses including the original suppliers' and/or manufacturers' part name, part numbers, company names, addresses, telephone numbers and contact persons' names.

**1.23. PARTS AVAILABILITY GUARANTY**

The Contractor hereby guarantees to provide, within reasonable periods of time, the spare parts, software and all equipment necessary to maintain and repair the buses supplied under this Contract for a period of at least fifteen (15) years after the date of acceptance. Parts shall be interchangeable with the original equipment and be manufactured in accordance with the quality assurance provisions of this Contract.

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

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

## 1.24. PRODUCTION OF DOCUMENTS

Upon award of the Contract to an Offeror, such Offeror shall commence performance under the Contract by executing all Contract Guaranty Agreements provided with the Offer, by furnishing copies of the certificates of insurance required to be procured by the Contractor pursuant to the Contract documents within 30 calendar days after the date of receipt of the notice of award or within such further time as the City of Raleigh may allow. **Failure to fulfill these requirements within the specified time is cause for the termination of the Contract under "Breach of Contract" on page 36.**

## 1.25. MATERIALS/ACCESSORIES RESPONSIBILITY

The Contractor shall be responsible for all materials and workmanship in the construction of the bus and all accessories used, whether the same are manufactured by the Contractor or purchased from supplier. This provision excludes fare boxes, radios, and any equipment leased or supplied by the City of Raleigh, except insofar as such equipment is damaged by the failure of a part or component for which the Contractor is responsible, or except insofar as the damage to such equipment is caused by the Contractor during the manufacture of the buses. Risk of damage to or loss of the buses is the subject of "Assumption of Risk of Loss" on page 3.

## 1.26. INSPECTION STATIONS

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

1.26.1. Stations shall also be at the best locations to inspect or test characteristics before they are concealed by subsequent fabrication or assembly operations. These locations shall minimally include underbody structure completion, body framing completion, body prior to paint preparation, water test, engine installation completion, underbody dress-up and completion, bus prior to final paint touchup, bus prior to road test and bus final road test completion.

## 1.27. RESIDENT INSPECTORS

The City of Raleigh shall be represented at the Contractor's plant by resident inspectors, as required by FTA. Resident inspectors may be City of Raleigh employees or outside contractors. The City of Raleigh shall provide the identify of each inspector and shall also identify their level of authority in writing. They shall monitor, in the Contractor's plant, the manufacture of transit buses built under the procurement. The presence of these resident inspectors in the plant shall not relieve the Contractor of its responsibility to meet all of the requirements of this procurement. The City of Raleigh shall designate a primary resident inspector, whose duties and responsibilities are delineated in "Pre-Production Meetings," "Authority" and "Pre-Delivery Tests," below. Contractor and resident inspector relations shall be governed by the guidelines included in "Quality Control /

Quality Assurance" on page 16.

## 1.28. PRE-PRODUCTION MEETINGS

The primary resident inspector may participate in design review and pre-production meetings with the City of Raleigh. At these meetings, the configuration of the buses and the manufacturing processes shall be finalized, and all Contract documentation provided to the inspector.

1.28.1. No less than thirty (30) days prior to the beginning of bus manufacture, the primary resident inspector may meet with the Contractor's quality assurance manager and may conduct a pre-production audit meeting. They shall review the inspection procedures and finalize inspection checklists. The resident inspectors may begin monitoring bus construction activities two weeks prior to the start of bus fabrication.

## 1.29. AUTHORITY

Records and data maintained by the quality assurance organization shall be available for review by the resident inspectors. Inspection and test records for this procurement shall be available for a minimum of one year after inspections and tests are completed.

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

1.29.2. Discrepancies noted by the resident inspector during assembly shall be entered by the Contractor's inspection personnel on a record that accompanies the major component, subassembly, assembly or bus from start of assembly through final inspection. Actions shall be taken to correct discrepancies or deficiencies in the manufacturing processes, procedures or other conditions that cause articles to be in nonconformity with the requirements of the Contract specifications. The inspection personnel shall verify the corrective actions and mark the discrepancy record. If discrepancies cannot be corrected by replacing the nonconforming materials, the City of Raleigh shall approve the modification, repair or method of correction to the extent that the Contract specifications are affected.

1.29.3. The primary resident inspector shall remain in the Contractor's plant for the duration of bus assembly Work under this Contract. Only the primary resident inspector or designee shall be authorized to release the buses for delivery. The resident inspectors shall be authorized to approve the pre-delivery acceptance tests. Upon request to the quality assurance supervisors, the resident inspectors shall have access to the Contractor's quality assurance files related to this procurement. These files shall include drawings, assembly procedures, material standards, parts lists, inspection processing and reports, and records of Defects.

## 1.30. SUPPORT PROVISIONS

The Contractor shall provide office space for the resident inspectors in close proximity to the final assembly area. This office space shall be equipped with desks, outside and interplant telephones, Internet access, file cabinet and chairs.

## 1.31. COMPLIANCE WITH SAFETY REQUIREMENTS

At the time of the Pre-Production meeting, the Contractor shall provide all safety and other operational restrictions that govern the Contractor's facilities. These issues will be discussed, and

the parties will agree which rules/restrictions will govern the City of Raleigh's inspector(s) and any other City of Raleigh representatives during the course of the Contract.

**1.32. ACCEPTANCE TESTS**

Fully documented tests shall be conducted on each production bus following manufacture to determine its acceptance to the City of Raleigh. These acceptance tests shall include pre-delivery inspections and testing by the Contractor and inspections and testing by the City of Raleigh after the buses have been delivered.

**1.33. PRE-DELIVERY TESTS**

The Contractor shall conduct acceptance tests at its plant on each bus following completion of manufacture and before delivery to the City of Raleigh. These pre-delivery tests shall include visual and measured inspections, as well as testing the total bus operation. The tests shall be conducted and documented in accordance with written test plans approved by the City of Raleigh.

1.33.1. Additional tests may be conducted at the Contractor's discretion to ensure that the completed buses have attained the required quality and have met all Technical Specifications. The City of Raleigh may, prior to commencement of production, demand that the Contractor demonstrate compliance with any requirement in that section if there is evidence that prior tests have been invalidated by the Contractor's change of Supplier or change in manufacturing process. Such demonstration shall be by actual test, or by supplying a report of a previously performed test on similar or like components and configuration. Any additional testing shall be recorded on appropriate test forms provided by the Contractor and shall be conducted before acceptance of the bus.

1.33.2. The pre-delivery tests shall be scheduled and conducted with thirty (30) days' notice so that they may be witnessed by the resident inspectors, who may accept or reject the results of the tests. The results of pre-delivery tests, and any other tests, shall be filed with the assembly inspection records for each bus. The underfloor equipment shall be available for inspection by the resident inspectors, using a pit or bus hoist provided by the Contractor. A hoist, scaffold or elevated platform shall be provided by the Contractor to easily and safely inspect bus roofs. Delivery of each bus shall require written authorization of the primary resident inspector. Authorization forms for the release of each bus for delivery shall be provided by the Contractor. An executed copy of the authorization shall accompany the delivery of each bus.

**1.34. VISUAL AND MEASURED INSPECTIONS**

Visual and measured inspections shall be conducted with the bus in a static condition. The purpose of the inspection testing includes verification of overall dimension and weight requirements, that required components are included and are ready for operation, and that components and subsystems designed to operate with the bus in a static condition do function as designed.

**1.35. TOTAL BUS OPERATION**

Total bus operation shall be evaluated during road tests. The purpose of the road tests is to observe and verify the operation of the bus as a system and to verify the functional operation of the subsystems that can be operated while the bus is in motion.

1.35.1. Each bus shall be driven for a minimum of fifteen (15) miles during the road tests. If requested, computerized diagnostic printouts showing the performance of each bus shall be produced and provided to the City of Raleigh. Observed Defects shall be recorded on the test forms. The bus shall be retested when Defects are corrected and adjustments are

made. This process shall continue until Defects or required adjustments are no longer detected.

## 1.36. PROTOTYPE/PILOT VEHICLE ACCEPTANCE

In order to assess the contractor's compliance with the Technical Specifications (a Pilot Vehicle is required), the agency and the contractor shall, at the pre-production meeting, jointly develop a Configuration and Performance Review document for review of the pilot vehicle. This document shall become part of the official record of the pre-production meeting.

1.36.1. Potential dimensional/performance tests that may be included in the Configuration and Performance Review include the following:

1. Complete electrical system audit
2. Dimensional requirements audit
3. Seating capacity
4. Water test
5. Water runoff test
6. Function test of systems/subsystems and components
7. Sound/noise level tests
8. Vehicle top speed
9. Acceleration tests
10. Brake stop tests
11. Airflow tests
12. PA function tests
13. Air/brake system audit
14. Individual axle weight
15. Standee capacity
16. Body deflection tests
17. Silent alarm function test
18. Interior lighting
19. Exterior lighting
20. Gradeability test
21. Kneeling system function
22. HVAC pulldown/heat
23. Speedometer
24. Outside air infiltration (smoke)
25. Wheelchair ramps
26. Engine performance qualification:
    This test shall be jointly conducted by the contractor and engine manufacturer (including but not limited to charge air cooler performance, air to boil test, loss of coolant, fuel system electrical inputs and engine protection system).
27. Transmission performance qualifications:
    This test shall be jointly conducted by the Contractor and transmission manufacturer (including but not limited to retarder operation, heat exchanger, interface with ABS and electrical inputs).

## 1.37. BUY AMERICA AUDIT

A post-delivery Buy America audit is required for federally funded bus procurements (see 49 CFR Part 663 for additional information). The onsite resident inspectors are to monitor the production processes to verify compliance with final assembly requirements identified by the Buy America pre-award audit. This audit is to verify compliance with final assembly requirements and final

documentation of Buy America compliance and must be completed prior to title transfer.

1.37.1. NOTE: If there is not a pilot/prototype bus, then the Buy America post-delivery audit should be performed following completion of the first serial production bus. In addition to monitoring of the production processes, the agency must verify compliance that more than 60 percent of the costs of all components are produced in the United States. Finally, the agency must execute the required certificates.

## 1.38. VEHICLE INSPECTIONS

Each bus is subjected to a series of inspections after the bus reaches the point of final completion on the assembly line. Typically, the vehicle manufacturer performs its own quality assurance inspections following assembly line completion before releasing each bus to the resident inspectors. The inspections for each vehicle are documented, signed off upon passing and included in the vehicle record.

1.38.1. These are the typical inspections performed on each bus by the resident inspectors:

1. Water test inspection
2. Road test inspection
3. Interior inspection (including functionality)
4. Hoist/undercarriage inspection
5. Exterior inspection (including roof)
6. Electrical inspection
7. Wheelchair ramp/lift inspection

## 1.39. WATER TEST INSPECTION

The water test inspection checks the integrity of the vehicle's body seams, window frame seals and other exterior component close-outs for their ability to keep rainwater, road splash, melting snow and slush, and other exterior water from entering the inside of the vehicle. The vehicle's interior is inspected for signs of moisture and water leaks. To perform the leak inspection, interior ceiling and side panels are removed, and access doors are opened. If any moisture or water is detected, then the source of the leak will be located and repaired by the manufacturer, and the vehicle will be tested again.

## 1.40. ROAD TEST INSPECTION

The road test inspection checks all the vehicle's systems and sub-systems while the vehicle is in operation. Typically, the road test inspection is performed immediately following the water test inspection to reveal any standing water that may be present due to a leak but was not noticed during the "static" water test.

Objectionable vibrations, air leakage and other factors that affect ride quality are recorded and reported to the vehicle manufacturer for resolution. Vehicle stability, performance, braking and interlock systems, HVAC, and other critical areas are checked to ensure that the vehicle is complete and ready to provide safe and reliable service.

1.40.1. The following tests may be performed and recorded during the road test:

1. Acceleration test
2. Top speed test
3. Gradeability test
4. Service brake test

5. Parking brake test
6. Turning effort test
7. Turning radius test
8. Shift quality
9. Quality of retarder or regenerative braking action

1.40.2. During the road test, a vehicle may be taken to a weigh station to record the vehicle's frontaxle weight, rear axle weight and total vehicle (curb) weight.

## 1.41. INTERIOR INSPECTION

The interior inspection checks the fit and finish of the interior installations. In addition, the inspection also verifies the installation and function of systems and subsystems according to the Build Specification. All systems and functions accessed from the interior are inspected for functionality, appearance and safety.

Examples of systems/functions inspected include the following:

1. Interior and exterior lighting controls
2. Front and rear door systems
3. Flooring installation
4. Passenger and operator's seat systems
5. Wheelchair securement and ramp systems
6. Fire suppression system
7. Electrical installations (multiplex, tell-tale wiring, panels, etc.)
8. Window systems and emergency escape portals
9. Operator dash/side panel controls/indicators

## 1.42. HOIST/UNDERCARRIAGE INSPECTION

The hoist/undercarriage inspection checks the installation of components, wiring, air lines, presence of fluid leaks, etc., located under the vehicle. Typically, this inspection is performed following the road test. The vehicle is lifted onto a hoist or pulled over a pit for the inspection. Areas inspected are the front suspension, air bags, airline routings, electrical connections and routings, drive-train components, linkages, and any other system or component that may be prone to early failure due to inadequate installation techniques. All lines, cables, hoses, etc., are inspected for proper securement and protection to prevent rubbing, chafing or any other condition that could result in a failure. The engine/powerplant and HVAC compartments are also inspected during this time.

