

PART 4 - TECHNICAL SPECIFICATIONS

1.0 GENERAL REQUIREMENTS

1.1 SCOPE AND PURPOSE

These Technical Specifications are intended to provide a general description of low floor, CNG powered para-transit buses designed for service in the Greater Detroit Metropolitan area. The buses may be used for both curb-to-curb demand responsive service and general suburban line run service in densely populated urban areas and on rural secondary roads. The buses are intended for use by the widest possible spectrum of passengers, including children, adults, and the elderly and handicapped. These Technical Specifications are not intended to dictate any specific product but rather are intended to indicate the type of low floor para-transit bus and equipment desired by BWATC and certain standards of vehicle performance which must be achieved. It is the intention of these Technical Specifications to provide for the purchase of a low floor para-transit vehicle of substantial and durable construction in all respects.

1.2 DESCRIPTION

New transit buses shall be propelled by a dedicated CNG engine with hydraulic automatic transmission. The buses shall have a minimum seating capacity of fifteen (15) able-bodied passengers and three (3) wheelchairs up to twenty able-bodied passengers with no wheelchairs. Bus dimensions shall be less than thirty (30) feet in length and no wider than one hundred and two inches (102") in width. Seasonal climate control shall include heating and air conditioning compatible with environmental and climatic conditions experienced in the Greater Detroit Metropolitan area. Buses shall be of a kind known to the transit industry as low floor, medium duty para-transit buses.

1.3 DEFINITIONS

The following are definitions of special terms:

1. dba - Decibels with reference to 0.0002 microbar as measured microbar as measured on the "A" scale.
2. Audible Discrete Frequency: An audible discrete frequency is determined to exist if the sound power level in any 1/3 octave band exceeds the average of the sound power levels of the two adjacent 1/3 octave bands by 4 decibels (d8) or more.
3. Standee line: A line marked across the bus aisle in line with the driver's barrier to designate the forward area which passengers may not occupy when the bus is moving.
4. Free Floor Space: Floor area available to standees, excluding ingress/egress areas, area under seats, area occupied by feet of seated passengers, and the vestibule area.
5. Curb Weight. Weight of vehicle, including maximum fuel, oil, and all equipment required for operation and required by this specification but without passengers or driver.

6. Seated Load: One hundred fifty (150) pounds for every designed passenger seating position and for the driver.

7. Gross Load: One hundred fifty (150) pounds for every designed passenger seating position, for the driver, and for each 1.5 square feet of free floor space.

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

9. GVWR (Gross Vehicle Weight Rated): Curb weight plus gross load.

10. Driver's Eye Range: The 95th percentile eyellipse defined in SAE Recommended Practice 3941, except that the height of the eyellipse shall be determined from the seat at its reference height.

11. Fireproof: Materials that will not burn or melt at temperatures less than 2,000 degrees Fahrenheit.

12. Fire Resistant: Materials that have a flame spread index less than 150 as measured in a radiant panel flame test per ASTM-E 162-75.

13. Human Dimensions: The human dimensions used are as defined in SAE Recommended Practice 3833.

14. HIC (Head Injury Criteria per FMVSS 208): The following equation presents the definition of the head injury criteria:

Where a = the resultant acceleration at the center of gravity of the head form expressed as a multiple of g , the acceleration of gravity. t_1 and t_2 = any two points in time during the impact.

15. Standard Configuration Bus: The standard configuration bus described by these Technical Specifications is up to thirty (30) feet long, 102 inches wide, air-conditioned, dedicated CNG, and electronic destination sign equipped.

16. Alternative: An optional specification condition to the standard configuration bus.

17. Design Operating Profile: The operating profile for design purposes shall consist of simulated Greater Detroit area transit type service. The duty cycle is described in the following paragraphs. The duty cycle consists of three phases to be repeated in sequence:

A central business district (CBD) phase of two (2) miles with seven (7) stops per mile and a top speed of 20 mph, an arterial route phase of two (2) miles with two (2) stops per mile and a top speed of 40 mph, and a commuter phase of four (4) miles with one (1) stop and a maximum speed of 55 mph. This duty cycle approximates the profile of a typical suburban express route as operated by BWATC. The bus must operate a minimum of 250 miles on a fill up of CNG.

The bus shall be loaded to SLW and shall average approximately 18 mph while operating on this duty

cycle. Operation shall continue regardless of the ambient temperature or weather conditions. The passenger doors shall be opened and closed at each stop. The braking profile shall be:

Sixteen (16%) percent of the stops at three (3) fpsps

Fifty (50%) percent of the stops at six (6) fpsps

Twenty six (26%) percent of the stops at nine (9) fpsps

Eight (8%) percent of the stops at twelve (12) fpsps

These percentages shall be evenly distributed over the three (3) phases of the duty cycle. For scheduling purposes, the average deceleration rate is assumed. Buses shall be designed to afford features essential for safe, fast, efficient and comfortable operation under all driving and road conditions. The bus must be maneuvered easily in normal and heavy traffic and be able to pass over occasional grades up to a maximum of twenty two (22%) percent. The central business district phase of the duty cycle shall have a minimum of four (4) ninety (90°) degree turns evenly spaced.

18. Classes of Failures: Classes of failures are described below;

Class 1: Physical Safety: A failure that could lead directly to passenger or driver injury and represents a severe crash situation.

Class 2: Road Call: A failure resulting in an enroute interruption of revenue service. Service is discontinued until the bus is replaced or repaired at the point of failure.

Class 3: Bus Change: A failure that requires removal of the bus from service during its assignments. The bus is operable to a rendezvous point with a replacement bus.

Class 4: Bad Order: A failure that does not require removal of the bus from service during its assignments but does degrade bus operation. The failure shall be reported by driver, inspector, or hostler.

Class 5: Major Failure: A failure that required the bus to be removed from service and the failed subsystem to be removed from the bus for repair or replacement.

19. Maintenance Personnel Skill Levels: Defined below are maintenance personnel skill levels used in the Technical Specifications:

5M: Specialist Mechanic or Class A Mechanic Leader

4M: Journeyman or Class A Mechanic

3M: Service Mechanic or Class B Serviceman

2M: Mechanic Helper or Bus Serviceman

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

stated.

21. Defect: Patent or latent malfunction or failure in manufacture or design of any component or subsystem that causes a bus to cease operating or causes it to operate in a degraded mode.

22. Related Defect: Damage inflicted on any component or subsystem as a direct result of a defect.

23. CNG: Compressed Natural Gas

24. NFPA 52: National Fire Protection Association Standard Number 52 for Compressed Natural Gas Vehicular Fuel Systems, most current edition, as amended.

1.4 ABBREVIATIONS

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

1. ASTM: American Society for Testing and Materials

2. SAE: Society of Automotive Engineers

3. ANSI: American National Standards Institute

4. ASHRAE: American Society of Heating, Refrigerating and Air Conditioning Engineers

5. SPI: Society of the Plastics Industry

6. USDHEW: United States Department of Health, Education and Welfare

7. JIC: Joint Industrial Council

8. BMCS: Bureau of Motor Carrier Safety.

9. FMVSS: Federal Motor Vehicle Safety Standards.

10. DCA: Dry Chemical Additive

11. BWATC: Blue Water Area Transportation Commission

12. FTA: Federal Transit Administration

13. MDOT: Michigan Department of Transportation

1.5 LEGAL REQUIREMENTS

The bus shall meet all applicable FMVSS and all applicable BMCS regulations in effect at the date of manufacture. The bus shall also meet all requirements of the Americans with Disabilities Act and all standards of NFPA 52, most current edition. The contractor shall comply with all applicable Federal, State, and local regulations. In the event of any change in the specified standards, codes, laws, regulations or rules after the date of proposal submission, the price of the buses shall be adjusted to reflect the price of the changes, modifications or additional accessories or equipment required by such standards, codes, laws, rules and regulations.

1.6 OVERALL REQUIREMENTS

All proposers must conform to these Technical Specifications. The product furnished shall be of first class quality and the workmanship shall be of the best obtainable in 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. All units or parts not specified particularly shall be manufacturer's standard units. In all cases, material must be furnished as specified, but if the term "approved equal" is used, BWATC must approve any material or equipment substituted for specified material or equipment prior to proposal opening.

1.6.1 DIMENSIONS

1.6.1.1 Physical Size

With the exceptions of exterior mirrors, marker and signal lights, flexible portions of the bumpers, fender skirts, and rub rail, the bus shall have the following overall dimensions, except exterior doorway lights, which may be mounted above window level:

Length: Less Than 30 feet

Width: 102" maximum

Height: 11 feet, maximum

Wheelbase: 200.00 inch maximum

Ground to first step: Front step: 10" minimum to 12" maximum, kneeling, 6" minimum.

1.6.1.2 Underbody Clearance

The bus shall maintain the minimum clearance dimensions as defined in SAE Standard 3689, regardless of load up to the gross vehicle weight rating.

Approach angle shall be no less than ten (10⁰) degrees. Break over angle shall be no less than ten (10⁰) degrees. Departure angle shall be no less than nine (9⁰) degrees.

Ground clearance shall be no less than ten (10") inches except within the wheel area and axle zone.

Axle zone clearance, which is the projected area between tires and wheels on the same axle centerline, shall be no less than six (6") inches.

Wheel area clearance shall be no less than eight (8") inches for parts fixed to the bus body and six and a half (6-1/2") inches for parts that move vertically with the axles.

1.6.2 WEIGHT

1.6.2.1 Curb Weight

Curb weight of the standard configuration para-transit bus shall not exceed 19,500 pounds.