## 1.43. EXTERIOR INSPECTION

The exterior inspection checks the fit and finish of components installed on the exterior of the vehicle. Access panels are opened, and accessories are inspected for proper installation. In addition, vehicle paint, graphics and proper decals are also inspected. Acceptable paint finish quality (orange peel, adhesion, etc.) should be agreed on with the vehicle manufacturer prior to production to ensure consistency of inspections.

## 1.44. ELECTRICAL INSPECTION

The vehicle's main electrical panels and other sub-panels are inspected for proper components, to include relays, fuses, modules, terminal strips, decals, etc. In addition, electrical harnesses are inspected for proper wiring and termination techniques, bulkhead protection, looming and other items that could result in future electrical failure. Onboard vehicle compartment schematics are verified for accuracy.

## 1.45. WHEELCHAIR RAMP INSPECTION

The wheelchair ramp assembly is inspected for proper installation and performance. Clearances critical to the operation of the ramp are verified, and the ramp's electrical systems are inspected to ensure appropriate wire routings and protection. The successful integration of the ramp assembly into the vehicle is verified, and the vehicle interlocks are checked during automatic and manual ramp operation.

## 1.46. AUDITS

During serial production of the bus's quality assurance inspection, tests may be performed to ensure that the manufacturer's quality standards are being followed. These inspection audits could be on items such as torque wrench calibrations, proper techniques for fastener installations, proper use and type of adhesives, use of correct installation drawings on the production line, etc.

## 1.47. COMMUNICATIONS

The lines of communications, formal and informal, should be discussed and outlined in the pre-production meeting. As previously discussed, resident inspectors should represent the agency for all bus-build related issues (quality, conformance, etc.). Resident inspectors can relay communications addressing contractual type issues but should do so only under the consult of the agency's contracts administrator. Actual personnel contacts for the manufacturing facility should be established during resident inspector orientation. These contacts could include quality assurance, production, material handling, engineering, and buy-off area personnel.

## 1.48. DOCUMENTATION / REPORTS

The following documents/reports are typically generated during the bus build process:

1. Vehicle Build Specification
2. Sales Order
3. Pre-production meeting notes
4. Prototype and production correspondence (vehicle build file)
5. Manufacturer's Vehicle Record (Warranty file)
6. Vehicle line documents
7. Serialization documents (Warranty file) Alignment verification
8. Brake testing
9. HVAC testing and checkout Manufacturer's QA checklist and signoff
10. Weight Slip (Prototype & Warranty file)
11. Prototype Performance Tests document (vehicle build file)
12. Acceleration Test Top Speed Test gradeability Test
13. Interior Noise Test A – Stationary Interior Noise Test B – Dynamic Exterior Noise Test A – Pull Away
14. Exterior Noise Test B – Pass-By Exterior Noise Test C – Curb Idle Turning Radius Test
15. Turning Effort Test Parking Brake Test Service Brake Test
16. Vehicle Acceptance Inspections – Production (Warranty file)
17. Water Test Inspection Report Road Test Inspection Report Interior Inspection Report
18. Hoist/Undercarriage Inspection Report Exterior Inspection Report
19. Electrical Inspection Report Wheelchair Inspection Report
20. Speed Memos (Warranty file)
21. Agency Vehicle Inspection record (Warranty file) Release for Delivery documentation (Warranty file)
22. Post-Production Acceptance – Certificate of Acceptance (Accounting) Post-Delivery Inspection Report – (Fleet Management & Warranty files)

## 1.49. VEHICLE RELEASE FOR DELIVERY

Upon satisfactory completion of all inspection, audit and test criteria, and resolution of any outstanding issues affecting the purchase of any or all buses, proper documentation (the Release for Delivery) is signed by the designated resident inspector authorizing the bus manufacturer to deliver the vehicle to the agency's facility, where it will undergo a post-delivery inspection process and final acceptance. The satisfactory sign-off of the Release for Delivery should complete the resident inspector's duties for each bus. In final preparation for delivery, the bus manufacturer may request the resident inspector to do a final walk-through of the bus after it has been cleaned and prepped for shipping.

## 1.50. POST-DELIVERY AND FINAL ACCEPTANCE

The agency shall conduct acceptance tests on each delivered bus. These tests shall be completed within 15 days after bus delivery and shall be conducted in accordance with the agency's written test plans. The purpose of these tests is to identify defects that have become apparent between the time of bus release and delivery to the agency.

1.50.1. The post-delivery tests shall include visual inspection, along with a verification of system(s) functionality and overall bus operations. No post-delivery test shall apply new criteria that are different from criteria applied in a pre-delivery test.

1.50.2. Buses that fail to pass the post-delivery tests are subject to non-acceptance. The agency shall record details of all defects on the appropriate test forms and shall notify the contractor of acceptance or non-acceptance of each bus within five days after completion of the tests. The defects detected during these tests shall be repaired according to procedures defined in the contract after non-acceptance.

## 1.51. CERTIFICATE OF ACCEPTANCE

1.51.1. Accepted

1.51.2. Not accepted: In the event that the bus does not meet all requirements for acceptance. The Cityof Raleigh must identify reasons for non-acceptance and work with the OEM to develop a timeline of addressing the problem for a satisfactory resolution and redelivery.

1.51.3. Conditional acceptance: In the event that the bus does not meet all requirements for acceptance, the City of Raleigh may conditionally accept the bus and place it into revenue service pending receipt of contractor furnished materials and/or labor necessary to address the identified issue(s).

## 1.52. ALTOONA TEST

A copy of the Altoona test report is required with bid submission.

## 1.53. WARRANTIES AND WARRANTY PROCEDURES

Warranties in this document are in addition to any statutory remedies or warranties imposed on the Supplier. Consistent with this requirement, the Supplier warrants and guarantees to the City of Raleigh each complete Bus, including sub-systems and components as follows:

| COMPONENT | WARRANTY TERM |
|---|---|
| BASIC BUS | 1 YR / 50,000 |
| BODY STRUCTUAL | 3 YR / 150,000 |

| | |
|---|---|
| STRUCTUAL INTEGRITY / CORROSION | 5 YR / 150,000 |
| ENGINE | 5 YR / 300,000 |
| TRANSMISSION | 3 YR / 300,000 |
| AXLES | 2 YR / 100,000 |
| BRAKES (EXCLUDES FRICTION MATERIAL) | 1 YR / 100,000 |
| HVAC | 3 YR / UNLIMITED |
| A/C COMPRESSOR | 3 YR / UNLIMITED |
| WHEELCHAIR RAMP (PARTS ONLY) | 1 YR / UNLIMITED |
| ALTERNATOR | 1 YR / 50,000 |
| AIR COMPRESSOR | 3 YR / UNLIMITED |
| DOOR SYSTEM | 2 YR / 100,000 |
| STARTER | 1 YR / 50,000 |
| DR ITS SYSTEM | 3 YR / UNLIMITED |

1.53.1. The warranty on repairs to items or subsystems during the warranty period shall be extended for the time and/or miles of the remaining warranty or the manufacturer's basic warranty, whichever is greater, beginning on the repair/replacement date that the correction was performed. The bus manufacturer shall forward and honor any warranty offered by the component manufacturer(s), which is longer than required above.

**1.54. VOIDING OF WARRANTY**

The warranty shall not apply to any part or component of the bus that has been subject to misuse, negligence, accident, or that has been repaired or altered in any way so as to adversely affect its performance or reliability, except insofar as such repairs were made in accordance with the Supplier's maintenance manuals and the workmanship was in accordance with recognized standards of the industry.

**1.55. EXCEPTIONS TO WARRANTY**

The warranty shall not apply to scheduled maintenance items such as filters. Consumable items are only fuel, oil and lubricants. Items with progressive wear characteristics such as belts, wiper blades, etc. are not excluded from warranty and should not be of poor quality that requires frequent change. The warranty shall not apply to tires, nor to any items furnished by the City of Raleigh such as radios, fare boxes, and other auxiliary equipment, except insofar as such equipment may be damaged by the failure of a part, component, or design for which the Supplier is responsible.

**1.56. DETECTION OF DEFECTS**

The City of Raleigh shall, at any time within the warranty period, repair any defect detected to insure the bus being kept in service and the Supplier's representative will be notified by written claim or verbal communication. A claim will be submitted for signature by the City of Raleigh within thirty (30) calendar days of the failure. Within five working days after receipt of notification, the manufacturer's representative shall agree either that the Defect is in fact covered by warranty, or reserve judgement until the subsystem or component is inspected by the manufacturer's representative or is removed and examined at that particular agency's property or at the manufacturer's plant. At the time, the status of warranty coverage on the subsystem or component shall be mutually resolved between that agency and the manufacturer. Work shall commence to correct the Defect within 10 (ten) working days after receipt of notification and shall be conducted in accordance with "Repairs by manufacturer".

**1.57. SCOPE OF WARRANTY REPAIRS**

When major warranty repairs are required that are beyond the scope of the Agencies capability or

manpower, the City of Raleigh and the Supplier's representative shall agree within ten (10) calendar days after notification on the most appropriate course of action for the repairs and the exact scope of the repairs to be performed.

**1.58. FLEET DEFECTS**

A fleet defect is defined as a 25 % failure of identical items or sub-systems of a single order.

**1.59. NOTIFICATION OF FLEET DEFECTS**

Upon determination that a fleet defect exists, the Supplier will be notified by the City of Raleigh This notice shall be communicated by letter to the Supplier.

**1.60. SCOPE OF FLEET DEFECT PROVISIONS**

The Supplier shall promptly, upon notification, correct all fleet defects as defined above and undertake a work program designed to prevent the occurrence and reoccurrence of the same defect in all buses purchased under this contract.

1.60.1. Detailed instructions for any work program must be submitted to the City of Raleigh, in writing, before any work commences.

**1.61. WARRANTY CLAIM FORMS**

The Supplier must supply the City of Raleigh with all documents necessary for the filing of warranty claims. The documents will be delivered in conjunction with the delivery of the first Bus.

**1.62. QUALITY CONTROL / QUALITY ASSURANCE QUALITY ASSURANCE REQUIREMENTS**

The Contractor, the Contractor's manufacturing plant and organization shall have an in-house quality control/quality assurance program that meets the City of Raleigh's minimum standards.

**1.63. INSPECTOR**

The City of Raleigh may be represented at the Contractor's plant by Inspector(s). They shall monitor, in the Contractor's plant, the manufacturer of transit buses built under this procurement. The Inspectors shall be authorized to approve the delivery acceptance tests, and to release the buses for delivery. Upon request to the quality assurance supervisor, the Inspector shall have access to the Contractor's quality assurance files related to this procurement. These files shall include drawings, material standards, parts lists, inspection processing and reports, and records of defects.

1.63.1. The contractor shall provide office space for the Inspector in close proximity to the final assembly area. This office space shall be equipped with desks, outside and inter-plant telephones, internet access, file cabinet, chairs, copy machine, printer, and clothing lockers sufficient to accommodate the Inspector's staff. The office space shall be properly heated, air-conditioned. The presence of these Inspectors in the plant shall not relieve the Contractor of its responsibility to meet all of the requirements of this procurement.

**1.64. LEGAL REQUIREMENTS**

The contractor shall comply with all applicable Federal, state and local regulations in effect at the date of manufacture. These shall include, but not be limited to, Federal ADA, Federal EPA, FMVSS and FMCSR regulations, State Biodiesel Vehicles' Warranties (S1277 or G.S. 143-58.4), as well as other state and local accessibility, safety and security requirements. Local regulations are defined as those below the state level.

1.64.1. In accordance with N.C. G. S. 20.116, North Carolina prohibits the operation of any

passenger buses with a Gross Vehicle Weight exceeding 40,000 lbs.

1.64.2. In the event of any conflict between the requirements of this Specification and any applicable legal requirement, the legal requirement shall prevail. Technical requirements that exceed the legal requirements are not considered to conflict.

**1.65. OVERALL REQUIREMENTS**

The contractor shall ensure that the use and installation of major bus sub-components and systems comply with all such sub-component vendors' requirements and recommendations. Components used shall be of heavy-duty design and proven in transit service.

**1.66. RESPONSIBILITIES FOR SYSTEMS INTEGRATION & TESTING**

Upon bid award, the vehicle manufacturer shall analyze and become familiar with the City of Raleigh's specifications, functional requirements and vehicle operational characteristics, as described herein. Based upon this analysis, the vehicle manufacturer shall provide the subsystem requirements to the subsystem supplier as may be needed to ensure proper functioning of those subsystems and their integration with other vehicle subsystems. (i.e. City of Raleigh specifications and/or manufacturer's specific requirements).

1.66.1. The vehicle manufacturer shall bear the responsibility of ensuring that the City of Raleigh's logic requirements will result in the safe operation of the vehicle and shall make the City of Raleigh aware of any inconsistencies regarding normal vehicle operations.

1.66.2. The vehicle manufacturer shall demonstrate proper integration of all on-board subsystems in accordance with the City of Raleigh's specification requirements prior to final inspection and delivery of the buses.

**1.67. TRAINING**

1.67.1. The City of Raleigh may require Operator and / or Maintenance training over the term of the contract. All training will be conducted at the City of Raleigh's facility and priced separately from the base bus on the price proposal as follows:

1. Eight (8) hour Operator Training class.
2. Twenty-four (24) hour Maintenance Technical Training class.

1.67.2. The City of Raleigh and the Manufacturer will determine the specific training requirements which may include but not be limited to: Familiarization, Pre-trip Inspections and Driving Characteristics for Operator and Electrical systems, Suspension and Steering systems, Brake Systems, Engine, Transmission and Body repair for Maintenance.