1.6.3 CAPACITY

Rated capacity of the standard configuration bus shall be a maximized for the specified seating arrangement. In some cases, up to three (3) wheelchair positions may be provided. Some vehicles may be ordered with no wheelchair positions. Proposers should assume maximum seating in preparation of their proposal. SLW and GVRW shall be determined by the seating and standee capacities of the actual arrangement specified. Seating arrangements shall be specified after award.

1.6.4 SERVICE LIFE AND MAINTENANCE

1.6.4.1 Service Life

The bus shall be designed to operate in transit service for at least seven (7) years or 200,000 miles. It shall be capable of operating the full duration of its service life without any major structural failure.

1.6.4.2 Maintenance and Inspection

Scheduled maintenance or inspection tasks, as specified by the contractor, shall require a skill level of 3M

or less. Scheduled maintenance tasks shall be related and shall be grouped in maximum mileage intervals. Routine scheduled maintenance actions, such as filter replacement and adjustments, shall not be required at intervals of less than 6,000 miles, except for routine daily services performed during the fueling operations. Higher levels of scheduled maintenance tasks shall occur at even multiples of mileages for lower level tasks.

1.6.4.3 Mean Mileage between Failures

The following are design goals for mean mileage between failure by failure classes provided that all specified preventative maintenance procedures are followed:

Class 1: Physical Safety. Mean mileage shall be greater than 200,000 miles.

Class 2: Road Call. Mean mileage shall be greater than 20,000 miles.

Class 3: Bus Change. Mean mileage shall be greater than 16,000 miles.

Class 4: Bad Order. Mean mileage shall be greater than 10,000 miles.

Class 5: Major Failure. Mean mileage shall be at least 100,000 miles.

1.6.4.4 Mean Time to Repair

Repair time and skill levels required for various repairs to bus components shall not exceed mean time or skill levels typically required by BWATC to repair less than thirty (30') foot para-transit buses manufactured after 2015.

1.6.4.5 Accessibility

All systems or components serviced as part of periodic maintenance or whose failure may result in Class 1 or Class 2 failures shall be readily accessible for service and inspection. To the extent practicable, removal or physical movement of components unrelated to the specific maintenance and/or repair tasks involved shall be unnecessary.

Relative accessibility of components, measured in time required to gain access, shall be inversely proportional to frequency of maintenance and repair of the components.

1.6.4.6 Interchangeability

Components with identical functions shall be interchangeable to the extent practicable. These components shall include, but not limited to, passenger window hardware, interior trim, lamps, lamp lenses, and seat assemblies. Components with non-identical functions shall not be, or appear to be, interchangeable.

1.6.4.7 Maintainability

The vehicle manufacturer shall give prime consideration to the routine problems of maintaining the buses. All bus components and systems, both mechanical and electrical, which will require periodic physical work or inspection processes, shall be installed so that a minimum of time is consumed in gaining access to the critical repair areas. It shall not be necessary to disassemble portions of the bus structure and equipment such as seats and flooring under seats in order to gain access to these areas.

Each bus shall be designed to facilitate the disassembly, reassembly, servicing or maintenance thereof by use of tools and items which are normally available as standard commercial items. Requirements for the use of unique specialized tools will be minimized. Special tools required for servicing and overhaul shall be supplied by the contractor in sufficient quantity to equip one (1) heavy repair/overhaul facility. One (1) set of special tools shall be supplied. See Section 6.6.2.

The body and structure of all buses shall be designed for ease of maintenance and repair. Individual panels or other equipment which may be damaged in normal service shall be repairable or replaceable. Ease of repair shall be related to the vulnerability of the item to damage in service.

NOTE: Tools such as compartment door keys which are required for daily usage and maintenance inspections shall not be included in the special tool list and shall be furnished for each bus.

1.6.4.8 Systems Integration

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

1.6.5 OPERATING ENVIRONMENT

The bus shall achieve normal operation in the Greater Detroit metropolitan area.

2.0 BODY

2.1 SHELL

2.1.1 GENERAL

2.1.1.1 Design

The bus shall have a clean, smooth, simple design, primarily derived from bus performance requirements

and passenger service criteria established by these Technical Specifications. The exterior and body features, including grills and louvers, shall be shaped to allow complete and easy cleaning by automatic bus washers without snagging washer brushes. Water and dirt shall not be retained in or on any body feature to freeze or bleed out onto the bus after leaving the washer. Body and windows shall be sealed to prevent leaking of air, dust, or water under normal operating conditions and during cleaning in automatic bus washers for the service life of the bus. Accumulation on any window of the bus or spray and splash generated by the bus's wheels on a wet road shall be minimized.

2.1.1.2 Materials

Body materials shall be selected and the body fabricated to reduce maintenance, extend durability, and provide consistency of appearance throughout the life of the bus. Detailing shall be kept simple, add-on devices and trim shall be minimized and, where necessary, integrated into the basic design.

2.1.1.3 Finish and Color

All exterior surfaces shall be smooth and free of visible fasteners, wrinkles and dents. Exterior surfaces to be painted shall be properly cleaned and primed, as appropriate for the paint used, prior to application of paint to assure a proper bond between the basic surface and successive coats of paint. Paint shall be applied smoothly and evenly with the finished surface free of dirt, runs, orange peel, and other imperfections. All exterior finished surfaces shall be impervious to diesel fuel, gasoline and commercial cleaning agents. Finished surfaces shall not be damaged by controlled applications of commonly used graffiti removing chemicals.

Exterior paint shall be PPG two-part catalyzed enamel or approved equal

All surface preparation and paint applications shall be in accordance with procedures as recommended by the paint manufacturer.

The colors shall match the following PPG paint colors:

White - paint number 8001

For paint touch-up of any other surface shall be PPG two part catalyzed enamel or approved equal and shall match the above colors.

Exact sizes and placement of signatures, stickers and numbers will be supplied to the successful bidder.

2.1.1.4 Pedestrian Safety

Exterior protrusions greater than a half (1/2") inch and within eighty (80") inches of the ground shall have a radius no less than the amount of the protrusion. The left side rearview mirror and required lights and reflectors are exempt from the protrusion requirements. Grills, doors, bumpers and other features on the sides and rear of the bus shall be designed to minimize the ability of unauthorized riders to secure toeholds or handholds.

2.1.2 STRUCTURE

2.1.2.1 Strength and Fatigue Life

Buses of BWATC will be operated throughout the entire service area of Greater Detroit Metropolitan area and surrounding contiguous counties. They will operate under conditions encountered in transit service in BWATC service areas throughout the expected seven (7) year service life of the bus. The bus design shall incorporate all heavy-duty features which shall enable the basic structure to withstand fatigue damage that is sufficient to cause Class 5 major failure. The structure shall also withstand sustained impact and inertial loads up to 16,000 psi due to both urban and rural street travel in the BWATC service area throughout the expected seven (7) year service life of the bus without permanent deformation, damage or failure of the structure. The structure is considered to be frame, support braces, spines, bulkheads and outer bus shell.

2.1.2.2 Distortion

The 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 with any one wheel or dual set of wheels on a six (6") inch curb or in six (6") inch deep hole.

2.1.2.3 Resonance

All structure, body, and panel-bending mode frequencies, including vertical, lateral, and torsional modes, shall be sufficiently removed from all primary excitation frequencies to minimize audible, visible, or sensible resonant vibrations during normal service.

2.1.2.4 Material

Reinforced fiberglass and plastic materials shall be excluded from the stress carrying body construction, except for replaceable panels or doors.

2.1.2.5 Corrosion

The bus shall resist corrosion from atmospheric conditions and road chemicals. It shall maintain structural integrity and original appearance throughout its service life, provided it is maintained in accordance with the procedures specified in the service manual. Materials exposed to the elements and all joints and connections of dissimilar metals shall be corrosion resistant and shall be protected from galvanic corrosion.

Rivets and bolts will be of the same electrochemical composition as the parts they join. All under frame members' surfaces will be covered with a protective coating satisfying the requirements of Military Specification MIL-P-53084.

2.1.2.6 Towing

Towing devices shall be provided on the front and rear end of the bus. Each towing device shall withstand, without permanent deformation, tension loads up to 1.2 times the curb weight of the bus within twenty (20) degrees of the longitudinal axis of the bus. The rear towing device shall not provide a toehold for unauthorized riders. The rear towing devices shall allow lifting of the bus, at curb weight, until the rear wheels are clear of the ground. Each towing device shall accommodate a crane hook with a minimum 1.5 inch throat.

All buses shall be designed and constructed in such a way as to be able to withstand being craned, towed or recovered (wheels off the ground) from the front or rear without any frame, structural, or body deformation.

2.1.2.7 Jacking

It shall be possible to safely jack up the bus, at curb weight, with a common ten (10") inch high hand jack or a ten (10) ton floor jack, when a tire or dual set is completely flat and the bus is on a level, hard surface without crawling under any portion of the bus and without relocating the bus. Jacking from a single point shall permit raising the bus to a sufficient height to remove and reinstall a wheel and tire assembly. Jacking and changing any one (1) tire shall be completed by a 2M serviceman in less than thirty (30) minutes from the time the bus is approached until the bus is sufficiently high to remove and reinstall a wheel and tire assembly. The bus shall withstand such jacking at any one (1) or any combination of wheel locations without permanent deformation or damage.

2.1.2.8 Hoisting (RESERVED)

2.1.2.9 Bulkhead Fire Protection

The passenger and engine compartments shall be separated by a bulkhead(s) which shall, by incorporation of fireproof materials in its construction, be a firewall. This firewall shall preclude or retard propagation of an engine compartment fire into the passenger compartment. Only necessary openings shall be allowed in the firewall, and these shall be fireproofed. Piping through the bulkhead shall have copper, brass or fireproofing fittings sealed at the firewall with copper or steel piping on the forward side. Wiring may pass through the bulkhead only if connectors or other means are provided to prevent or retard fire propagation through the firewall. The conduit and bulkhead connectors shall be sealed with fire-proof material at the firewall. Engine access panels in the firewall shall be fabricated of fireproof fasteners. These panels, their fasteners, other fasteners, and the firewall shall be constructed and reinforced to minimize warping of the panels during a fire that will compromise the integrity of the firewall.

2.1.2.10 Crashworthiness

The bus body shall have been subjected to and passed FMVSS Standard 214, 220, 221, 222 and Standard 301 tests. Any additional testing the manufacture has performed on the proposed vehicle may be submitted with their proposal.

Certification shall be required by all Proposers as to passing the above tests and shall be submitted with Bid Proposals. A copy of the Altoona Test Report shall also be submitted.

2.1.3 EXTERIOR AND APPLIED PANELS

2.1.3.1 Strength and Installation

Exterior surface panels shall not be installed or retained with visible rivets or fasteners.

2.1.3.2 Repair and Replacement (RESERVED)

2.1.3.3 Rain Gutters

Gutters shall be provided to prevent water flowing from the roof onto the side windows and passenger doors. When the bus is decelerated, the gutters shall not drain onto the windshield, or driver's side window, or into the door boarding area. Cross sections of the gutters shall be no less than 0.25 square inches.

2.1.3.4 License Plates

Provisions shall be made to mount standard size U.S. license plates on the rear of the bus. These license plates shall be flush-mounted or recessed so that it does not allow a toehold or handhold for unauthorized riders and so that it can be cleaned by automatic bus washing equipment without being caught by the brushes. **No provision shall be made for a front license plate.**

2.1.3.5 Rub rails

Rub rails shall be composed of flexible, resilient material to protect both sides of the bus body from damage caused by minor sideswipe accidents with automobiles. Rub rails shall have vertical dimensions of no less than 2-1/2 inches. A damaged portion of the rub rail shall be replaceable without requiring removal or replacement of the entire rub rail.

2.1.4 INTERIOR

2.1.4.1 Headroom

Headroom above the aisle and at the centerline of the aisle seats shall be approximately 78 inches. In any area of the bus directly over the head of a seated passenger and positioned where a passenger entering or

leaving the seat is prone to strike his head, padding shall be provided on the overhead paneling.

2.1.4.2 Driver Barrier

A barrier or bulkhead between the driver and the left front passenger seat shall be provided. The barrier shall eliminate glare and reflections in the windshield directly in front of the barrier from interior lighting during night operation. The barrier shall extend from the floor to within one (1) inch of the ceiling and shall fit the bus side windows and wall to prevent passengers from reaching the driver or his personal effects. The barrier may be constructed of durable, unpainted, corrosion resistant material and shall have a light transmission density of no less than fifty (50%) percent with a minimum thickness of .375 inch.

2.1.4.2.1 Driver Storage

A storage area for driver's personal items (lunchbox, tablet or purse) shall be provided in the driver's area and shall not obstruct bus operations. Storage area shall be lockable and keyed alike in all units in the same order.

2.1.4.3 Modesty Panels

Sturdy divider panels constructed of durable, unpainted, corrosion resistant material complementing the interior trim shall be provided at the front entrance. These dividers shall be mounted on the side wall and shall project toward the aisle no further than the projection in the aisle side of the transverse seats. Modesty panels shall extend no higher than the lower daylight opening of the side windows and shall extend to within one and one fourth (1-1/4") inches of the floor. Dividers positioned at the doorways shall provide no less than a two and one fourth (2-1/4") inch clearance between the modesty panel and the opened door to protect passengers from being pinched. The modesty panel and its mounting shall withstand normal kicking, pushing, and pulling loads of two hundred (200) pound passengers without permanent visible deformation. They must be attached to tapping plates integral to the sidewall framing. The bus side panels and shall be free from "drumming" at all times.

2.1.4.4 Rear Bulkhead

The rear bulkhead paneling shall be contoured to fit the ceiling, side walls, and seat backs so that any litter will tend to fall to the floor or seating surface when the bus is on a level surface. Any air vents in this area shall be louvered to reduce air flow noise and to reduce the probability of trash or litter being thrown or drawn through the grille.

2.1.4.5 Construction

Interior panels may be integral with or applied to the basic bus structure. They shall be decorated in accordance with the interior selected. Use of moldings and small pieces of trim shall be minimized, and all parts shall be functional.

2.1.4.6 Fastening

Interior panels shall be attached so that there are no exposed edges or rough surfaces. Panels and fasteners shall not be easily removable by passengers. Interior trim fasteners, where required shall be tamperproof.

2.1.5. FLOOR

2.1.5.1 Height

Height of the floor above the street shall be no more than twelve (14") inches, measured at the centerline of the front door (6" minimum when kneeling). The floor may be inclined only along the longitudinal axis of the bus, and the incline shall be one and a half (1-1/2) degrees or less of the horizontal. All floor measurements shall be with the bus at the design height and on a level surface.

2.1.5.2 Strength

The floor deck may be integral with the basic structure or mounted on the structure securely to prevent chafing or horizontal movement. Sheet metal screws shall not be used to retain the floor and all floor fasteners shall be serviceable from one (1) side only. Tapping plates used for the floor fasteners shall be no less than the same thickness as a standard nut, and all floor fasteners shall be secured and protected from corrosion for the service life of the bus. The floor deck shall be reinforced as needed to support passenger loads. At GVWR, the floor shall have an elastic deflection of no more than 0.25 inches from the normal plane. The floor shall withstand the application of 2.5 times gross load weight without permanent detrimental deformation. Floor and step treads, with coverings applied, shall withstand a static load of at least one hundred fifty (150) pounds applied through the flat end of a 1/2 inch diameter rod with 1/32 mill end radius without permanent visible deformation. Floor shall be made of 3/4 inch, 7 ply Phenolic resin bonded A.C. marine grade fir plywood. The plywood shall be installed with the "A" side up and all flooring edges sealed. All holes in floor for mounting bolts, seams, wheel chair hold downs, seat retention bolts, CNG tank mounts or any other floor protrusions are to be caulked and sealed to insure a watertight fit.

2.1.5.3 Edges

The floor shall be essentially a continuous flat plane, except at the wheel housings. Where the floor meets the walls of the bus, the surface edges shall be blended with a circular section of radius not less than one (1") inch, and a molding or cover shall prevent debris accumulation between the floor and wheel housings.

2.1.5.4 Floor Protection

The floor, as assembled, including the sealer, attachments and covering, shall be waterproof, non-hygroscopic, resistant to wet and dry rot, resistant to mold growth, and impervious to insects. Floor covering shall be a slip resistant rubberized floor covering such as Gerflor Tarabus Apollo Kiliminjaro 4479 NT or equal. Color to be selected after award.

2.1.6 STEP

2.1.6.1 Step

At the front door, the step up from street level shall not exceed twelve (14") inches with the bus at the design height, and shall be at the floor level.

Tread shall be same as flooring. Color of the tread covering shall match the vestibule flooring. The edge of the vestibule floor shall have no overhang. The edge of the vestibule floor and the end of the step tread shall have a bright, contrasting **white** band no less than two (2") inches wide on the full width of the aisle as a standee line. The color shall be permanently blended into the tread covering material.

2.1.7 WHEEL HOUSINGS

2.1.7.1 Construction

Wheel housings shall be constructed of stainless-steel material and shall be no less than 14 gauge thick. The wheel housings of the bus shall be capable of withstanding all types of normal abuse due to wheel pickups thrown against the underside. Wheel housings shall be securely mounted and sealed to the bus body structure, and floor, and they shall be isolated from dissimilar metals to prevent galvanic corrosion. Wheel housings, as installed and trimmed, shall withstand impacts of a two (2") inch steel ball with at least two hundred (200) foot pounds of energy without penetration.

2.1.7.2 Clearance

Sufficient clearance and air circulation shall be provided around the tires, wheels, and brakes to preclude overheating when the bus is operating.

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.

2.1.7.3 Fender Skirts

Features to minimize water spray from the bus in wet conditions shall be included in wheel housing design. Any fender skirts shall be unbreakable and easily replaceable and they shall be flexible if they extend beyond the allowable body width. Wheels and tire shall be removable without disturbing the fender skirts.

2.1.7.4 Splash Aprons (Mud Flaps)

Splash aprons, composed of one fourth (1/4") inch minimum composition or rubberized fabric, shall be installed behind each wheel and shall extend downward to within three (3") inches of the road surface. Splash aprons and their attachments shall be inherently weaker than the structure to which they are attached.

Splash aprons and their attachments shall not be included in the road clearance measurements. Other splash aprons shall be installed where necessary to protect bus equipment as determined by the Proposer or BWATC inspectors during the build process.

2.1.8 PASSENGER DOOR

2.1.8.1 Requirements

One (1) door shall be provided in the right side of the bus for passenger ingress and egress. The door shall be located so that the driver is able to collect or monitor the collection of fares. The door when fully closed shall provide a positive seal from water, road splash, debris or HVAC losses. The opening and closing of the door shall be controlled by the driver. Requirements for operation of the door are in Section 2.2.1.

2.1.8.2 Materials

Structure of the door, any attachments, inside and outside trim panels and any mechanism exposed to the elements shall be durable and corrosion resistant. Door construction shall be corrosion resistant metal or reinforced Fiberglass. The door, when fully opened, shall provide a trim support and shall not be damaged if used as an assist by passengers during ingress or egress.

2.1.8.3 Dimensions

When open, the door shall leave an opening no less than 77 inches in height. Front door opening width shall be no less than thirty six (36") inches, with the door fully opened. Door will be so arranged and designed that in the process of opening and closing there will be no hazards to passengers' fingers or feet. Door shall be controlled by the operator.