# MINIMUM SPECIFICATIONS

Heavy duty transit buses ordered under this bid will be low-floor diesel powered and will be 35 feet, 40 feet, and 60 feet in length by 102 inches wide, diesel powdered, CNG fuel, and electric alternatives. The manufacturer shall certify that each bus meets all Federal and State Vehicle Safety Standards and shall be designed, constructed and tested to ensure a minimum service life of at least twelve (12) years or 500,000 miles in revenue service. A copy of the Altoona test report is required with bid submission.

## 1.68. REQUEST FOR REVIEW

Throughout these specifications, City of Raleigh has described the various components and systems. Brand names are used as a description of a component or system that are known to the City of Raleigh as meeting its requirements. Unless otherwise specified, these named products are offered for illustrative purposes only and as a means to better explain the accompanying salient physical, functional, or performance characteristics.

1.68.1. Bidders are required to provide full descriptions including manufacturer, make or model, and other descriptive data or literature for each specified component, regardless of whether the component was included in the City of Raleigh's illustrative listings.

1.68.2. Any prospective bidder may request the City of Raleigh's review of a specific component to determine if the component meets the City of Raleigh's requirements. All requests for the City of Raleigh's review of a specific component and/or system must be fully supported with technical data, test results, transit revenue experience, or other pertinent information which confirms that the item and/or system being offered meet the City of Raleigh's requirements. The City of Raleigh will review such requests and announce its determinations to all known interested parties.

1.68.3. All such requests must be submitted in writing to by the date and time specified in the Bid Schedule (see Bid Schedule on page 5).

1.68.4. All major systems and sub-systems shall be individually and permanently labeled with Manufacturer, Part Number, and Serial Number. Label is to be located, in each instance, for easiest access for reading while installed for use in the bus. List of all systems, subsystems, and components shall accompany each bus either on paper or electronic format on a USB Thumb Drive.

## 1.69. BUS STRUCTURE

1.69.1. CRASHWORTHINESS

1. The transit bus body and roof structure shall withstand a static load equal to 150 percent of the curb weight evenly distributed on the roof with no more than a six-inch reduction in any interior dimension. Windows shall remain in place and shall not open under such a load. The bus shall withstand a 25 - mph impact by a 4,000-pound, post - 1973, American automobile at any point, excluding doorways, along either side of the bus with no more than three inches of permanent structural deformation at seated passenger hip height. This impact shall not result in sharp edges or protrusions in the bus interior.

2. Exterior panels and their supporting structural members shall withstand a static load of two thousand (2,000) pounds applied perpendicular to the bus by a pad no larger than five inches square. This load shall not result in deformation that prevents installation of new exterior panels to restore the original appearance of the transit bus. The transit bus, at GVWR and under static conditions, shall not exhibit deformation or deflection that impairs operation of doors, windows, or other mechanical elements. Static conditions include the vehicle at rest with any one wheel or dual set of wheels on a 6-inch curb or in a 6-inch-deep hole. All structure, body, and panel-bending mode frequencies, including vertical, lateral, and torsion modes, shall be sufficiently removed from all primary excitation frequencies to minimize audible, visible, or

sensible resonant vibrations during normal service.

3. The sidewall structure shall be capable of withstanding impacts of 200-foot pounds of energy from a steel faced spherical missile no less than 9 inches in diameter and of a 500-pound load applied

4. anywhere along their length by a rigid plate 1 foot in length with no visible damage to the supporting structure. A damaged portion of the supporting structure shall be replaceable without requiring removal or replacement of the entire structure.

5. To protect passengers seated in low floor area, the chassis structure shall be stainless steel and incorporate a substantial side impact barrier. The barrier shall include steel plate, continuous between the front wheel arches and the rear suspension (except in the width of the exit door opening). The impact barrier shall be an integral welded part of the undercarriage portion of the bus structure and shall be angled such that vehicles impacting the bus side will tend to subvert. To further increase both passenger safety and repair ability, robust welded structures are required between the angled barrier and the bus side skins. These shall be designed to dissipate collision energy.

6. The buses will be used for general service on urban arterial streets in geographical area in and throughout the state. Buses are to be used in urban areas, but at the same time must be able to maintain speeds up to 65 MPH for relatively long distances between stops. Buses shall be able to maintain a minimum of 7 MPH on a fifteen percent (15%) grade when loaded to GVWR. The buses shall afford features essential for safe, efficient and comfortable operation by the operator. This implies the utmost in road and traffic visibility under all driving conditions and adequate means for safe passenger movement. The bus must be maneuvered easily in normal and heavy traffic.

7. All Proposers must conform to these specifications and the product they furnish shall be of first-class quality, and workmanship, and shall be of the best obtainable in the various trades. The design of the body, chassis, and equipment, which the manufacturer proposes to furnish, shall be such as to produce a vehicle of substantial and durable construction in all respects.

1.69.2. BODY AND UNDER FRAMING

1. All material, metal panels, fasteners, shall be suitably treated (and electrically grounded) in an approved manner to resist corrosion. All posts in body size and roof sections shall in general, be made of durable aluminum alloy/stainless steel construction, securely fastened to the under-frame structure so that the entire assembly acts as one unit without any movement at the joining. The chassis understructure shall be stainless steel construction with an integrated side impact barrier. The end posts shall be designed to resist shear which would result in the case of a collision. Dissimilar metals shall not be joined by conductive material or fasteners and should be independently grounded using highly conductive straps.

2. All exterior access panels shall be hinged to the body frame. No sheet metal screws are permitted. Rivets, if used, shall be of the flush-head type and not protrude above the panel surface. Rivet spacing shall be in accordance with the best practices of bus industry standards. Exterior panels shall be joined and sealed in a manner which

precludes the entry of water at joints and fastenings for a minimum of 12 years. Lower exterior body panels shall be designed to facilitate quick change in thirty (30) minutes or less by one maintenance person.

3. All exposed under framing, underside of flooring, body panels below floor level, compartments, pans, step wells and wheel housings shall be undercoated. Particular care shall be exercised to see that this material is sprayed into all corners, crevices and pockets. Under-floor devices, valves, connectors, lines, wires and similar items shall not have undercoating applied to them to facilitate easy replacement of parts when required. Undercarriage shall be designed to ensure water will not collect and remain trapped to accelerate rust or rot.

4. All metal hardware shall be plated or otherwise protected against corrosion and dissimilar metals shall not be used. Fasteners and trim shall be vandal-resistant (e.g. Southco or Torx Screws) and of a type that will not loosen or break under vibration. All unexposed interior metal body parts shall be primed or painted prior to assembly.

5. The engine bulkhead shall be designed to last the life of the vehicle without experiencing fatigue-cracking under normal operating conditions and constructed to inhibit the spread of an engine compartment fire to the bus of the interior. The largest possible access to the engine shall be provided from the rear seat to enable easy access reach and remove parts on the upper side of the engine. Such access openings shall be hinged and seal securely to prevent the entry of fumes, heat, fire, or noise to the bus interior.

1.69.3. ROOF AND CEILING

1. The roof structure shall be constructed of high strength extruded aluminum and bolted to the body frame. The roof shall be covered with a single sheet fiberglass skin with a minimum thinness of 3mm and be coated with a photocatalytic coating for ease of cleaning. The entire roof and body structure shall be well insulated against be insulated with polyurethane foam-in-place thermal insulation applied 1 1/2" nominal thickness to provide the most efficient barrier against heat and cold in an operating environment which ranges from 20 degrees to 105 degrees F as well as be insulated against operating noises from outside sources. Water deflecting roof gutters shall be provided over the side windows and doors.

2. The riser beneath the seats across the rear of the bus shall be stainless steel of adequate thickness and construction to preclude damage by passenger's feet. The body and under framing shall be designed and constructed to accommodate the bus being lifted by a wrecker at the front or rear ends and being towed with the front or rear wheels off the ground without damage to any of the body, frame or suspension components.

3. Manual open and close roof-mounted escape hatches, with clearly marked external handle, shall be provided above the front and rear axle area of the bus.

1.69.4. WHEELHOUSES

Wheel housings shall be constructed of stainless-steel corrosion and fire-resistant material. Wheel housings, as installed and trimmed, shall withstand impacts of a 2-inch steel ball with at least 200 foot- pounds of energy without penetration. Sufficient clearance and air circulation shall be provided around the tires, wheels, and brakes to preclude

overheating when the bus is operating on the design operating profile. Interference between the tires and any portion of the bus shall not be possible in maneuvers up to the limit of tire adhesion with weights from curb weight to GVWR. Wheel housings shall be adequately reinforced where seat pedestals are installed. Front wheel housing shall be constructed to allow maximum aisle clearance between them for passenger movement and ADA access.

1.69.5. FENDERS AND SPLASHGUARDS

Buses shall be provided with fenders and splash aprons. Fenders shall be of molded or extruded rubber or high-density polyethylene and shall be provided at each wheel housing. Fenders shall present a smooth appearance and be free of dents, waves and similar irregularities. The fender for the left front wheel shall, to the maximum extent possible, preclude road spray from obscuring the driver's vision in the left- hand, outside mirror. Mud flaps/splash aprons shall be installed under the body in front of the front wheels to preclude road spray and debris from being thrown on the wheelchair lift and its components. A three-piece splash apron shall be provided across the entire bus at the rear of the rear wheels, and separate splash aprons shall be provided behind the front wheels. An approved method of grounding static electricity shall be provided on each bus such as a conductive nylon grounding strap.

1.69.6. BUMPERS AND TOW EYES

The front and rear bumper shall be a semi-pneumatic, energy absorbing bumper of a wraparound type. It shall be at least 8 inches high and shall project at least 4 inches ahead of the foremost part of the bus. (Excluding the bike rack).

1. The bumper will provide immediate, automatic resetting after impact without any adjustments or manual operations. The bumper shall be able to withstand a head-on impact of a 4,000-pound passenger car moving at 8 mph without damage to the stopped bus or the bus bumper. The bumper shall provide 6 mph fixed barrier impact capability, without passenger load, with no damage to the bus. Color shall be black.

2. The bumper shall comply with FMVSS 215. The bumper and adjacent body panels shall be designed to protect the bus while discouraging persons from standing on or hitching rides on them. Wrap around bumper extensions shall not hinder service and be free of protrusions or sharp edges. The leading edge of the extensions shall be flush with the body. The bumper shall be independent of all power systems of the bus and shall not require service or maintenance in normal operation during the service life of the bus. Bumper heights shall be selected considering S.A.E. standards to protect against automobile damage and considering the optimal bumper height requirements of FMVSS 215.

3. Two front tow eyes and two rear tow eyes shall be provided. A "glad hand" with shut off valve, or a quick coupler, brake hook up shall be installed to be utilized when towing the bus. It will provide brakes for the bus in tow. A fitting for outside air source during towing will be provided on both the front and rear of the bus. Fittings to have shut off valve to prevent loss of bus air when not needed for towing.

1.69.7. SUBFLOOR

1. The sub floor shall be made of 3/4"-7 Ply GW Industries Transit Deck XP Plus with all edges sealed. The floor shall be laid so as to be free from squeaks and must be

securely fastened. Thesub floor shall be level and of sufficient rigidity that will not bend or move up towards the plywood when riveted together. A gradual incline over the axles is permitted but not to exceed 3" maximum rise. The sub floor shall be finished and filled after installation in the manner prescribed by the manufacturer of the floor covering.

2. Access doors/panels shall be provided where necessary to service transmission, engine, engine accessories, or other under-floor components, which are not readily accessible from theengine compartment, side panels or from the underside of the bus.

1.69.8. FLOOR COVERINGS

1. Floor covering shall be heavy duty non-skid transit rubber flooring or equivalent. The floor covering shall be attached continuously to the sub-floor by waterproof adhesives without voids. All seams and interfaces with the wall, wheel housing, etc. shall be covered with stainless steel trim that will provide a floor that is free of tripping hazards and easy to clean by dry and wet wash with cleaning solutions. Clear or color matching silicone caulking shall be used at any point such as seams where moisture may enter into the flooring material.

2. All flooring will be smooth. The standee line shall be at least two inches wide and shall extend across the bus aisle in line with the driver's barrier. This line and the edge of the steps shall be Yellow. The City of Raleigh is aware of the RCA flooring that is known to meet this requirement.

3. Driver's foot operated switches shall be protected from moisture and dirt. Foot switches and other controls shall be installed to prevent entry of drafts. A heel wear plate shall be mounted at thebase of the throttle and brake pedals.

1.69.9. INSIDE NOISE ABATEMENT

1. The combination of inner and outer panels and any material used between them shall provide sufficient sound insulation so that a sound source with a level of 80 dBA measured at the outside skin of the bus shall have a sound level of 65 dBA or less at any point inside the bus. These conditions shall prevail with all openings, including doors and windows, closed and with the engine and accessories switched off. The bus generated noise level experienced by a passenger at any seat location in the bus shall not exceed 83 dBA and the driver shall not experience a noise level of more than 75 dBA under the following test conditions: The bus shall be empty except for test personnel, not to exceed four (4) persons, and the test equipment. All openings shall be closed and all accessories shall be operating during the test. The bus shall accelerate at full throttle from a standstill to thirty-five (35) mph on level commercial asphalt or concrete pavement in an area free of large reflecting surfaces within fifty (50) feet of the bus path.