2.1.8.4 Door Glazing

The front door shall be glazed for no less than ninety (90%) percent of the respective door opening area of each section. The edge of a six (6") inches high curb shall be visible to the seated driver through the closed front door when the bus is more than twelve (12") inches from the curb.

2.1.8.5 Door Projection

Exterior projection of the front door shall be minimized and shall not exceed thirteen (13") inches during the opening or closing cycles of when the door is fully opened. Projection inside the bus shall not exceed twenty (20") inches. The closing edge of each door panel shall have no less than two (2") inches of soft weather stripping. The door, when closed, shall be effectively sealed and the hard surfaces of the door shall be at least four (4") inches apart.

2.1.8.6 Door Heights above Pavement

It shall be possible to open and close the passenger door when the bus, loaded to GVWR, is parked with the tires touching an eight (8") high curb on a street sloping toward the curb.

2.1.8.7 Rear Door - OPTION

Proposer shall provide a rear entry door capable of passenger entrance and egress. Rear door shall meet, at a minimum, the requirements of Sections 2.1.8.1 thru 2.1.8.6 and 2.2.1.1 thru 2.2.1.4. Any available data on rear door shall be provided in the proposal.

2.1.9 SERVICE COMPARTMENTS AND ACCESS DOOR

2.1.9.1 Interior

Access for maintenance and replacement of equipment shall be provided by panels and doors that appear to be an integral part of the interior. Removal of fixtures or equipment unrelated to the repair task to gain access shall be minimized. Access doors shall be hinged with props, as necessary, to hold the door out of the mechanic's way. Retention of all interior access panels shall be standardized so that only one (1) tool is required to service all special fasteners within the bus. Access door for the door actuator compartments shall be secured with hand screws or latches, and shall prevent entry of mechanism lubricant into the bus interior. All fasteners that retain access panels shall be captive in the cover.

Access openings in the floor shall be sealed to prevent entry of fumes and water into the bus interior. Access openings shall be non-symmetrical so that reinstalled flooring shall be properly aligned. Fasteners shall tighten flush with the floor.

2.1.9.2 Exterior

Conventional or pantograph hinged door shall be used for the engine compartment and for all auxiliary equipment compartments. Access openings shall be sized for easy performance of tasks within the compartment including tool operating space. Access door shall be of rugged construction and shall be capable of withstanding severe abuse throughout the life of the bus. They shall close flush with the body surface. The door shall be hinged at the top or on the forward edge and shall be prevented from coming loose or opening during transit service or in bus washing operations. Door with top hinges shall be equipped with gas spring assist. The access door shall be retained in the open position by a positive locking device. Springs and hinges shall be corrosion resistant and shall last for the bus's service life.

Latch handles shall be flush with, or recessed behind the body contour and shall be sized to provide an adequate grip for opening. Large access door shall hinge up and out of the way or fold flat. These doors, when opened, shall not restrict access for servicing other components or systems.

2.1.9.3 Battery Compartment

The battery compartment shall prevent accumulation of snow, ice and debris on top of the batteries and shall be vented and self-draining. It shall be accessible only from the outside of the bus. All components within the battery compartment, and the compartment itself, shall be protected from damage or corrosion from the electrolyte. The inside surface of the battery compartment's access door shall be electrically insulated, as required, to prevent the battery terminals from shorting on the door if the door is damaged in an accident or if a battery comes loose.

Battery quick disconnect shall be identified with a decal. Decal size shall not be less than 3.5 x 5 inches. Location of switch shall meet BWATC's approval.

NOTE: Battery hold down bracket shall be constructed of a non-metallic material (plastic, Fiberglass, wood, etc.).

2.2 OPERATING COMPONENTS

2.2.1 DOORS

2.2.1.1 Control

Operation of the passenger door shall be completely controlled by the driver. Door shall open or close completely in 1 to 1.5 seconds from the time of control actuation and shall be subject to adjustment requirements of Section 2.2.1.3. A control adjacent to the front door mechanism shall be provided to permit manual operation of the front door with the bus shut down.

To preclude movement of the bus, an interlock shall lock the accelerator in the closed position when the door is in the open position.

2.2.1.2 Closing Force

No more than a ten (10) pound force shall be imposed on a one (1) square inch area of any passenger struck by a closing door. A maximum force of thirty five (35) pounds shall be required for a passenger to free himself after having door close upon him.

2.2.1.3 Actuator

Door actuator shall be adjustable so that the door opening and closing speeds can be independently adjusted from 1 second up to 3 seconds. Actuator and the complex door mechanism shall be concealed from passengers, but shall be easily accessible for servicing. All elements of the door and actuator system shall operate without a Class 3 failure for 50,000 miles on the design operating profile. The opening and closing time as shown on table below will be controlled by pneumatic valve:

OPENING

CLOSING

1 - 1.5 seconds

2 - 3 seconds

2.2.1.4 Emergency Operation

In the event of an emergency, it shall be possible to open the door manually from inside the bus after activating an unlocking device at the door. The unlocking device shall be clearly marked as an "emergency only" device. The door emergency unlocking devices shall be accessible from the entrance areas.

2.2.2 WINDSHIELD WIPERS AND WASHERS

2.2.2.1 Windshield Wipers

The bus shall be equipped with an intermittent wiper system for the windshield. No part of the windshield wiper mechanism shall be damaged by manual manipulation of the arms. At 60 mph, no more than ten (10%) percent of the wiped area shall be lost due to windshield wiper lift. Both wipers shall park along the bottom edge of the windshield glass and shall not impair the driver's view. Windshield wiper motors and mechanisms shall be accessible for repairs or service from outside the bus. Wiper blades shall be designed for winter operation.

2.2.2.2 Windshield Washers

The windshield washer system shall deposit washing fluid on the windshield and, when used with the wipers, shall evenly and completely wet the entire wiped area. The windshield washer system shall have a minimum three (3) quart reservoir, located for easy refilling. Reservoir pumps, lines and fittings shall be corrosion resistant, and the reservoir itself shall be translucent for easy determination of fluid level. The filler cap shall be positively retained.

2.2.3 LIGHTING, CONTROLS, INSTRUMENTS

2.2.3.1 Exterior Lighting

All exterior lights shall be LED type as much as possible. Other exterior lamps must be sealed to prevent entry and accumulation of moisture or dust, and each lamp shall be replaceable in less than 5 minutes by a 2M mechanic. Lights mounted on the engine compartment door shall be protected from the impact shock of door opening and closing. Lamps, lenses, and fixtures shall be interchangeable to the extent practicable. Roof marker lights, one at each corner of bus with amber front, red rear lens shall be provided.

Exterior vehicle lighting shall conform to FMVSS 108. Each bus shall be equipped with the number of lamps, reflective devices and associated equipment specified in Table 1 of 49 CFR 571.108. Exterior lighting and associated equipment shall be located in accordance with Table II of 49 CFR 571.108.

Visible and audible warnings shall inform following vehicles or pedestrians of reverse operation. Visible

reverse operation warning shall conform to SAE Standard 3593. Audible reverse operation warning shall conform to SAE recommended Practice 3994-Type C or D.

The bus shall be provided with the current technology automotive headlights which shall be controlled by a dimming switch convenient to the driver.

Lamps at the front door shall activate only when the door is open and shall illuminate the street surface to a level of no less than one (1) foot-candle for a distance of three (3') feet outward from the lowest step tread edge. The lights may be positioned above the lower daylight opening of the windows and shall be shielded to protect passengers' eyes from glare. Lights may be positioned over the door which will also be activated by door operations.

Turn signal lights shall be provided on both sides of the bus. The side turn signals shall be located opposite each other and in a position standard to the manufacturer's design.

In addition, amber turn signal lamps shall be located above the right and left rear fender wells and shall operate in conjunction with the standard turn signals.

Contractor to furnish and install one additional brake light mounted in a location in the center of the rear panel. Auxiliary brake light will operate in conjunction with standard brake light system.

2.2.3.2 Service Area Lighting

Lights shall be provided in the engine compartment to generally illuminate the area for night emergency repairs or adjustments. Necessary lights, located in other service compartments, shall be provided with momentary contact switches on the light fixture or a switch convenient to the light.

2.2.3.3 Passenger Interior Lighting

An overhead LED lighting system shall provide general illumination in the passenger compartment and shall be controlled independently. The system shall provide no less than fifteen (15) foot-candles of illumination in a one (1) square foot plane at an angle of 45 degrees centered thirty three (33") inches above the floor and twenty four (24") inches in front of the seat back at each seating position except at the rear cross seat where the illumination may be decreased to seven (7) foot-candles.

The floor surface in the aisle shall be illuminated to no less than ten (10) foot-candles. Floor surface in the vestibule shall be illuminated to no less than four (4) foot-candles with the front door open and to no less than two (2) foot-candles with the front door closed. LED light fixtures shall be located above the side windows at or near the juncture of the bus ceiling and the side wall and may be provided over the rear door.

Lamp fixtures and lenses shall be fire resistant and shall not drip flaming material onto seats or interior trim if burned. If so equipped, the fixtures shall be sealed to prevent accumulation of dust and insects but shall be easily openable on hinges for cleaning and service. The lenses shall be retained in a closed position and

if threaded fasteners are used, they must be captive in the lens with cross recessed type heads. Power supplies shall be enclosed with fireproof material and shall be located at the individual light fixtures. Power supplies shall be inaudible with an operating frequency above 18,000 Hz. Interchangeability of lamps, lenses, fixtures and power supplies shall be maximized.

An entrance lighting system shall be illuminated when the Doors are opened. The front entrance lamps shall be extinguished when the doors are closed. The system shall provide no less than two (2) foot-candles of illumination on the entry and exit step treads with the door open. These lights shall be shielded to protect passengers' eyes from glare. Light fixtures shall be totally enclosed, splash proof, designed to provide ease of cleaning as well as lamp and housing removal, and shall not be easily removable by passengers. Entrance lights shall be protected from damage caused by passengers kicking lenses or fixtures and shall not be a hazard to passengers.

No glare shall be produced by the forward most interior lights when the bus is operated in dark conditions.

2.2.3.4 Driver's Lighting

The driver's area shall have a light to provide general illumination and it shall illuminate the half of the steering wheel nearest the driver to a level of ten (10) to fifteen (15) foot-candles. This light shall be controlled by a switch that is convenient to the driver. This lamp shall operate at any position on the master switch, including off.

2.2.3.5 Driver's Controls

All switches and controls necessary for the operation of the bus shall be conveniently located in the driver's area and shall provide for ease of operation. Switches and controls shall be essentially within the hand reach envelope described in SAE Recommended Practice, 3287, Driver Hand Control Reach. Controls shall be located so that boarding passengers may not easily tamper with control settings. Accelerator and brake pedals shall be designed for ankle motion and not deviate in height. Steel pedals shall be covered with tear resistant, non-skid rubber foot surfaces. Pedal travel shall be limited by adjustable stops under the pedals.

Controls for engine operations shall be closely grouped within the driver's compartment. These controls include a separate keyed ignition switch, or a master run switch and a start switch or button. The keyed ignition or master switch shall shut off all bus functions.

The door control, windshield wiper/washer controls, and ignition/run switch shall be in the most convenient driver locations. They shall be identifiable by shape, touch and markings. Door shall be operated by a single control, conveniently located and operable in a horizontal plane by the driver's hand. The setting of this control shall be easily determined by position and touch. Turn signal controls shall be steering column mounted lever.

LOW FLOOR, MEDIUM DUTY PARA-TRANSIT BUS

OPERATING SWITCHES AND CONTROLS

Keyed Ignition/ Master Switch
Turn Signal Switch
Interior Lighting Switch
Instrument Panel Lighting Intensity Control
Passenger Chime Switch
Driver's Area Light Switch
Hazard Warning Switch
Horn Button in steering wheel hub
Headlight Dimmer Switch
Fast Idle Switch
Diagnostic Light Panel Test Switch
Master Door Switch

CONTROLS

Accelerator Pedal
Brake Pedal
Door Control
Kneeling Control
Windshield Wipers
Wiper Delay Control
Windshield Washers
Interior Climate Controls
Defroster Control
Driver's Heater Control
Parking/Emergency Brake (Actuation of Brake, Not Control, Shall Be Indicated to the Driver)
Transmission Control
Front Door Emergency Release
Destination Sign Controls

All switches and controls shall be marked with easily read identifiers. All panel mounted switches and controls shall be replaceable, and the wiring at these controls, shall be serviceable from the electrical department, or driver's area. Switches, controls and instruments shall be dust and water resistant consistent with the bus washing practice described in Section 2.3.1.

2.2.3.6 Instrumentation

The speedometer, air pressure gauge(s) and certain indicator lights shall be located on the dashboard immediately ahead of or adjacent to the steering wheel. The steering wheel spokes or rim shall not obstruct the driver's vision of the instruments when the steering wheel is in the straight ahead position. Illumination of the instruments shall be simultaneous with the marker lamps. Glare or reflection in the windshield, side

window, or front door windows from the instruments, indicators, or other controls shall be minimized. Instruments and indicators shall be easily readable in direct sunlight. Indicator lights immediately in front of the driver shall include:

Low air pressure

High beam headlamps

Right turn

Left turn

Hazard warning (may be common with turn signal indicators)

Parking brake applied

CNG low fuel lamp

The instrument panel shall include the following gages:

1. A speedometer indicating no less than 120 mph and calibrated in maximum increments of 5 mph. The speedometer shall be a rotating pointer type, with a dial deflection of 220° to 270° and 55 mph near the top of the dial. The speedometer shall be sized and accurate in accordance with SAE Recommended Practice 3678.
2. Air reservoir pressure gauge(s) with indicators for primary and secondary air tanks.
3. Voltmeter(s) to indicate the operating voltage across the bus batteries.
4. Transmission temperature gage.
5. CNG pressure gage, in addition to OEM fuel gage.
6. Coolant temperature gage.

The instrument panel and wiring shall have sufficient length and be routed to permit removal for routine service without stretching or chafing the wires.

2.2.3.7 On-Board Diagnostics

Critical systems or components shall be monitored with a built-in diagnostic system. This diagnostic system shall have visual and audible indicators. The diagnostic indicator lamp panel shall be located in clear sight of the driver but need not be immediately in front of him. The intensity of indicator lamps shall permit easy determination of "ON/OFF" status in bright sunlight but shall not cause a distraction or visibility problem at night. All indicators shall have a method of momentarily testing the operation of the lamp.

Wherever possible, sensors shall be of the closed circuit type, so that failure of the circuit and/or sensor shall activate the malfunction indicator. An audible alarm shall sound when certain malfunctions are

detected by the diagnostic system. The audible alarm shall be loud enough for the driver to be aware of its operation and to be inclined to discontinue operation of the bus. Malfunction and other indicators listed in Section 3.1.4 shall be supplied on all vehicles.

2.3 INTERIOR TRIM

2.3.1 GENERAL REQUIREMENTS

The interior shall be pleasing, modern and free from superficial design motifs. It shall have no sharp depressions or inaccessible areas and shall be easy to clean and maintain. To the extent practicable, all interior surfaces more than ten (10") inches below the lower edge of the side windows or windshield shall be shaped so that objects placed on them fall to the floor when the bus is parked on a level surface. Handholds, lights, air vents, armrests and other interior fittings shall appear to be integral with the bus interior. There shall be no sharp, abrasive edges and surfaces and no unnecessary hazardous protuberances. All plastic and synthetic materials used inside the bus shall be fire resistant. Materials shall be selected on the basis of maintenance, durability, appearance, safety, flammability and textile qualities. Trim and attachment details shall be kept simple and unobtrusive. Materials shall be strong enough to resist everyday abuse and vandalism; they shall be resistant to scratches and markings. Interior trim shall be secured to avoid resonant vibrations under normal operational conditions.

2.3.1.1 Trim Panels

Interior side trim panels shall be melamine or equivalent. It shall permit easy removal of paint, greasy fingerprints, and ink for felt tip pens. Panels shall be tamper resistant. They shall be reinforced, as necessary, to resist vandalism and other rigors of transit bus service. Interior side trim panels above the bottom of the windows shall be plastic, melamine type material or painted metal to conform to the bus interior decorative scheme. It shall permit easy removal of paint, dirt, greasy fingerprints and ink for felt tip pens. Interior mullion trim, moldings and trim strips shall be plastic, textured stainless steel, or anodized aluminum. Individual trim panels and parts shall be interchangeable to the extent practicable. Untrimmed areas shall be painted and finished to the quality described in Section 2.1.1.3.

2.3.1.2 Headlining

Ceiling panels shall be melamine type material. Headlining shall be supported to prevent buckling, drumming, or flexing and shall be secured without loose edges. Headlining materials shall be treated or insulated to prevent marks due to condensations where panels are in contact with metal members. Moldings and trim strips, as required to make the edges tamper-proof, shall be stainless steel, or plastic, colored to compliment the ceiling material. Headlining panels covering operational equipment that is mounted above the ceiling shall be on hinges for ease of service but retained to prevent inadvertent opening.

2.3.1.3 Front End

The entire front end of the bus shall be sealed to prevent debris accumulation behind the dash and to prevent the driver from kicking or fouling wiring and other equipment with his feet. The front end shall be free of protrusions that are hazardous to passengers standing or walking in the front of the bus during rapid decelerations. Paneling across the front of the bus and any trim around the driver's compartment shall be formed metal or plastic material. Formed metal dash panels shall be painted and finished to exterior quality. Plastic dash panels shall be reinforced, as necessary, vandal resistant, and replaceable. All colored, painted, and plated parts forward of the driver's barrier shall be finished with a dull matte surface.

2.3.1.4 Rear End

The rear bulkhead and/or rear interior surfaces shall be of a material suitable for exterior skin, painted and finished to exterior quality, or paneled with melamine type material, plastic, and trimmed with stainless steel or plastic.

2.3.2 PASSENGER SEATS

BWATC is open to new and innovative ideas in seating design, layout, and wheelchair restraint. Proposers should take into account that these buses will be used in various forms of public transit including passengers' ages two to six years old. Since the final seating configuration will be decided after award and several different seating configurations may be requested during the period of this contract, the following sections may serve as a guide to the Vendor as to what may be required.

2.3.2.1 ARRANGEMENTS

Final seating configurations shall be determined after award. Generally, passenger seats shall be arranged in a transverse, forward facing configuration, except at the wheel housing and wheel chair securement area where seats may be arranged as appropriate with due regards for passenger access and comfort. **Forward facing seating must be maximized.**

Seating capacity with these arrangements may be up to twenty (20) able-bodied passengers with no wheel chair positions. Hip to knee room, measured from the front of one seat back surface horizontally across the highest part of the seat surface to the seat or panel immediately in front, shall be no less than 28 inches at all seating positions in paired transverse seats immediately behind other transverse seats. At other seating positions hip to knee room shall be no less than twenty eight (28") inches. Foot room, measured forward parallel to the floor from a point vertically below the front of the seat cushion, shall be no less than fourteen (14") inches. Seats immediately behind the wheel housings may have foot room reduced to nine (9") inches, measured to the first vertical barrier, provided the wheel house is shaped so that it may be used as a footrest.