2. During the test, the ambient noise level in the test area shall be at least 10 dBA lower than the bus under the test. Instrumentation and other general requirements shall conform to SAE Standard J366. If the noise contains an audible discrete frequency, a penalty of 5 dBA shall be added to the sound level measured.

1.69.10. OUTSIDE NOISE ABATEMENT

1. Airborne noise generated by the bus and measured from either side shall not exceed eighty-three (83) dBA under full power acceleration when operated at or below thirty-five (35) mph at curb weight and just prior to transmission up shift. The bus-generated noise at curb idle shall not exceed sixty-five (65) dBA. If the noise contains an audible discrete frequency, a penalty of five (5) dBA shall be added to the sound level measured. All noise readings shall be taken fifty (50) feet from, and perpendicular to, the centerline of the bus with all accessories operating.

2. Instrumentation, test sides, and other general requirements shall be in accordance with SAE Standard J366. The pull way test shall be conducted with the rear bumper even with the microphone. Both interior and exterior noise abatement tests must be certificated to be compliant and a copy of the furnished with the proposal.

1.69.11. DIMENSIONAL SPECIFICATIONS

| Size: | 39 Ft - 42 Ft. | 29 Ft - 32 Ft. |
|---|---|---|
| Length Over Bumpers: | 504.5 In. | 383 In. |
| Length Over Body: | 493.5 In. | 372 In. |
| Width Over Body excluding Mirrors: | 102 In. | 102 In. |
| Height Maximum: | 135 In. | 134 In. |
| Seating Capacity Maximum | 40 | 26 |
| Front Step Height Unkneeled: | 15.3 In. | 15.3 In. |
| Head Room Maximum at Center of Aisle: | 95 In. | 95 In. |
| Aisle Width Minimum between Frt Wheel Wells: | 26 In. | 26 In. |
| Wheel Base: | 279 In. | 162.8 In. |
| Turning Radius Outside Bumper: | 45 Ft. 11 In. | 29 Ft. 10 In. |
| Approach Angle: | 8.6 Deg. | 8.4 Deg. |
| Departure Angle: | 8.8 Deg. | 8.1 Deg. |
| Break Over Angle: | 10.7 Deg. | 14.6 Deg. |
| Ground Clearance Including Axles: | 8.04 In. | 7.9 In. |
| Ground Clearance Excluding Axles: | 8.76 In. | 6.1 In. |
| Curb Weight Max. GVW: | 29,740 lbs | 23,260 lbs |
| Vehicle Weight Max. GVWR: | 41,600 lbs | 34,000 lbs |

## 1.70. SUSPENSION AND STEERING SYSTEMS

1.70.1. SUSPENSION

1. Buses shall be equipped with a four (4) air bag front and rear suspension system. The

air suspension system shall consist of a combination of air bellows and leveling valves by which the air pressure is automatically regulated in proportion to bus loading. The leveling valves shall also act to keep the bus body in a relatively level position and contain a damping or compensating feature to prevent excessive consumption of air resulting from high frequency Axle movements over rough streets. The air bellows shall act as a flexible connection between the body and the axle to cushion and absorb road shocks.

2. The air system must be equipped with safety devices which will prevent the loss of air beyond safe operating limits in the event of failure or leaks in any or all of the suspension system components. Suitable radius rods, torque rods or track bars, shall be provided to control lateral, longitudinal and torsional movement of the body in relation to the axles. Anti-sway bars shall be provided both front and rear in order to prevent the bus from swaying when turning or moving on and out of traffic.

3. Shock absorbers shall be heavy-duty and compatible with the rated axle capacity. Shock absorbers shall not interfere with the steering mechanism. Leveling valve exhaust ports shall be protected to avoid fouling by road dirt. A means shall be provided to allow the front air bellows to be deflated at bus stops to "kneel" the bus, lowering the front steps as an aid to passenger entry and exit. A guarded three position spring-loaded to the off-position KNEEL switch shall be provided.

   Actuation of the switch when the front door is open shall cause the bellows to deflate in not less than one nor more than five seconds. Release of this switch after actuation shall stop the kneel cycle immediately but shall not cause the bus to rise; closing the front door shall cause the bellows to be inflate.

4. The accelerator and rear brakes shall both be interlocked so that the bus cannot be driven when the bus is kneeling, and the front door and/ or rear door is open. An emergency override switch shall be provided remotely located in the driver's compartment electrical panel to allow bus movement in the event an air bellow should break.

5. The bus will kneel and rise at a maximum rate of 1.5 inches per second at essentially a constant rate. After kneeling, the bus shall rise within two (2) seconds to a height permitting the bus to resume service and to rise to the correct operating height within nine (9) seconds. During the lowering and rising operation, the maximum acceleration shall not exceed 0.2g and the jerk shall not exceed 0.3g/sec. measured on the front door step tread. The City of Raleigh is aware of the Neway suspension that is known to meet this requirement.

1.70.2. FRONT AXLE

1. The front axle shall be solid beam, non-driving with a load rating sufficient for the bus loaded to GVWR and shall be equipped with grease type front wheel bearings and seals. All friction points on the front axle shall be equipped with replaceable bushings or inserts and lubrication fittings easily accessible from a pit or hoist. No element of the axle steering system shall sustain a Class I failure when one of the tires hits a curb or strikes a severe road hazard.

2. Inadvertent alternations of steering as a result of striking road hazards are steering

failures. The City of Raleigh is aware of the Meritor FH 946 that is known to meet this requirement.

1.70.3. REAR AXLE

1. A standard single reduction axle will be used. The axle shall be of a separable carrier housing construction with a load rating sufficient for the bus loaded to GVWR.

2. Transfer of gear noise to the bus interior shall be minimized. The driven axle shall operate for 300,000 miles on the design operating profile without repairs. The lubricant drain plug shallbe magnetic type, external hex head of a standard size. The axle shall be vented with the vent so designed as to prevent water from entering when the axle is submerged. The vent line shall be filtered to prevent entrance of foreign materials.

3. The bus manufacturer shall ensure the rear axle and differential assemblies installed are capable of withstanding the additional loadings and stresses imposed by the integral transmission retarder. Durability and reliability shall not be reduced because of the use of retarder.

4. Axle gear ratio shall ensure the bus is capable of highway speeds of up to 65 MPH for relatively long distances between stops. Buses shall be able to maintain a minimum of 7 MPH on a fifteen percent (15%) grade when loaded to GVWR. City of Raleigh is aware of the Meritor 71163 with grease seals that is known to meet this requirement.

1.70.4. HUBS, WHEELS AND TIRES

1. Buses shall be equipped with single front and dual rear wheels. Wheels shall be hub-piloted full polish aluminum with a dura-bright finish. The wheels shall be 10-stud, ventilated disk radial tire type, with wheel loads carried by the center hub.

2. Wheel bearings shall be grease lubricated (packed type) for front hubs. An option for oil lubricated bearings shall also be provided. The wheel bearing inner axle fluid seals shall run on a replaceable wiper ring/wear surface.

3. Tires shall be approved for transit application with a load range appropriate to bus weight and size. All wheel and tire assemblies shall be balanced to assure smooth handling and optimum tire wear.

4. One spare wheel shall be provided with each bus. This wheel shall be shipped with the bus and the manufacturer shall provide a protective padding between the spare wheel and flooring.

1.70.5. BRAKES

1. Buses shall be equipped with an s-cam type air brake system which conforms to FMVSS requirements and all Federal and State regulations. Air brake chambers and slack adjusters shall be furnished at all wheels, actuated for service braking in a manner to assure balanced braking, and actuated for parking/emergency braking on the rear wheels. Buses shall be equipped with four (4) wheel Anti-Lock Brake system

with a minimum of 3 sensors. Parking brake shall be spring applied, air released chamber mounted on the rear axle assembly. The emergency air tank shall be piped to a service valve at the left front corner of the bus to fill the tank for towing the vehicle. The City of Raleigh is aware of the MGM Type 24 front and MGM 3636 rear chambers that is known to meet this requirement. An option for air disc brakes may be proposed.

2. Brake shoes shall be operated by cams which in return are operated by automatic slack adjusters' Slack adjusters shall be equipped with grease fittings and be capable of automatic adjustments throughout the life of the lining and drum assembly.

3. Brake lines shall be installed so that the possibility of damage is minimized. Lines and hoses shall be clamped and supported in a manner which minimizes long, unsupported hose lengths and precludes rubbing against any part of the bus. The City of Raleigh is aware of the Haldex S.A.B. Automatic slack adjuster that is known to meet this requirement.

4. The parking and emergency brakes shall be with a 40 PSI setting, controlled by a manual valve located convenient to the driver for safe, convenient access. Valve operation shall be "pull to set brakes" and "push to release" type brake system.

5. This brake shall have stopping ability that is equal to or better than required by Federal and State regulations. It shall automatically apply if air system pressure falls below half the normal value or such other value as is recommended by the manufacturer. This parking/emergency brake shall be of spring brake design.

1.70.6. STEERING

1. Hydraulically assisted power steering gear is required. The steering column shall be atilt/telescope column and shall be adjustable by the driver. The steering gear shall be an integral type of American manufacture with flexible lines eliminated or the number and length minimized.

2. Steering torque applied by the driver shall not exceed (10) foot-pounds with the front wheels straight ahead to turned 10 degrees. Steering torque may increase to seventy (70) foot-pounds when the wheels are approaching the steering stops. Steering effort shall be measured with the bus at SLW, stopped with the brakes released and the engine at normal idling speed on clean, dry, level, commercial asphalt pavement and the tires inflated to recommended pressure.

3. Power steering failure shall not result in loss of steering control. With the bus in operation, the steering effort shall not exceed 55 pounds at the steering wheel rim and perceived free play inthe steering system shall not materially increase as a result of power assist failure. Gearing shall require no more than seven (7) turns of the steering wheel lock-to-lock.

4. The steering wheel shall be twenty inches (20") minimum in diameter and shall be black color plastic construction with a metal core and non-padded. It shall be provided with puller holes in the hub for easy removal. Steering effort and number of turn's lock-to-lock shall be designed and coordinated to minimize driver fatigue. Steering forces and characteristics in the event of failure in the power boost shall be such that

the bus can be safely driven in this condition.

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

6. Gear assembly shall be mounted so as to reduce road shock and vibration. Steering mechanism shall be mounted so that all adjustments can readily be made without demounting parts. Diagnostic port shall be provided to monitor pressures.

7. Grease fittings shall be provided to allow proper lubrication of all steering components and located to be accessible with a straight end on the grease gun with the vehicle on a pit or hoist.

## 1.71. PROPULSION SYSTEMS

### 1.71.1. ENGINE (CNG)

1. The bus shall be powered by a compressed natural gas engine capable of providing the performance to satisfy the operating conditions in geographical area throughout our operating area. The engine shall be fueled by compressed natural gas and rated at peak horsepower of 280 BHP @ 2,000 RPM and peak torque of 900 ft-lbs @ 1,300 RPM. The engine shall have a minimum design life of 12 years or 500,000 miles, whichever comes first, and it shall be designed to require no more than one (1) major overhaul to achieve this lifetime. The engine and the transmission shall be compatible with each other in that the electronic controls of the engine shall interface with the transmission and vice versa. The engine shall meet all current Federal EPA, Clean Air Act of 1990. A copy of the engine certification shall be supplied with the proposal. The City of Raleigh is aware of the Cummins L9N 280HP engine known to meet this requirement.

2. The power plant shall be removable in eight (8) hours or less by 2 Class II Mechanics, as a complete unit, including engine and transmission assembly. The engine mounting devices shall provide maximum isolation from audible frequencies and from vibrations which could be transmitted to the bus. No vibrations shall be produced or transmitted at fundamental frequenciesof the bus structure or suspension, or any of the attachments to the bus.

3. The engine air intake shall be through a screened or louvered opening at the rear of the bus. The opening and the duct to the air cleaner shall be isolated from the primary body structure for noise attenuation. A dry type air cleaner that is easily removable and meets or exceeds the engine manufacturer’s requirements for transit operations shall be used.

4. The engine duct shall be designed to minimize the entry of water into the air intake system. Drainage provisions shall be included to allow any water/moisture to drain prior to entry into the air filter. A highly visible sight gauge to facilitate inspection of the air cleaner element condition will be incorporated. The City of Raleigh is aware that the Donaldson Informer RBX00-2277 known to meet this requirement.

5. The engine shall be equipped with spin-on oil filter(s) of a type and capacity which exceed all engine manufacturer requirements.

6. Engine auxiliary devices shall be flange-mounted and gear-driven directly from the engine with the exception of the alternator and A/C compressor. All auxiliary drive belts shall be guarded and protected from road debris by a hinged guard. Engine driven auxiliary devices shall be secured to the engine and/or transmission except the A/C compressor.

7. Sensors shall be supplied on the engine and incorporated in an engine protection system to warn the operator of low oil pressure and hot engine conditions. Engine protection circuitry shall automatically shut down the engine if adverse oil pressure and/or coolant temperature conditions exist in accordance with engine manufacturers recommendations.

8. The engine shall be equipped with a 24-volt DC electrical starter system. Starter shall incorporate over crank protection. A starter switch, starter cutout switch, and engine run control switch shall be supplied in the engine compartment. The City of Raleigh is aware of the Delco 24V-42MT-450 Electric Starter known to meet this requirement.