Each transverse, forward facing seat, except the rear seats, shall accommodate two (2) adult passengers. Thickness of the transverse seat backs shall be minimized to increase passenger knee room and bus capacity. The area between the longitudinal seat backs and the attachment to the bus side walls shall be

designed to prevent debris accumulation.

The aisle between the seats shall be no less than twenty (20") inches wide at seated passenger hip height. Seat backs shall be shaped to increase this dimension to no less than twenty four (24") inches at standing passenger hip height.

2.3.2.2 Structure and Design

The passenger seat frame and its supporting structure shall be constructed and mounted so that space under the seat is maximized to increase maneuvering room and is completely free of obstructions to facilitate cleaning. The structure shall be of sufficient strength for the intended service. The underside of the seat shall be configured to prevent debris accumulation and the transition from the seat underside to the bus side wall shall be smooth. Structural failure of any part of the seat shall not introduce a laceration hazard. The back of each transverse seat shall incorporate a handhold no less than 7/8 inches in diameter for standees and seat access/egress. The handhold shall not be a safety hazard during severe decelerations. Passenger head protection shall be built integrally into the seat back handhold to the maximum extent practicable. The seat back handhold shall be coated with a vandal resistant resilient thermoplastic coating or surface material. The handhold shall extend above the seat back near the aisle so that standees shall have a convenient vertical assist, no less than four (4") inches long that may be grasped with the full hand. This handhold shall not cause a standee using this assist to interfere with a seated 50th percentile male passenger. The handhold shall also be usable by a 5th percentile female, as well as by larger passengers, to assist with seat access/egress for either access/egress for either transverse seating position. Armrests shall not be included in the design of transverse seats.

Seat back handholds shall withstand static horizontal and vertical forces of two hundred fifty (250) pounds applied anywhere along their length with less than a fourth (1/4") inch permanent deformation. Seat back handholds shall withstand 25,000 impacts in each direction of a horizontal force of one hundred twenty five (125) pounds with less than a fourth (1/4") inch permanent deformation and without visible deterioration.

2.3.2.3 Construction and Materials

Seat types may vary during the length of this contract. Pricing shall be included on **Form 3.1, Pricing Proposal, per seated position**. Types of seats that may be used are;

- A. Fiberglass shell with vinal insert (i.e. American Seating; Freedman Citi-Seat)
- B. Fiberglass shell with vinal cushion (i.e. American Seating; Freedman "Rock Solid")
- C. Steel Frame, fully vinal (i.e. American Seating; Freedman Feather Weight)
- D. Fold Away Seats (not cantilever mounted) used for wheel chair positions (i.e. American Seating EZ Fold; Freedman FCS Fold away)

Include with proposal full documentation on the make and model of the seats proposed.

Pricing per seated position shall also be included on **Form 3.1** for the addition of seat belts. Seat belts shall be fully retractable with no loose belts falling on the floor. Seat belt retractors shall be underslung on seats and designed to meet FMVSS 210 on forward facing seats. All seat belt components shall be permanently attached.

Seat shall be attached to the frame with tamper proof fasteners. Coloring shall be consistent throughout the seat material with no visually exposed portion painted. All visually exposed metal of the standard seat structure shall be aluminum or stainless steel.

The seat shall be contoured for individual lateral support and maximum comfort and shall fit the frame- work to reduce exposed edges.

The upper rear portion of the seat back and seat back handhold shall be constructed of energy absorbing materials. Permanent deformation of the seat resulting for a two (2) 95th percentile males striking the seat back during a 10g deceleration shall not exceed two (2") inches measured at the aisle side of the seat. During a 10g deceleration, the HIC number shall not exceed through a 95th percentile male. Seats, seat back panels and other pads shall be securely attached and shall be detachable by means of a simple release mechanism employing a special tool so that they are easily removable by the maintenance staff but not by the passengers. To the extent practicable, complete seat assemblies, cushions, seat back panels, seat back handholds and pads shall be interchangeable throughout the bus. All materials and workmanship shall conform to SPI standards and specifications.

All seats with the exception of the rear cross seat shall have a seat back height of 23" minimum. Seats to be supplied vandal resistant.

Back panels, if equipped, and energy absorbing grab rail color shall be Sikkens No. N0437 Dark Blue. Fiberglass shell color, if equipped, shall be Sikkens N0434 Light Blue. (Seat vinyl and colors subject to change after award.)

2.3.3 WHEELCHAIR PASSENGER SEATS

2.3.3.1 Arrangements

One or more seat assemblies, as close to the wheelchair entrance as practical, shall be modified to provide parking space and secure tie down for three (3) wheelchairs. Maneuvering room inside the bus shall accommodate easy travel for a passenger in a wheelchair from the loading area through the bus to the designated parking areas, and back out. No portion of the wheelchair or its occupant shall protrude into the normal aisle of the bus when parked in the designated parking space(s). As a guide, no width dimension should be less than 39 inches; areas requiring 90 degree turns of wheelchairs should have a clearance arc dimension no less than 36 inches and in the parking area where 180 degree turns are expected, space should be clearing a full 61 inch diameter circle. A vertical clearance of 12 inches above the floor surface should be provided on the outside of turning areas for wheelchair foot rest clearance. The contractor shall provide a seating plan including layout drawings for entry, maneuvering, parking and exit of wheelchair passengers

prior to submission of the bid for BWATC approval.

2.3.3.2 Structure and Materials

Seat material of the fold up seats shall be attached to the frame with tamper proof fasteners. Fold up seating shall conform with the requirements of Sections 2.3.2.2 and 2.3.3.3 to the maximum extent practicable.

2.3.3.3 Wheelchair Restraint

BWATC requires that a "state of the art", self-storing style wheelchair restraint system be engineered into the bus. Floor covering in the wheelchair accommodation area shall be non-skid or abrasive so as to prevent skidding of wheelchair with its lock applied.

BWATC's prior approval will be required for securement area and location of securement paraphernalia.

The restraint system shall be designed so that it can be conveniently fastened and unfastened by a wheelchair occupant who has nearly normal arm/hand movement and control. Type 1 seat belts, conforming to FMVSS 209 shall be provided for securing the passenger in the wheelchair in either system.

Restraint devices and belts when not in use shall retract, fold or stow so as to give a neat appearance, present no tripping or catching hazard, and cause no interference with the use of the folding seats.

BWATC currently uses Q-Straint "Slide -n- Click". Full documentation of restraint system shall be provided with proposal.

2.3.4 DRIVER'S SEAT

2.3.4.1 Operator's seat to be a USSC G2E Evolution with skirt, arm rests and head rest or approved equal. Installation of the seat shall not interfere with any of the adjustment features of the seat. The driver's seat shall be upholstered with a Vinal upholstery seat.

The operator's seat must be equipped with a lap and shoulder safety belt.

2.3.5 FLOOR COVERING

2.3.5.1 Vestibule

The floor in the vestibule shall be covered with nonskid rubber composition material that remains effective in all weather conditions. The floor covering, as well as transitions of flooring material to the main floor and to the entrance area, shall be smooth and present no tripping hazards. . The standee line shall be at least two (2") inches wide and shall extend across the bus aisle in line with the driver's barrier. This line

shall be the same color as the edge of the steps. Color shall be consistent throughout the floor covering. The floor covering in the vestibule shall be identical to the remaining flooring.

2.3.5.2 Passenger Area

The floor in the passenger area shall be covered with nonskid rubber composition material and remain effective in all weather conditions. The covering between the center strip and the wheel housings may be separate pieces.

The floor under the seats, including driver's seat, shall be covered with the same flooring material as the rest of the bus. The floor covering shall closely fit the sidewall cover or extend to the top of the cove. Color of the floor covering in the passenger compartment shall be the same as that in the vestibule.

2.3.5.3 Entrance Area

The edge of the floor covering material at the openings of the entrance area shall be white while forming an integral part of the floor covering material.

2.3.5.4 Installation

All joints must be flush and sealed to form a waterproof joint. The cement used to bond the floor covering to the plywood sub-floor, must result in a permanent bond, impervious to water, salt or brine solution.

2.3.5.5 Floor covering

Floor covering shall be a slip resistant rubberized floor covering such as Altro Trans Floor 2.2 (Preferred 2.7). Color to be selected after award.

2.4 WINDOWS AND ESCAPE HATCHES

2.4.1 DRIVER'S WINDOWS

2.4.1.1 Windshield

The windshield shall permit a panoramic view as referenced in SAE Recommended Practice 31050. The windshield shall be designed and installed to minimize external glare as well as reflections from inside the bus. When the bus is operated at night with the passenger interior lighting "ON", essentially no reflections shall be visible in the windshield immediately forward of the driver's barrier. Reflections in the remainder of the windshield shall be minimized, and no reflection of any part of the bus interior behind the driver's barrier shall be visible in the windshield.

The glazing material shall be laminated safety glass with single density tint. The upper portion of the windshield above the driver's field of view shall have a dark, shaded band with a minimum luminous

transmittance of six (6%) when tested in accordance to ASTM D-1003. The band must be integral to the glass laminations.

2.4.1.2 Driver's Side Window

The driver's side window shall open fully. No fixed panels will be allowed. The open window will provide for maximum ventilation of the driver's compartment. This window section shall slide rearward in tracks or channels designed to last the service life of the bus. The driver's side window shall not be bonded in place and shall be easily replaceable. The glazing material shall be nominal 1/4 inch laminated safety glass. The window shall be gray tinted with the lowest light transmittance allowable by law.