1.71.2. ENGINE (DIESEL-option)

1. The bus shall be powered by a diesel engine capable of providing the performance to satisfy the operating conditions in geographical area throughout our operating area. The engine shall meet all current Federal EPA, Clean Air Act of 1990.

2. The maximum operating speed of the engine will be governed at 55 mph. A copy of the engine certification shall be supplied with the proposal. The City of Raleigh is aware of the CumminsL9 that is known to meet this requirement.

1.71.3. ENGINE (BATTERY ELECTRIC)

1. The bus battery electric propulsion system shall be capable of providing the performance to satisfy the operating conditions in geographical area throughout our operating area.

2. The propulsion system shall meet all current Federal EPA and Federal D.O.T. regulations.

1.71.4. COOLING SYSTEM

1. The cooling system shall be an electric fan cooling system with brushless electric fans which have built in controller cooling function is to be controlled by required from engine ECM. The fans should be capable of being manually reversed, in order to keep the heat exchangers clean. System shall be sized to maintain fluids at safe, continuous operating temperatures during the most severe operations possible with the bus loaded to GVWR and with ambient temperatures up to 120 degrees Fahrenheit. The cooling system requires a float type coolant level sensor made of stainless steel with an independent sensor arm and float assembly.

2. The engine shall be cooled by a water-based, pressure type, cooling system. The radiator surge tank mounted above the radiator shall be of heavy-duty stainless steel with a pressure relief cap mounted on top of the tank vented into a non-pressurized

coolant recovery reservoir. Coolant fill shall be added to the system through the non-pressured part of the system. The engine cooling system shall be equipped with a properly sized water filter. Shut-off valves shall allow filter replacement without coolant loss.

3. The radiator shall be of durable corrosion resistant construction. The radiator shall be mounted with the radiator easily accessible for cleaning. Radiator piping shall be stainless steel and brass tubing. The engine radiator will be designed of sufficient size to provide cooling for the engine as required by the engine manufacturer for this application. The City of Raleigh is aware of the EMP Gen IV MH5 Fan System that is known to meet this requirement.

4. Necessary hoses shall be premium silicone types that are rated for cooling systems. All hoses, water and air intake, shall be secured with premium clamps. The City of Raleigh is aware of constant torque type clamps that is known to meet this requirement.

1.71.5. EXHAUST SYSTEM

1. The engine exhaust system shall be constructed so that it 1) will minimize back pressure to the engine, 2) emits the lowest levels of exhaust noise and current year emissions under all operating conditions, 3) is commensurate with the latest commercially available technology and equipment, and 4) shall not cause damage to the bus finish, or present a hazard to pedestrians. An exhaust vibration balancer or, as an alternative, flexible pipes, will be used in restricted space areas. The exhaust system shall be leak free to prevent exhaust products, including heat, from entering the bus. The muffler and pipes shall be placed or mounted in such a manner that they do not restrict access to other equipment or components to the extent possible.

2. A Diesel Particulate Filter will be included with all engines that will comply with the most recent EPA requirements at the time of vehicle delivery. An electrical switch is required for stationary regeneration if applicable. Switch shall be a guarded switch and placed in the electrical panelabove the operator’s head or another protected area.

3. The engine compartment shall be completely sealed to prevent smoke or fumes from the exhaust entering the bus interior. The engine bulkhead and exhaust duct plenum shall be insulated adequate to prevent discomfort to passengers due to heat, to minimize hazard of fire in the engine compartment, and to aid in controlling noise to meet required levels.

1.71.6. TRANSMISSION (DIESEL AND CNG)

1. The transmission shall be multiple speed (minimum of four (4) forward speeds), automatic shift with torque converter, retarder and electronic controls. Gross input power, gross input torque and rated input speed shall be compatible with the engine. A 3M mechanic, with optional assistance, shall be able to remove and replace the transmission assembly for service in less than 8 total combined man-hours. The transmission shall be designed to operate for not less than 300,000 miles on the design operating profile without replacement or major service. The City of Raleigh is aware of the Allison B400R that is known to meet this requirement.

1.71.7. DRIVE SHAFT

1. The drive shaft shall be a minimum of 4" diameter heavy-duty with needle bearing universal joints between the transmission and differential. A slip joint shall be included to compensate for vertical movement of the rear axle. Alignment between transmission and differential shall not exceed 9 degrees and must meet manufacturer's guidelines for recommended installation. The universal joints shall be equipped with two grease fittings installed 180 degrees apart on the U-joint to facilitate servicing. The drive shaft shall be guarded to prevent it from striking the floor of the bus or the ground in the event of a tube or universal joint failure. The City of Raleigh is aware of the Spicer 1710 driveshaft that is known to meet this requirement.

1.71.8. HYDRAULIC SYSTEM

1. Hydraulics shall be limited to the Power Steering system. The system shall require an engine driven pump and minimum 9qt reservoir with sight glass. All power steering pressure and return hoses shall be FC300. A low fluid sensor and indicator lamp on dash shall be provided.

## 1.72. FUEL TANK

1.72.1. CNG STORAGE TANKS

1. The CNG tanks shall be neck mounted and located on the roof of the vehicle. Tanks shall be designed for a settled pressure of 3,600 psig and provide for a maximum filling pressure of 4,250 psig.

2. Each tank will be labeled "For CNG Only" in letters. Each tank shall be oriented on the vehicle so that the manufacturer's label with a serial number, manufacture date and "For CNG Only" tag will be visible without rotating tank to obtain that information. For compliance regulation purposes the CNG system must meet: NFTA 52, NGV2, and FMVSS304.

1.72.2. CNG ACCESSIBILITY

1. For safety purposes, the roof mounted tanks must be accessible to maintenance personnel without the requirement to walk on top of the closed tank enclosure to open the enclosure doors. The enclosure doors shall be secured with non-keyed twist latches and shall incorporate hand holds to assist in opening the enclosure doors once unlatched. When opened, the enclosure doors shall be secured to prevent from over-extension. The open enclosure doors shall also provide a certain degree of fall prevention. Once exposed, for safety purposes, maintenance personnel shall not have to walk on top of or over the tanks in order to inspect or service the tanks, valves, regulators or Pressure Relief Devices (PRD). Access to the roof mounted tanks shall be through the rear roof hatch.

2. At a minimum, each tank must have an easily accessible and operable manual shutoff valve that will isolate the tank from the shared fuel supply piping system. The option to add electric solenoid valves to each tank shall be made available. Depending on the size of the tank, two (2) or three (3) PRDs will protect each tank. The PRDs will vent independently (not manifolded together) through cutouts in the tank enclosure. The PRD vents must be able to be inspected from ground level with the use of a mirror

and shall be designed so as to not collect water.

1.72.3. CNG CAPACITY

1. Standard Tank configuration for 35’ shall be as follows:
2. Front row: Four tanks 16” diameter x 85” length
3. Rear row: Four tanks 16” diameter x 85” length
4. Capacity: 17,608 SCF 816 lbs of fuel
5. Diesel equivalent gallons: 126
6. Standard Tank configuration for 40’ shall be as follows:
7. Front row: Four tanks 16” diameter x 120” length
8. Rear row: Four tanks 16” diameter x 85” length
9. Capacity: 21,636 SCF 1002 lbs of fuel
10. Diesel equivalent gallons: 155

1.72.4. CNG PIPING AND TUBING

1. The entire high-pressure portion of the fuel delivery system shall be constructed of stainless steel and shall be sized appropriately. There shall only be one (1) crossover fuel line on the roof with a single stainless-steel fuel supply line going into the engine compartment at the rear curbside of the vehicle. This fuel supply line shall be covered with a conduit vent to trap and expel any escaped gas that may accumulate in the fueling panel. All hoses in the fuel system shall be continuously marked with manufacturer’s name, CNG service and working pressure.

1.72.5. CNG HOSES

1. Flexible hoses shall be used only in the low-pressure portion of the fuel delivery system. The hose between the pressure regulator in the fuel management panel and the low-pressure filter in the engine compartment shall be a minimum of 10 feet in length to provide warming of the CNG fuel after the pressure and temperature drop from the regulator. The hose from the filter to the engine shall be a maximum of 4 feet in length.

1.72.6. CNG FITTINGS

1. All high-pressure stainless-steel tubes shall use Swagelok fittings to join to each other or to components like valves. All hoses use 37º JIC flare fittings. All components have straight thread O-ring seal ports. The use of pipe threads is not acceptable.

1.72.7. CNG FILTERS

1. There shall be one high pressure and one low pressure filter supplied. The high-pressure filter shall be provided in the fuel management panel in a location that provides for ease of service. A normally closed electric solenoid shall be provided downstream from the high-pressure filter and prior to the high-pressure regulator. The “shut-off” solenoid will stop the flow of gas when the ignition is in the “off” position.

2. The low-pressure filter shall be furnished with the engine assembly and remote mounted in the curbside engine compartment on the filter outrigger.

1.72.8. CNG FUEL MANAGEMENT SYSTEM

1. The vehicle shall incorporate an integrated fuel management panel located behind a hinged access door located at the rear curbside of the vehicle. The access door shall include an interlock sensor to disable the engine starter when the door is open. In the event of a failure to the sensor the engine will not start.

2. The fueling panel shall incorporate the main manual shut off valve, liquid filled high and low-pressure gauges, a fast fill refueling connection, slow fill refueling connection and a defueling connection. All receptacles shall include a tethered dust cap. The pressure regulator, high pressure filter and a normally closed high pressure electric solenoid shall be installed behind the fuel management panel. A low fuel lamp will be provided in the driver's area. Proposers will provide pricing for a fuel level gauge as an option.

3. Each vehicle shall bear a label at the fueling panel that includes:

    a. CNG Fueled Vehicle
    b. System working pressure
    c. Installer's name or company
    d. Cylinder retest date
    e. Total cylinder water volume in cubic inches

1.72.9. FUEL SYSTEM (DIESEL-option)

1. Shall meet or exceed Federal D.O.T. Regulations for diesel and Bio-diesel fuel systems.

1.72.10. FUEL TANK (DIESEL-option)

1. The fuel tank shall be securely mounted to the bus to prevent movement during bus maneuvers but shall be easily removable for cleaning or replacement. The fuel tank shall have a usable capacity of not less than 115 gallons on the 40-foot bus and 75 gallons for the 35' bus.

2. The fuel tank shall be mounted in such a manner to permit the repair and replacement of the fuel pick up, return lines, cover gasket, or the fuel tank neck and gasket without the removal of the fuel tank. The fuel tank shall be equipped with an external, hex head, brass drain plug. The drain plug shall be located at the lowest point of the fuel tank.

3. The fuel tank shall have a removable filter to permit cleaning and inspection. The fuel tank shall be made of stainless steel with internal baffles to prevent sloshing noises regardless of the fuel level. The baffles or fuel pickup location shall assure continuous full power operation on a six (6) percent upgrade for 15 minutes starting with more than 25 gallons of fuel over the unusable amount in the tank and a six (6) percent downgrade for thirty minutes starting with no more than ten gallons of fuel over the unusable amount in the tank.

4. The tank shall be internally braced and externally supported in such a manner as to eliminate the possibility of developing vibration fatigue cranks. The tank shall be mounted by stainless steel saddle and straps. The straps shall be insulated from the

tank with non-porous material that does not absorb moisture.

5. The fuel tank shall have a permanently affixed plaque stating manufacturer, certification capacity and date of manufacturer. The plaque shall be clean and legible after any undercoating process, and shall comply with E.P.B. requirements. The plaque shall be visible when the fuel fill door is open. All fuel systems on all model buses will be compatible with all blends of Bio- Diesel fuel.

1.72.11. FUEL FILL (DIESEL-option)

1. The fuel fill shall be located behind the centerline of the bus. The filler cap shall be a flip cap to the fuel filler neck. To accommodate existing refueling equipment, the fuel filler shall accommodate a nozzle that forms a locked and sealed connection during the refueling process to eliminate spills. Fuel shall not be allowed to flow into the tank unless the nozzle has been properly coupled, locked and sealed to the filler. With the nozzle open, fuel shall enter the tank at a fill rate of not less than 40 gallons per minute of foam-free fuel without causing the nozzle to shut off before the tank is full. The nozzle shall automatically shut off when the tank is essentially full. Once disconnected, fuel shall not be allowed to flow through the nozzle at any time. Any pressure over 3 psi shall be relieved from the fuel tank automatically. An audible signal shall indicate when the tank is essentially full. The fuel tank filler neck must be equipped with a poppet valve mounted internally of the fuel filler neck to prevent fuel splash back from the fuel tank. The City of Raleigh is aware of the Emco-Wheaton Posi-Lock system that is known to meet this requirement.

2. The fuel lines forward of the engine bulkhead shall be stainless steel with FC 350 jumper lines to fuel tank All filters and lines shall be installed in such a manner as to avoid excessive heat and fire hazard (e.g., protected from exposure to temperatures above 250 degrees Fahrenheit, positioned so leaks or breaches will not permit fuel to contact exhaust parts hotter than 250 degrees Fahrenheit). Tubing and lines shall be installed so as not to rub or be rubbed by other components.

3. The Fuel Filter shall be a spin-on primary and secondary fuel filter approved by the engine manufacturer.

1.72.12. REAR RUN BOX AND CONTROLS

1. Provisions shall be made in the engine compartment for a control box or panel which will incorporate the following devices. All devices shall be clearly marked and easily accessible with the engine compartment door open:

    a. Rear hand Throttle
    b. Engine Compartment Light Switch
    c. Engine Run Control and Rear Start Switch Electric J1939 Oil Pressure Gauge
    d. Electric J1939 Coolant Temperature Gauge Electric Fan Reverse Switch
    e. Engine /Transmission/ABS Diagnostic Gauge

1.72.13. AIR SYSTEM

1. The air compressor and remote mounted governor shall be mounted to the engine and

gear driven. The air compressor shall have a self-contained air filter for air intake or be connected to the filtered air in the engine's air induction system. Connecting lines, pipes or hoses shall be suitable for the purpose, location/operating conditions and be protected from chafing damage.

2. A sufficient number of reservoirs to provide safe operation of all air operated components are required. Reserve capacity shall exceed minimum industry requirement. All air tanks shall have clean out plugs and be equipped with a pet cock type drain valves to allow individual tank purging/depressurization. All drain lines will be routed to the outside of the bus to a single access panel containing the pet cock drain valves. Each valve shall be clearly marked as to which tank it controls. Safety valves and check valves will be installed to protect against over-pressurization and/or unplanned loss of pressure.

3. Provisions shall be made to allow application of air pressure to the bus from an external source. Air connections shall be securely mounted in a readily accessible in the engine compartment and at the front end of the bus.

4. All air lines, components and their installation shall comply with applicable Federal and State requirements as in effect at the time of the bus manufacturer. The bus air system shall operate all accessories and the braking system with reserve capacity. The engine driven air compressor shall be sized to charge the air system from 40 psi to the governor cutoff pressure in less than three minutes while not exceeding the engine's fast idle rated speed. Regardless of the system's air pressure, idle up to the rated engine speed shall be available to the driver with the transmission in neutral and the parking brake applied.

5. With the air system fully charged and the engine shut off, the reservoir capacity shall be sufficient to permit four full brake applications and maintain 80 PSI. Buses shall not leak down more than six (6) PSI as indicated on the instrument panel mounted air gauges, within 15 minutes from the point of governor cut-off. Grommets shall protect the air lines at all points where they pass through understructure components.

6. The air system shall be equipped with a transit application desiccant type air dryer. The air dryer shall be mounted in compliance with the engine manufacturer's recommendations. The City of Raleigh is aware of the AD9 type Dryer that is known to meet this requirement.

## 1.73. BODY SYSTEMS

### 1.73.1. ACCESSIBILITY (COMPARTMENTS, PANELS, DOORS)

1. The rear engine compartment door shall have a center mounted handle and shall lift upward hinged at the top. Gas operated shocks will provide assistance as the door is opened and shall secure access doors in the open position during inspection and servicing. When closed, the door will be secured to the body with a 5/16" square latch on the lower corners.

2. Access panels to the left and right side of the engine compartment shall be provided with expanded metal inserts to provide heat dissipation in the engine compartment. Access panels will be hinged to open upward and be designed with gas operated

shocks will provide assistance as the door is opened and shall secure access doors in the open position during inspection and servicing. When closed, the doors will be secured to the body with a 5/16” square latch provided on the lower corners.

3. The battery access door shall be and be designed with gas operated shocks will provide assistance as the door is opened and shall secure access doors in the open position during inspection and servicing. When closed, the doors will be secured to the body with a 5/16” square latch provided on the lower corners.

4. There shall be separate access doors located on the outside of the bus for the battery disconnect switch, fuel fill, diesel emissions fluid, air tank drain valves, and the windshield washer fluid. All doors will be equipped with a well-type securing latch. The door shall be hinged on the top or side, and able to be opened by hand with the assistance of any tool.

5. Engine compartment access through access panel located under the rear settee shall be required. This panel shall include the largest size opening possible to allow maintenance access to the upper portions of the engine compartment. The rear settee seat shall be hinged on the top and when opened, secured with an appropriate device to hold it in the open position during inspection and servicing.

6. Each bus shall be equipped a Electronics cabinet sized appropriate to house all electronic equipment including radio video recording, vehicle logic, APC and other electronic equipment. The cabinet shall be located on the left front wheelhouse and shall be lockable, completely water resistant and of steel construction. It shall have slide trays that automatically lock into place for easy maintenance of the equipment. The compartment shall be water resistant when the service door is secured. Ventilation fans shall be installed to keep the compartment temperature cool. Mounted inside the cabinet will be 12-volt, 24 volt and ground provisions to support all electronic devises.

7. A driver's box shall be provided behind the driver’s seat mounted to the driver’s barrier. The box shall be approximately six (6) inches wide, fourteen inches in height and sixteen inches in depth. The box shall be constructed of 080 steel primed and painted black.

1.73.2. PASSENGER DOORS

1. The front door shall be a "slide glide" type inward opening, driver controlled, of corrosion resistant construction. Minimum clear opening shall be 31.00” inches. The front door shall have a minimum height of 75” inches. The overhead clearance between the top of the door opening and the highest point of the ramp shall be a minimum of 68 inches. Door panels shall have both upper and lower glazing. A control valve in the driver's compartment shall shut off the power to, and/or dump the power from, the front door mechanism to permit manual operation of the front door with the bus shut down.

2. The rear or exit door may be a two panel swing out type designed to provide a minimum clear opening of 29” inches and a minimum height of 77” inches. Rear doors shall be operator opened and spring closed. The closing of the door shall begin after the control has been moved to the closed position, and after the door has been

fully opened. Door opening and closing speeds shall be adjustable. The rear door shall be equipped with a sensitive edge which will open the door automatically if an object is trapped between the doors. Door panels shall have both upper and lower glazing.

3. To preclude movement of the bus, an accelerator interlock shall lock the accelerator in the closed position and a brake interlock shall engage the rear axle service brake system when the front and rear door control is activated and the vehicle is moving below 3 mph. When vehicle is moving above 3mph the rear door shall remain locked.

4. Both the entrance and exit doors, if used, shall be controlled by single actuators units mounted in a compartment above the doors.

1.73.3. EMERGENCY OPERATION

1. In the event of an emergency, it shall be possible to open the doors manually from inside the bus using a force of no more than 25 pounds after actuating an unlocked device at each door. The unlocking devices shall be clearly marked as an emergency only device and shall require two distinct actions to actuate. The door emergency unlocking device shall be accessible from the step well areas. When this emergency device is actuated, the door interlock brake system shall apply to stop the bus.

2. The meeting edges on doors shall be equipped with extruded rubber edges of the overlapping type, designed to preclude the entry of drafts and rain. All rubber parts on doors shall be of ozone- resistant material.

3. Doors shall be controlled by a five-position door valve, mounted to the left of the driver. The valve placement shall not interfere with the driver or be prone to catch the driver's sleeve. Air exhaust shall be vented outside the bus body. A valve shall be located near the driver's station to isolate the front door motor from the bus air system and release the doors for manual opening.

4. The exit door shall be provided with a release lever near the door to allow passengers to manually open the door in an emergency. The lever shall be located in an easily accessible location with a glass or plastic cover and hammer, and it shall be properly labeled. Both entrance and exit door controls shall allow maintenance personnel to adjust the opening and closing speed of each door independently.

1.73.4. WHEELCHAIR RAMP

1. The bus shall be equipped with a front door ramp mechanism that conforms to all requirements of the Americans with Disabilities Act (ADA). At a minimum the ramp will have a 6:1 slope when the bus is kneeled, and the ramp deployed. It is to be an electrically operated system which will assume the normal entrance configuration when stowed. When stowed, the ramp should not exceed any of the normal bus undercarriage clearances. All ramp components and mechanisms shall be constructed of corrosion resistant materials and incorporate a design which affords maximum protection from the elements during normal bus operations.

2. Should the ramp become inoperable through the use of electric power, the operator shall be able to open and close the ramp manually with very little effort.

3. The ramp shall be controlled by toggle switches, master on/off, up-down and stow-deploy. The control switches shall be of the spring loaded to a safe position type so that constant manual pressure is required by the operator during ramp operation. All controls shall be clearly identified by function and present a reasonably foolproof and natural sequence of operation.

4. Visual and audible warning devices shall be located immediately to the rear of the front door. In addition, activation of the 4-way flashers shall occur automatically when the ramp power is ON. The audible warning device shall be activated only when the ramp is functioning.

5. Interlocking and fast idle provisions shall be incorporated so the ramp cannot be extended unless the entrance door is in the full open position the transmission in neutral and the parking brake engaged. The entrance door cannot be closed unless the ramp is in the fully stowed position. The bus service brakes shall be automatically applied when the ramp is in any position other than the stowed and locked position. The City of Raleigh is aware of the Lift-U LU18 that is known to meet this requirement.

1.73.5. DRIVER'S SEAT

The driver's seat shall include a high back, five-way mechanically adjustable with a 6" fore/aft travel and adjustable seat back angle. The seat shall have an air lumbar support integrated into the seat back and include a 2-point seat belt. The seat back shall incorporate a black shell and seat material shall be a fabric to include GoRaleigh logo/design. Driver's seat shall conform to FMVSS 207,209, and 210. The City of Raleigh is aware of the Recaro Ergo Metro AM80 that is known to meet this requirement.

1.73.6. PASSENGER SEATING

Passenger seats shall accommodate multiple types of seat layouts. Hip-to-knee room shall be a minimum of 26.50". Passenger seating shall incorporate thermoformed plastic shrouds and molded shell seats with plastic seating surface. Installation shall be with cantilevered without closeouts and T-Pedestal as applicable. Seat Proposers shall include seats layout options with proposed bus. Any exposed metal of the frame will be powder coated, color coordinated to match the seat shrouds to, and the handholds shall be colored the same as the back panels of the passenger seats. Rear seats shall be hinged to gain access to engine compartment. Seating shall integrate USB ports convenient for passenger use. The City of Raleigh is aware of the American Seating Insight that is known to meet this requirement.

1.73.7. WHEELCHAIR ACCOMMODATION

1. Wheelchair tie-downs Shall be incorporated and located as close to the front door of the bus as practical to ensure maximum aisle width and wheelchair maneuverability. The wheelchair shall have aisle facing flip seats installed at the wheel chair positions.

2. The stop request system shall be mounted on the flip up seat bottom or on the side wall and consist of a 3.5" x 7" push pad and separate dash mounted indicator with audible signal for notification to the operator of an intended stop request by a wheelchair patron.

3. Maneuvering room inside the bus shall accommodate easy travel for a passenger in a

wheelchair from the loading device through the bus to the designated parking area, and back out of the bus. The City of Raleigh requires 2 wheelchair positions with a minimum clear area to meet or exceed all ADA/FTA regulations.

4. Accommodations, including passenger seatbelts for wheelchair passengers shall be provided. Passenger seat belts shall be of sufficient length to accommodate passenger in electric powered wheelchair or scooter and shall have a minimum useful length of 80 inches.

5. Proposers should provide a plan, including layout drawings for entry, maneuvering, parking, and existing of wheelchair passengers, applying to all ADA/FTA regulations with their proposals.

1.73.8. WHEELCHAIR SECURING SYSTEM

1. Proposer shall provide a telescope restraint system at each wheelchair position. At a minimum, all restraint systems must meet CFR 49, FMVSS, FTA and ADA standards. The City of Raleigh is aware of the ARM restraint system with Q'Straint belts and retractors that is known to meet this requirement.

2. Proposer shall incorporate one automated, rear-facing securement station in the other wheelchair position. Q'Straint Quantum is known to meet this requirement.

1.73.9. STANCHIONS AND GRAB RAILS

1. There shall be a horizontal grab rail dash mounted between the entrance door and the farebox and on the front wheel housings. A yellow powder coated vertical stanchion grab rail at the entrance door modesty panel and stainless steel vertical grab rail mounted on the driver's modesty panel All other stanchions and grab rails shall be stainless steel tubing mounted from floor to ceiling or ceiling to passenger seat grab handles.

2. There shall be fourteen (14) vinyl coated nylon grab straps (35'and 40" bus) and ten (10) on (30'bus) positioned throughout the bus interior mounted to the horizontal stanchions.

3. A detailed seating layout showing various possible configurations of stanchion configurations shall be submitted at the time proposals are made.

1.73.10. MODESTY PANELS

A clear modesty panel shall be provided behind the front entrance door from the wheel housing to ceiling. Modesty panel must not obstruct drivers view. A modesty panel shall be provided behind the rear exit door and the first passenger seat in the upper section of the bus. The panel shall be constructed of melamine and framed on all sides with stainless steel tubing. Melamine colors will be determined by the City of Raleigh at the per-production meeting.

1.73.11. DRIVER'S STATION

1. A driver's barrier shall be provided. The barrier shall extend from the left side panel to the right rear of the driver's station. The back panel shall in no way detract from, or

interfere with the safe, normal operation of the bus nor restrict full movement of the driver's seat.

2. The barrier shall be a 28 percent density, vacuumed formed, polycarbonate plastic panel mounted to 1-1/4" O.D. or melamine with stainless steel-clad tubing and be installed behind the driver's seat area. Colors will be specified at the pre-production meeting.

3. There shall be approximately 6" x 6" x 1" pocket, preferable on the left side of the driver’s station to store permits etc.

4. A driver’s protection barrier shall be provided, such as Arow Global ArowGuard, solid lower with upper slider, extended glass.

5. The following controls and switches shall be provided. All controls shall meet the requirements of FMVSS 101 and ergonomic amendment as applicable to buses.