2.4.2 SIDE WINDOWS

2.4.2.1 Dimensions

Side windows shall have upper "T" sliders or tilt ins and shall extend from the shoulder height of a 5th percentile, seated, female passenger to the eye level of a 95th percentile, standing male passenger. Vertical mullions between windows including the trim shall not exceed seven (7") inches in width. All side windows shall be fixed in position, except as necessary to meet the emergency escape requirements in accordance with FMVSS 217. All side windows shall be easily replaceable without disturbing adjacent windows and shall be mounted so that flexing or vibration from engine operation or normal road excitation is not apparent.

2.4.2.2 Materials

Side window glazing material shall 1/4 inch minimum thickness laminated safety glass. Windows in the front passenger doors shall be laminated safety glass of 1/4 inch minimum thickness. The window glazing shall be free of visual distortions. Windows on the bus sides shall be tinted a neutral color, complimentary to the bus exterior. The maximum light transmittance shall be the lowest allowed by law. Windows over the side destination sign shall have essentially clear glazing. Glazing materials shall be in accordance with ASNI Z26.1-1966. Acrylic and other plastic glazing is exempt from the interior trim flammability required of Section 2.3.1.

The tint of the driver's and side windows and other glazing material shall need the approval of the BWATC. The materials will be selected from standard offerings.

2.4.3 DESTINATION SIGN WINDOWS

Windows over the front and side destination signs shall not be tinted. A heat/defogger electric type window glass wiring grid shall be installed on the front destination sign window to prevent fogging of the viewing areas.

2.4.4 ROOF ESCAPE HATCHES AND ROOF VENTS

The bus, if so equipped, shall have one (1) roof escape hatch and vent which shall be captive and resettable from inside the bus, when released.

The hatch shall be located standard to the manufacturer's design practice. The roof escape hatches shall also function as manual roof vents. Roof vents shall be capable of being positioned as a scoop with either the leading or trailing edge open no less than four (4") inches. A decal giving operating instructions shall be installed at each roof escape hatch.

2.5 INSULATION

2.5.1 MATERIAL

2.5.1.1 Properties

Any insulation material used between the inner and outer panels shall be fire resistant and sealed to minimize entry of moisture and to prevent its retention in sufficient quantities to impair insulation properties. Insulation properties shall be unimpaired by vibration compacting or settling during the life of the bus. The insulation material shall be non-hygroscopic and resistant to fungus and breeding of insects. Any insulation material used inside the engine compartment shall be fire resistant and shall not absorb or retain oils or water. All insulation material shall comply with ASTM E162 latest revision.

2.5.2 PERFORMANCE

2.5.2.1 Thermal Insulation

The combination of inner and outer panels on the sides, roof, and ends of the bus, and any material used between these panels shall provide a thermal insulation sufficient to meet the interior temperature requirements of these Technical Specifications. The bus body shall be thoroughly sealed so that drafts cannot be felt by the driver or passengers during normal operations with the passenger doors and windows closed.

2.5.2.2 Sound Insulation

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 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 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. During the test, the ambient noise level in the test area shall be at least 10 dB lower than the bus under test. Instrumentation and other general requirements shall conform to SAE Standard J366. Certified results of noise tests shall be supplied to BWATC.

2.6 ANCILLARY FEATURES

2.6.1 DRIVER'S AREA

2.6.1.1 Visors

An adjustable sun visor shall be provided for the driver's side of the windshield. Visor shall be shaped to minimize light leakage between the visor and windshield pillars. Visor shall store out of the way and shall not obstruct air flow from the climate control system or foul other equipment such as the radio handset or the destination control. Deployment of the visor shall not restrict vision of the rearview mirrors. Visor adjustment shall be made easily by hand with and shall not be subject to damage by over tightening. Sun visor construction and materials shall be strong enough to resist breakage during adjustments. Visor may not allow a visible light transmittance in excess of ten (10%) percent. Visor, when deployed, shall be effective in the driver's field of view at angles more than 5° above the horizontal.

2.6.1.2 Passenger Stop Request Signals

A passenger chime signal audible to the driver and to passengers anywhere inside the bus shall be provided. The chime shall be activated by pull cords that are convenient to seated passengers and standees. Standees shall be able to easily reach the chime signal. The pull cords shall be located no more than 67" - 68" from the floor and shall run along both sides of the passenger area of the bus. The pull cord shall be of the transparent coated, metal lined type. The chime shall be Faraday or approved equal. A "stop requested" light, visible to the passengers, shall be lit when the pull cord is activated and shall remain lit until the entrance/exit door is opened. A switch shall be provided that allows the driver to shut down the stop request system. The switch will be located convenient to the driver control panel.

2.6.1.3 Fire Extinguisher

A fire extinguisher is to be supplied and mounted in an approved location accessible to the driver. Access door to the fire extinguisher, if applicable, is to be identified with appropriate decal. Fire extinguisher shall be a 5 pound type ABC. Final location to be approved after award.

2.6.1.4 Coat Hook

The driver's area shall be equipped with a hook or other suitable device for hanging coats, sweaters, etc. The hook, shall not be a head bumping hazard to a 5th percentile female or 95th percentile male when standing. The coat hook shall be located such that, when in use, the driver's rear view is not obstructed.

2.6.1.5 Public Address System

The bus shall be equipped with a public address system. The system shall be integral with the AM/FM/CD radio as described in Section 3.12 if this option is elected. A black goose neck microphone with switch shall be installed convenient to the driver and not obstructing vision or creating blind spots. The PA shall override the AM/FM /CD radio when the microphone switch is in the on position. A minimum of four (4) ceiling speakers shall be installed capable of handling the full rated output of the PA/Radio system without damage. Exterior speakers shall be installed at the bus entrance door to comply with ADA requirements.

2.6.1.6 First Aid Kit

A general purpose first aid will be provided and mounted in the vehicle. A sign indicating its location shall be provided if kit is mounted inside a closed cabinet. Final location of the first aid kit will be determined after award.

2.6.1.7 Seat Belt Cutter

A seat belt cutter for the purposes of cutting the restraint belts of occupants during an emergency shall be provided. The cutter shall be securely mounted within reach of the belted driver. Final location of belt cutter will be determined after award.

2.6.1.8 – Security Cameras

The bus shall be equipped with a sufficient number of high definition (1080p), infrared night vision cameras and associated wiring provisions to allow continuous audio and video monitoring of bus interior for purposes of security. The cameras shall be a digital recording type, appropriately mounted to provide a clear view of entire passenger compartment, driver and fare box area, front and rear entrance and protected to prevent tampering and vandalism. The system shall have a digital recording capacity of no less than 72 hours. The system shall be capable of recording six channels of both audio and visual. System shall be programmable to automatically tag events, such as a panic button activation or a hard deceleration/impact. An impact sensor shall be included with the system. The unit shall be GPS integrated. Tagged events shall be stored on the hard drive. When retrieved, the tagged events shall be easily identifiable. The system module shall be located in an area that is approved by BWATC with adequate provisions for easy removal/replacement of hard drive/SD card for downloading of recorded information. Locks shall be keyed same. The system may be located inside the driver's storage compartment with adequate provisions for easy removal/replacement as described above. A provision shall be included to allow bus operator to electronically flag events recorded. Adequate number of decals/signs notifying the passengers of surveillance cameras on-board shall be installed in plain view throughout the bus. A spare storage device shall be furnished for each coach. Software to review archived video removed from a coach shall also be supplied.

BWATC currently uses the 247 system and SafetyVision. Complete description of any alternate system offered shall be included with proposal.

2.6.2 MIRRORS

2.6.2.1 Outside Mirrors

The bus shall be equipped with a remotely **adjustable** corrosion resistant, heated, outside rearview mirror on each side of the bus. Mirrors shall permit the driver to view the highway along both sides of the bus, including the rear wheels. Mirrors shall be firmly attached to the bus to prevent vibration and loss of adjustment, but not so firmly attached that the bus or its structure is damaged when the mirror is struck in an accident.

Exterior mirror arm brackets shall fold flat against the bus sides for bus washing operations and be equipped with stops so as to prevent contact with driver's window or front door glass when in a folded position.

Both left and right side mirrors shall be identical combination two piece, **remotely adjustable**, 6"x8" minimum flat glass on the top section and 6" x 3" minimum convex mirror on the bottom section.

2.6.2.2 Inside Mirrors

A mirror shall be provided for the driver to observe passengers movements. One 4"x 16" flat mirror shall be supplied. With a full standee load, including standees in the vestibule, the driver shall be able to observe passengers anywhere in the aisle, and in the rear seats. Inside mirror shall not be in the line of sight to the right outside mirror. Placement of mirrors to be determined after award.

2.6.2.3 Compliance Mirror Package - OPTION

Some or all of the buses ordered may be used to transport pre-school children to "Head Start" programs. To make this bus compliant with Federal regulations a more extensive mirror package needs to be installed. Contractor will furnish an installed option price for a complete inside and outside mirror package that, in addition to the requirements listed under 2.6.2.1 and 2.6.1.2, meets the requirements of 45CFR part 1310. (This statute basically calls for a school bus mirror package)

2.6.3 PASSENGER ASSISTS

2.6.3.1 General Requirements

Passenger assists in the form of full grip, vertical stanchions or handholds shall be provided for the safety of standees and for ingress/egress. Passenger assists shall be convenient in locations, shape, and size for both the 95th percentile male and the 5th percentile female standees. Starting from the entrance door and moving anywhere in the bus and out the exit door, a vertical assist shall be provided either as the vertical portion of seat back assist or as a separate item so that a 5th percentile female passenger may easily move from one assist to another using one hand and the other without losing support. Excluding those mounted

on the seats and doors, the assists shall be between 1-1/4 and 1-1/2 inches in diameter or width with radii no less than 1/4 inch. All passenger assists shall permit a full hand grip with no less than 1-1/2 inches of knuckle clearance around the assist.