1.73.12. ACCELERATOR / BRAKE PEDAL
The accelerator pedal shall meet the requirements for FMVSS 124. Accelerator and brake pedals shall be designed for even lateral ankle motion. Foot surfaces of the pedals shall be faced with wear-resistant, non- skid replaceable material. The City of Raleigh is aware of the 41-degree Williams Control Throttle and Brake pedal that is known to meet this requirement.

1.73.13. PARKING BRAKE CONTROL
Parking Brake control valve shall be to the left of the driver and shall be configured so that it operated as a "pull" to stop/set and "push" to release with a clearly labeled yellow knob.

1.73.14. TRANSMISSION CONTROL
Electronically operated controls as approved by the transmission manufacturer.

1.73.15. DOOR CONTROL AND DOOR PRESSURE RELEASE
A 5-position control handle located to the left of the driver shall be provided. A front door air release valve shall be provided for the driver to release the air pressure to the front door.

1.73.16. HEADLIGHT HIGH BEAM SWITCH
A floor mounted spring-loaded foot switch shall be provided to control high and low beam headlamps.

1.73.17. DIRECTIONAL SIGNALS
A floor mounted spring-loaded foot switch shall be provided to control directional signals.

1.73.18. EMERGENCY/FOUR WAY FLASHER SWITCH
A 2-position toggle switch with a red extension shall be provide close to the door control lever to operate the 4- way flashers.

1.73.19. WINDSHIELD WIPER AND WASHER CONTROLS
The controls shall allow the driver to select variable sweep speeds or intermittent/pulse operation. Also, these will control the distribution of washer fluid to the windshield.

1.73.20. FAST IDLE SWITCH

A fast-idle toggle switch shall be provided. The fast idle shall be interfaced to the brake interlock system, system will not operate unless emergency/parking brake is applied, and transmission is in neutral.

1.73.21. DRIVER AREA HEATING, VENTILATION, AIR CONDITIONING, AND DEFROSTER CONTROLS

The rotary control switch shall provide air to the windshield, driver's area and to the passenger compartment.

1.73.22. ENGINE START

Push button start interlocked with the transmission controls to permit engine starting only in neutral and shall be located convenient to the driver.

1.73.23. KNEELING CONTROL

Shall be a guarded spring-loaded toggle switch located on the primary panel and shall function to allow the bus to kneel.

1.73.24. WHEELCHAIR RAMP CONTROLS

Shall be located on the primary panel and shall function as described in the wheelchair specifications.

1.73.25. PUBLIC ADDRESS SYSTEM CONTROLS

Shall be simple/self-explanatory and be conveniently located for driver use and have a volume control knob on either the primary or secondary panel and be an integral part of the voice annunciation system.

1.73.26. INTERIOR LIGHTING SWITCH

Interior Lighting Switch Shall provide ON –NEUTRAL-OFF positions and be located on the primary or secondary panel, toggle switch only.

1.73.27. DRIVER'S AREA LIGHT SWITCH

Shall be on-off type and will be located on the primary or secondary panel or on the light fixture. This light shall not operate when the master switch is OFF.

1.73.28. PASSENGER SIGNAL SWITCH

Shall provide, SINGLE CHIME, NORMAL and OFF positions, located on the primary or secondary panel, toggle switch only.

1.73.29. INSTRUMENT PANEL

1. The following gauges shall be included on the instrument panel:

    a. Speedometer / Odometer
    b. Battery Charge Indicators 12 and 24 volts
    c. Air pressure gauge/Dual needle
    d. Fuel gauge

2. There shall be a light bar provided in front of the driver, over head with visual indicator lights to signal warning or fault conditions. All warning lights shall

illuminate when the master electrical control is in the run or night run position and the engine is not operating. There shall be a test button used for testing lights and buzzers located on the primary panel. Manufacturer shallprovide a layout of warning signals included in the proposal.

3. A coat hook and tieback loop shall be provided for the driver. It shall be mounted above and to the left rear of the driver's head level behind the driver's seat.

4. A driver's seat area light shall provide general illumination of the driver's station. It shall be suitable for reading and recovery of items on the floor. Switch location and control shall be as described in this section. This light shall be L.E.D.

1.73.30. WINDOWS, SASH, WINDSHIELD, WIPERS AND WASHER

1. The passenger side windows shall be frameless bonded type with upper transom lower fixed with the exception of the upper portion of front right side and left side windows that will not require to be transom. The first right (curbside) upper portion will be for the side destination sign. Windows (except destination sign) shall be of 7/32" 8-18% gray tinted tempered glass and frame windows will have black (dark) polyester powder coat aluminum inside frames. Destination sign glass will be clear. All passenger windows will have a 6-mil film guard on the inside of the glass.

2. Windows in the Low Floor Area will be designated as egress windows and shall have a positive lock type emergency latch meeting the FMVSS-217. Each window shall have a permanent decal describing emergency window operation procedures.

3. The driver's side window shall be easily adjusted (less than 20 lbs. of effort to open and /or close) with one hand and it shall be of two-piece design with two half sections sliding horizontally without a positive holding latch. This window shall also incorporate a latch mechanism to allow its use as an emergency exit.

4. The windshield shall be of lightly tinted laminated safety plate or float glass meeting the requirements of FMVSS 205 and ANSI Z 26.1, at least 0.25 inch thick. The windshields will be designed to minimize glare from the dash, side panel, and interior passenger compartment lights. Pull down sun shades shall be provided on the left windshield and on the operator's side window. Shades shall be ½ mesh and ½ solid.

5. Two electric windshield wipers with intermittent wipe and wet arm shall be furnished. The wipers shall be operated by variable speed wiper motors and shall meet requirements of FMVSS 104. The control shall have a PARK position causing the blades to stop at or near the center of the bus in the vertical position.

6. A windshield washer meeting the requirements of FMVSS 104 shall be provided to spray cleaning solution onto the left and right sides of the windshield. A translucent reservoir shall be supplied, located in the dash compartment The filler for the reservoir shall be easily accessible from the exterior of the bus, and a vent shall be provided to expedite filling.

1.73.31. MIRRORS

All mirrors must conform to the current Federal requirements.

1.73.32. EXTERIOR MIRRORS

Both the flat and convex exterior mirrors shall be remote controlled and heated with cast arms that return to original position when moved. Left mirror shall be mounted near the front lower at the driver's window. Right mirror shall be viewed through the upper right corner of windshield and mounted so as to provide maximum practical clearance to the ground. Mirrors must fold out of way of automatic washer. 2- 2 position (flat and convex) switches shall be provided in the drivers compartment for mirror adjustments. Exterior mirrors must utilize a waterproof “quick disconnect” for electrical wiring. The City of Raleigh is aware of the Safe Fleet mirrors that are known to meet this requirement.

1.73.33. INTERIOR MIRRORS

An 8 1/2” x 16” rear view mirror shall be provided on the front sign header. A 6"diameter adjustable convex mirror over and forward of the front door shall be provided. An adjustable convex mirror shall be provided over/above and to the rear of the rear exit door. (Convex mirrors described above are to be used in conjunction with each other.) The glass in this mirror shall be replaceable.

1.73.34. BICYCLE RACKS

A bicycle rack will be installed and ready for use upon delivery of buses. Racks will be identical in style to the existing racks on current procuring agencies’ fleets. Racks will be unpainted powder coated black, an orange bike rack deployed indicator antenna will be provided on the bike rack to signal deployment. The City of Raleigh is aware of the Sportworks DL2 that is known to meet this requirement.

## 1.74. ELECTRICAL SYSTEMS

The Electrical System (12/24 VDC) consists of the vehicle batteries and all other equipment that generate, distribute and use battery power throughout the vehicle (e.g., alternator, voltage regulator, wiring, relays, and connectors). Vehicle shall be SAE J1939 and J1708 communication compatible.

1.74.1. BATTERY AND BATTERY STORAGE

1. A stainless-steel battery tray shall be provided. The battery tray shall slide out, on rollers, with less than 50 lbs. of effort. The battery tray shall be protected against the accumulation of debris and road spray. Four twelve (12) volt lead acid filled thermal battery units, Group 31 maintenance free, with 3/8 Top Stud with a minimum of 700 cold cranking amps at zero degrees Fahrenheit with a reserve capacity of 425 minutes or greater shall be provided. In the event the batteries are unable to crank the engine, a plug shall be provided at the curbside rear of the bus to allow jump staring. The City of Raleigh is aware of the Deka 700 CCA (DP31CS), Group 31, Maintenance Free and Anderson SB350 jump start connector that is known to meet this requirement.

2. The battery shall be grounded to the vehicle chassis/frame at one location only, as close to the batteries as possible. When using a chassis ground system, the chassis shall be grounded to the frame in multiple locations, evenly distributed throughout the vehicle to eliminate groundloops. No more than four ground connections shall be made per ground stud. Electronic equipment requiring an isolated ground to the battery (i.e., electronic ground) shall not be grounded to the chassis.

1.74.2. CHARGING SYSTEM

An Alternator shall be provided sized to supply the entire nighttime operating electrical load of the bus while providing at least twenty (20) percent of its current output for battery

charging when the battery is fully discharged. The system shall supply a nominal 24 volts of direct current. Electrical power provided for the fare collection device all exterior lights and the radio compartment shall be 12 volts, DC. Precautions shall be taken to minimize hazards to service personnel. The power generating system shall be rated sufficiently higher than the total possible electrical load to maintain the charge on the batteries at all operating conditions including the engine at idle. The City of Raleigh is aware of the Neihoff C803 that is known to meet this requirement.

1.74.3. ELECTRICAL COMPONENTS

1. All electrical components, including switches, relays, flashers, and circuit breakers, shall be of Heavy-Duty designs. To the extent practicable, these components shall be designed to last the service life of the bus. Sockets of plug-in components shall be positively retained. Any manual reset circuit breakers critical to the operation of the bus shall be mounted in a location convenient to the driver with visible indication of open circuits. All electric motors except cranking motors shall be brushless type motors. Electric motors shall be located for easy replacement.

2. A single master switch shall be provided near the battery compartment for the disconnecting of all battery positives (12V & 24V) except for safety devices such as fire suppression system and other systems as specified. The location of the master battery switch shall be clearly identified on the exterior access panel, be accessible in less than 10 seconds for deactivation, and prevent corrosion from fumes and battery acid when the batteries are washed off or are in normal service. The access door shall be labeled "Battery Emergency Shut-Off Switch."

3. Dual electric horns, one "D" note and one "F" note shall be provided and shall be mounted in a manner to prevent entry of water and dirt into horn trumpets. The steering wheel horn button shall be non-reflecting and of the umbrella type to protect contracts from dirt and debris.

4. The ambulatory passenger signal shall be the pull cords, push button, or clear pull cords conveniently located so standing and seated passengers can easily reach it, this includes down the mullions. The pull cords shall be accessible from the exit door area. There shall be a lighted display sign which indicates "STOP REQUESTED" when the signal is activated. The signal chime shall operate once, and the sign shall light and remain lit with the chime disabled until the next stop when the front doors or rear doors have been opened, resetting the system. The chime shall be distinctive. The volume on the chime shall be adjustable between 90 and 55 Db. The lighted display shall be located on or near the ceiling at the front of the bus in view of the passengers. A light on the instrument panel shall be lit when the display sign is lit.

5. There shall be a second passenger signal of a different tone that meet the ADA requirements mounted to the bottom of the flip seat for the mobility aid users that alerts the operator when a mobility aid user wishes to disembark. There shall be two lights on the operator’s front dash that indicate when an ambulatory or non-ambulatory passenger wishes to disembark.

1.74.4. MULTIPLEXING

1. All vehicles shall be equipped with a multiplexing system. The primary purpose of

the multiplexing system is control of components necessary to operate the vehicle. This is accomplished by processing information from input devices and controlling output devices through the use of an internal logic program. Versatility and future expansion shall be provided for by expandable system architecture. The multiplex system shall be capable of accepting new inputs and outputs through the addition of new modules and/or the utilization of existing spare inputs and outputs.

2. All like components in the multiplex system shall be modular and interchangeable with self-diagnostic capabilities. The modules shall be easily accessible for troubleshooting electrical failures and performing system maintenance.

3. Multiplex input/output modules shall use solid-state devices to provide extended service life and individual circuit protection. Ten percent (10%) of the total number of inputs and outputs (or at least one each) at each zone location shall be designated as spares.

4. At a minimum, information shall be made available via a communication port on the multiplex system. The location of the communication port shall be easily accessible. The multiplex system shall have a proven method of determining its status (system health and input/output status) and detecting either active (Online) or inactive (Offline) faults through the use of on-board visual/audible indicators. In addition to the indicators, the system shall employ an advanced diagnostic and fault detection system, which shall be accessible via either a personal computer (PC) or a hand-held unit. Either unit shall have the ability to check logic function.

5. The multiplex system shall have security provisions to protect its software from unwantedchanges. This shall be achieved through any or all of the following procedures: password protection, limited distribution of the configuration software, limited access to the programming tools required to change the software, and hardware protection that prevents undesired changes to the software. Provisions for programming the multiplex system shall be possible through a PC/laptop. The multiplex system shall have proper revision control to ensure that the hardware and software is identical on each vehicle equipped with the system. The City of Raleigh is aware of the I/O Controls G4 Multiplex System that is known to meet this requirement.

1.74.5. INTERIOR LIGHTING

All interior lighting shall LED lighting where possible.

1.74.6. PASSENGER INTERIOR LIGHTING

1. The passenger interior lighting system shall be a LED lighting system. The front entrance area and curb lights shall illuminate when the front door is open and master run switch is in the "Lights" positions.

2. Rear exit area and curb lights shall illuminate when rear door is unlocked. Step lighting for the intermediate platform between lower and upper floor levels shall be provided and shall illuminate in all engine run positions. The step lighting shall be low profile to minimize tripping and snagging hazard for passengers and shall be shielded as necessary to protect passengers' eyes from glare. The City of Raleigh is aware of the Pretoria LED interior lighting that is known to meet this requirement.

1.74.7. DRIVER'S LIGHTING

The driver's area shall have a light to provide general illumination and it shall illuminate the driver's area. This light shall be controlled by a toggle switch that is convenient to the driver. The City of Raleigh is aware of the Peterson LED interior lighting that is known to meet this requirement.

1.74.8. SERVICE AREA LIGHTING

An LED light shall be provided in the engine compartment to generally illuminate the engine compartment. The lights shall be controlled by a switch located near the start controls in the engine compartment. The City of Raleigh is aware of the Peterson LED 12" Strip Lamps that are known to meet this requirement.

1.74.9. EXTERIOR LIGHTING

Exterior lighting shall comply with all applicable State and Federal regulations. All exterior lights, to the maximum extent possible, shall be all LED. Rear / Stop/ Tail / lamps shall be 4" diameter. Two 4' auxiliary brake lamps shall be center mounted on the rear of the bus and located to comply with all Federal laws. Turn signals shall be operated from a sealed, moisture-protected foot switch located on the floor in the driver's station. The City of Raleigh is aware of the Dialight LED lighting that is known to meet this requirement.

1.74.10. HEADLAMPS

1. LED sealed beam headlights are required with high and low beams controlled from a sealed, moisture-protected foot switch located on the floor in the driver's station. The sealed beam units shall be of the latest heavy-duty type and be ruggedly mounted to maintain adjustment under transit operating conditions.

2. Headlights shall be wired to operate on reduced voltage in the run position. The City of Raleigh is aware of the Dialight LED lighting that is known to meet this requirement.

1.74.11. FOUR WAY FLASHERS

The turn signals shall have an audible "clicking" sound when activated in the turning and Flashing mode. Side turn signals shall be LED and have protection guards installed to reduce breakage. The City of Raleigh is aware of the Dialight LED lighting that is known to meet this requirement.

## 1.75. HVAC SYSTEM

1.75.1. GENERAL

The Heating, Ventilation and Air Conditioning (HVAC) climate control system shall be rear mounted and capable of maintaining the interior of the bus at the temperature and humidity levels suitable for all climatologically conditions throughout our geographical region. Accessibility and serviceability of components shall be provided without requiring maintenance personnel to climb-up on the roof of the bus.

1.75.2. TEMPERATURE CONTROLS

Operation of the climate Control System shall be controlled by a microprocessor-based controller which maintains interior temperature at the desired set point. The controller

shall be mounted behind the return air grill where it is accessible only by maintenance personnel. A rotary switch shall be mounted on the dash panel to allow the driver to manually switch the HAVC system to Off, Cool, Vent High, Vent Low, Heat Low, Heat High Settings. The City of Raleigh is aware of the Thermo King T-14 rear mount HVAC unit with Intelligaire controls that is known to meet this requirement.

1.75.3. COMPRESSOR AND REFRIGERANT

The HVAC system shall utilize a pully driven compressor such as Thermo King X430 and operate with 134A refrigerant.

1.75.4. HEATER CORE (S) AND WATER LINES

Heater water lines shall be routed as much as possible through the inside of the bus. All lines not routed through the inside of the bus shall be properly insulated to control heat loss. Hand manual shut off valves for the heater core shall be provided in the water lines to provide for ease of replacement. All core(s) will be equipped with drain cocks to facilitate complete draining of the core(s). All flexible water hoses will be of the silicone type. Heater core must be replaceable without removing any major components.

1.75.5. DRIVER'S HEATER AND DEFROSTER

1. A separate heater and defroster system shall be provided in the front dash compartment. A heater unit of at least 44,000 BTU output at 160 degrees F. water temperature is required. A two-speed blower brushless motor shall be provided with a manual water valve shall be to control the flow of hot water to the core along with two hand shut off valves to facilitate replacement of the core and two shut off valves to facilitate replacement of the booster/marine pump. The City of Raleigh is aware of the MCC brushless motor that is known to meet this requirement.

2. This system shall be adequate to provide 65 degrees F temperature in the driver's area with an outside temperature of 0 degrees F. Defroster outlets shall be provided at the bottom of the windshield, and driver's side window so that the entire windshield, and side windows will be kept free from frost or fog. This system will also have an adjustable vent to apply heat to the driver's feet, and the complete system is to be under the direct control of the driver. The system shall be capable of operating without activating the main heater system.

1.75.6. AUXILIARY DASH FAN

Two 24 volt auxiliary fans shall be provided. A fan shall be mounted on the centerline of the driver’s dash, and another fan shall be mounted center of bottom of destination sign compartment with a HI/OFF/LOW switch located in the driver’s compartment.

1.75.7. OPTIONAL All ELECTRIC HVAC

As an option, proposers will offer an all-electric rear mounted HVAC system on the Electric bus. The system shall be capable of maintaining the interior of the bus at the temperature and humidity levels suitable for all climatologically conditions throughout our geographical region. The City of Raleigh is aware of the Thermo King all electric rear mount HVAC system that is known to meet this requirement.

## 1.76. ELECTRONIC SYSTEMS

1.76.1. ELECTRONIC DESIGNATION SIGNS

1. An all LED automatic electronic destination sign system shall be provided. The front destination sign system shall be capable of multi-color information between the route number and written destination. The side sign shall be white as well as the rear route sign. The sign system shall be controlled by an OCU located in the driver's compartment. Flash memory integrated circuits shall be capable of storing and displaying up to 10,000 message lines. Message memory shall be changeable by the use of a standard jump drive or remotely updated. A silent alarm switch is required to activate the sign.

2. One (1) Full ColorFront sign, 24 rows x 200 columns:

    a. The Front Sign shall be mounted on the front of the Bus, near the top edge of the body, behind windshield protection, and in an enclosed but accessible compartment.

3. Two (2) Side sign, on the curb side and street side, 14 rows x 112 columns:

    a. The Side Signs shall be located as follow; on the right side (curb side) of the Bus near the front door mounted near the top of an existing window and on the left side (street side) of the Bus just aft of the radio box mounted near the top of an existing window.

4. One (1) Rear sign, 16 rows x 48 columns:

    a. The Rear Sign (external) shall be mounted on the rear of the vehicle on an appropriate sized cutout.

    b. Operators Control Unit (OCU)

5. One (1) Dash (run) sign, 12 rows x 40 columns:

    1. The run sign shall be mounted on the curbside of the dashboard.

1.76.2. SIGN ENCLOSURES

All Signs shall be enclosed in a manner such as to inhibit entry of dirt, dust, water and other contaminants during normal operation or cleaning. Access shall be provided to clean the inside of the Bus window(s) associated with the Sign and to remove or replace the Sign components. Access panels and display boards shall be mounted for ease of maintenance/replacement. Any exterior Rear Sign enclosure used shall be made of Polycarbonate material containing fiberglass reinforcement. The vehicle manufacturer shall comply with the Sign manufacturer's recommended mounting, mounting configuration, and installation procedures to assure optimum visibility and service accessibility of the Sign System and System components.

1.76.3. VIDEO SURVEILLANCE SYSTEM

A Video Surveillance system consisting of a minimum of 8 Ttb HHD and up to ten (10) cameras shall be provided. There shall be (4) cameras in the passenger compartment, (1) forward facing camera, (1) rear facing camera, and (2) external IR side viewing cameras. The system shall include a G-Force impact sensor. The DVR shall be secured in the electrical cabinet. The City of Raleigh is aware of the Luminator RoadRunner Pro Camera

system that is known to meet this requirement.

1.76.4. PUBLIC ANNOUNCEMENT SYSTEM

The public announcement system shall be activated through the vehicle logic unit. This unit shall have an internal GPS receiver used for voice announcement, AVL, WLAN, APC, destination signs and GFI integration. The system shall be configured so it is completely independent from the bus radio system. A type N mobile data terminal shall be used for the voice announcement and AVL. The system shall incorporate provisions for an automatic Gain Control Microphone. Six (6) speakers in the 40’ bus and six (6) speakers in the 35’ bus, flush or semi-flush mounted shall be installed along or near the centerline of the bus ceiling to ensure adequate sound distribution. A tri band antenna shall be provided to for the GPS, Cellular modem, and WLAN all of which shall be required. The City of Raleigh is aware of the Clever Devices IVN5 with GPS system that is known to meet this requirement.

1.76.5. AUTOMATIC PASSENGER CONTROL (APC)

The APC system shall be provided and will be integrated with the Vehicle Logic Unit. APC shall have sensors mounted on both the front entrance door and the rear exit door. The APC units shall also monitor wheelchair and bicycle rack actuation. Irma Iris Matrix or similar is known to meet this requirement

1.76.6. FARE COLLECTION

1. If selected, a fare box shall be installed in a space as far forward as practicable, and/or structural provisions shall be made for installation of a fare box. Location of this fare collection device shall not restrict traffic in the vestibule or access to the driver's area and shall not restrict operation of driver controls. Farebox location shall permit accessibility to the vault for easy manual removal or attachment of suction devices.

2. The proposer shall furnish and install electrical wiring for the fare box. A power and ground circuit shall be provided under the floor of the farebox platform with an access hole on the side of the platform. The floor under the farebox shall be reinforced by eighteen-gauge steel plate, to provide a sturdy mounting platform and to prevent shaking of the farebox. The proposer shall provide pricing for the GFI Fast Fare as an option.

3. Tap card media reader shall also be provided, installed near the farebox.

## 1.77. SAFETY SYSTEMS

1.77.1. FIRE SUPPRESSION SYSTEM

1. Each vehicle shall be equipped with an automatic thematic fire suppression system to provide adequate coverage of fire suppression in the engine compartment and main electrical box areas. At a minimum, units shall consist of a 25 pounds ABC chemical cylinder, 3 stainless steel temperature sensitive weather proof thermostats, 4 nozzles, and a control panel mounted in the driver's compartment as minimum equipment.

2. Units shall be totally self-contained with all lines, fittings, brackets, and thermal release heads within the appropriate compartments, strategically placed, to provide the best protection. The system shall incorporate a telltale, dash mounted operator

warning light, audible indicator and switch, automatically shutting off all fans and climate control systems in the event of discharge. The system installed shall be certified by the vehicle manufacturer that it is suitable for use in the proposed vehicle in case the unit fails to function during an on-board vehicle event or fire. Each vehicle shall be delivered with a certificate identifying the vehicle identification number (VIN) for which it applies. The system shall be U.L., U.C.L., and F.M. listed and meets all D.O.T. and F.M.V.S.S. Regulations and is certified by the vehicle and equipment manufacturer. The City of Raleigh is aware of the Amerex model V25 that is known to meet this requirement.

3. For CNG powered buses the Fire Suppression will include a methane detection system included in the price of the CNG propulsion system option. The methane detection system will have a minimum of four (4) sensors located in the tank area and engine compartment as determined by the manufacturer. The City of Raleigh is aware of the Amerex Safety Net system that is known to meet this requirement.

1.77.2. SAFETY EQUIPMENT

Furnish a portable 5-pound capacity dry chemical ABC type fire extinguisher, including mounting bracket and inspection tag, on each bus. The extinguisher shall be painted red and permanently marked with the City of Raleigh's name. It shall be equipped with a chained safety pin. Buses shall be equipped with a safety triangle reflector kit with a durable protective container. These items shall be mounted neatly in the driver's area.

1.77.3. PAINT AND GRAPHICS PAINT (EXTERIOR)

The bus exterior shall be primed as recommended by the manufacturer and shall be painted as determined at the pre-production meeting. There shall be no bare or exposed metal surfaces showing on the exterior of the bus, exclusive of ornamentation and accessories.

1.77.4. PAINT (INTERIOR)

Selections of interior and trim color shall be determined at the pre-production meeting. This shall include but not be limited to the following: ceiling, walls, floors and modesty panels.

1.77.5. FLEET NUMBERS

Buses shall have fleet numbers applied both on the interior and exterior of the bus in sequence with factory serial numbers. Each individual order will include the correct starting number and the location, size and color of numbers. 4” bus numbers shall be installed at the following locations: Above the front door, above the driver’s window, lower left-hand corner of the rear engine door and above the street side headlamp.

1.77.6. VEHICLE FLEET ROOF NUMBERS

On the roof of the bus the 2-foot high numbers shall be centered on the longitude axis of the bus so they can be read from an airplane approaching from the rear of the bus. Individual orders may specify no roof number be applied.

1.77.7. INTERIOR DECALS

Interior decals such as but not limited to the following, No Smoking, Exit door, Emergency Exit, Watch Your Step, Wheelchair instructions and "Reserved for Wheelchairs," etc. shall be provided. All decals shall be in English and Spanish. All decals shall be in conformance with Federal regulations.

1.77.8. METAL BUILDERS PLATE

A metal builder's plate shall be installed on the inside of the front of the bus, listing the manufacturer's name, bus and chassis model, serial number and date of manufacture. The plate shall be installed with permanent fasteners. Include a FMVSS sticker in addition to the builder’s plate.

**End of Page**