Any joints in the assist structure shall be underneath supporting brackets and securely clamped to prevent passengers from moving or twisting the assists. All areas of the passenger assists that are handled by passengers including functional components used as passenger assists, shall be Type 312 or type 304 satin finish stainless steel or approved equal. Assists shall withstand a force of three hundred (300) pounds applied over a twelve (12") inch linear dimension in any direction normal to the assist without permanent visible deformation. Brackets, clamps, screw heads, and other fasteners used on the passenger assists shall be flush with the surface and free of rough edges. Number and lay-out location shall be approved after award.

2.6.3.2 Front Doorway

Front doors, or the entry way, shall be fitted with assists no less than 3/4 inch in width and shall provide at least one inch (1") of knuckle clearance between the assists and their mounting. Door assists shall be functionally continuous with the horizontal front passenger assist and the vertical assist on the front modesty panel.

2.6.3.3 Vestibule

The aisle side of the driver's barrier and the modesty panels shall be fitted with vertical passenger assists that are functionally continuous with the overhead assist and that extend to within thirty six (36") inches of the floor. These assists shall have sufficient clearance from the barrier to prevent inadvertent wedging of a passenger's arm. A horizontal passenger assist shall be located across the front of the bus and shall prevent passengers from sustaining injuries on the fare collection device or windshield in the event of a sudden deceleration. Without restricting the vestibule space, the assist shall provide support for a boarding passenger from the front door through the fare collection procedure. Passengers shall be able to lean against the assist for security while paying fares. The assist shall be no less than 36 inches above the floor or the average step tread surface. The assists at the front of the bus shall be arranged to permit a 5th percentile female passenger to easily reach from the door assist, to the front assist, to vertical assists on the driver's barrier or front modesty panel.

2.6.3.4 Overhead

Except forward of the front standee line and at the rear door, a continuous, full grip, overhead assist shall be provided. This assist shall be convenient to standees anywhere in the bus and shall be located over the center of the aisle seating position of the transverse seats. The assist shall be no less than seventy (70") inches above the floor. Overhead assists shall simultaneously support one hundred fifty (150) pounds on any twelve (12") inch length. No more than five (5%) percent of the full grip feature shall be lost due to assist supports.

2.6.3.5 Longitudinal Seats -RESERVED

2.6.3.6 Passenger Area

Vertical assists that are functionally continuous with the overhead assist shall be provided at the aisle side transverse seats located forward of the rear door. The vertical assists shall be staggered across the aisle. The location of these vertical assists shall be approved by BWATC after award.

2.6.4 EXTERIOR ROUTE DISPLAYS

2.6.4.1 Electronic Destination and Route Number Signs

Electronic destination signs shall include the following: automatic display, light emitting diode (LED) display, high visibility, completely electronic front destination/route sign and side route/run sign. Front sign to be pre-programmed for operation with a minimum capability of the list supplied after award. Characters displayed on the front sign shall be capable no less than five and one-half in height. The side route/run sign shall display the alpha-numerical characters listed. Successful proposer will be required to supply a complete set of all materials, software and equipment to reprogram, repair and diagnose the signs. Equipment and software must be delivered to the procuring agency prior to delivery of the first bus. The side sign must be slave to the front destination sign setting. All electronic signs are to have the same information that will be supplied to the manufacturer prior to the start of production.

The programming port for downloading program information to the sign shall be located adjacent to the drivers control box. No panels shall need to be opened to gain access to download port.

The sign boxes shall be sealed to prevent entry of dirt, dust, water and insects during normal operation or cleaning with a cyclone cleaner. The visibility and readability of the front and side destination signs shall not be degraded by continued exposure to sun-light, heat or cold. The interior of the sign boxes shall be painted gloss white. The Exterior trim surrounding the sign box windows shall be painted flat black in a manner consistent with bus design and approved by BWATC. Easy access shall be provided to clean the inside of the destination sign boxes. The list of required sign readings not exceeding 400 lines will be supplied after award. Complete specifications of the proposed sign shall be submitted with proposal.

2.6.4.2 Electronic Destination Sign Message Content

The messages shall be an abbreviated format based on the sign system ultimately selected. This will result in a message system which will display the route number and the vehicle destination.

The LED electronic destination sign shall be capable of displaying, at a minimum, all of the following:

Blank

Numbers (0 - 9)

Alphabet - upper and lower case (A - Z), ampersand, apostrophe, hyphen, dash, period, question mark, Diagonal slash (/), parenthesis, and exclamation point.

The sign shall be capable of displaying a constant "ON" single message or of flashing a multi-line destination message with a timed blackout to mark the end of the message.

The route number shall remain in a constant "ON" mode independent of the cycling of a multi-line destination message.

Single line destination messages shall remain in a constant "ON" mode. The length of display time of each line of a multi-line destination message is to be adjusted within limits to be agreed upon by BWATC and the sign manufacturer.

The message content will be supplied to the Vendor after award. (Will not Exceed 400 lines.)

2.6.4.3 Side Destination Signs

The side destination signs shall be of the same make and design, size excluded, and located as close to the front entry door as possible. The side destination sign shall be slave to the front sign.

2.6.5 FARE COLLECTION

Space as far forward as practicable and structural provisions shall be made for installation of currently available fare collection device(s). Location of the fare collection device shall not restrict traffic in the vestibule, including wheelchairs, and shall allow the driver to easily reach the coin drop levers and to view the change platform. The fare box shall not restrict access to the driver's area and shall not restrict operation of driver controls. Fare box location shall permit accessibility to the vault for easy manual removal. A 10-amp, 12-volt, DC protected circuit shall be available to power the fare box. This power service shall include a grounded lead with both wires enclosed in a flexible conduit. The floor under the fare box shall be reinforced, as necessary, to provide a sturdy mounting platform and to prevent shaking of the fare box. The fare box shall be a Diamond Model E-5, with spare vault, or approved equal. Lock numbers supplied after award.

2.6.5.1 – Electronic Registering Fare Box - OPTION

The Vendor will supply, as an option, a price for an electronic registering fare box with remote data pad, if needed. (I.E. GFI GENFARE Cents-a-bill). A price will also be supplied for ticket reader/issue machine and smart card reader.

The Vendor will also supply prices for ancillary equipment necessary to download and manipulate data from the fare box. (Vendor must assume that Property has no electronic registering fare boxes on site.)

2.6.5.2 - Modular Tally Counter - OPTION

The Vendor will supply an option price for an eight unit, 4 wide by 2 high, mechanical tally counter. The counter shall have four (4) figure counters and a common rotary reset for the entire row. Each unit shall be easily labeled using removable paper tabs. Lubrication of the unit shall not be required. (See www.tallycounterstore.com for an example.)

The tally counter shall be mounted convenient to the driver so they may easily use the counter without reaching. A locking swivel or fold away mount will be allowed.

2.7 ADVERTISING (RESERVED)

2.8 WHEELCHAIR LOADING

2.8.1 ACCOMMODATIONS

Space and body structural provisions shall be provided on a low floor para-transit bus to accommodate the wheelchair loading ramp or lift. The ramp or lift shall be installed at the front of the bus integral with the front entrance of the bus or accessed from an additional door.

2.8.2 LOADING SYSTEM

All buses equipped with a wheelchair ramp mounted in the front door shall provide ingress and egress quickly, safely, comfortably, and in a forward facing direction for a passenger in a wheelchair from the street level or curb.

The bus shall be prevented from moving during the loading or unloading cycle by a throttle and brake interlock system. The wheelchair loading system shall not present a hazard or inconvenience to any passenger. The wheelchair loading system shall be specifically designed to accommodate ambulatory passengers utilizing walkers and disabled passengers utilizing power wheelchairs which vary in width from 28-1/2 inches to 34 inches, and from 44 inches to 58 inches in depth. The system must have a total load capacity of 800 pounds which includes client, mobility device and driver. The device shall be inhibited from retracting or folding when a passenger is on the ramp. A passenger on the ramp shall be able to easily obtain support during the entire loading or unloading operating by grasping the passenger assist located on the doors or other assists provided for this purpose. The loading ramp shall extend no less than 18 inches outward of the bus with the transition from the sidewalk to the loading device not exceeding 1/2 inch and it shall be ramped to the extent practicable. The ramp shall be designed to protect the device from damage and persons on the sidewalk from injury during the extension phase of operation. The loading ramp shall be covered with a replaceable or renewable, nonskid material and shall be fitted with devices to prevent the wheelchair from rolling off the sides during loading or unloading. When the ramp is stowed, no hazard shall be presented to passengers between the ramp and the bottom edge of the floor and other parts of the ramp mechanism. A manual override system shall permit unloading a wheelchair and storing the device in the event of a primary power failure.

The wheelchair ramp shall be designed to function without failure or necessary adjustments in all weather conditions in the Greater Detroit metropolitan area as outlined in Section 1.6.5. The ramp system shall be constructed of corrosion resistant materials to provide protection for adverse weather and the heavy use of road salts in the winter. The installation of the ramp system shall incorporate the use of an under shielding and seal designed to provide protection from mud, snow, rain and salt spray. Front door ramps shall incorporate the design and installation of a reinforcement member to enhance the rigidity of the bus's front end which will be subjected to sustained impact and inertial loads due to street conditions and travel in BWATC service area throughout the expected life of the bus.

The installation of the ramp system shall not interfere with the entrance heating system used to melt ice and snow during the winter.

2.8.3 ELECTRICAL CONTROLS AND COMPONENTS

Circuit design shall allow for safe operation of the wheelchair ramp at all times. The physical configuration of the electrical control design shall be relay, or solid state, operating from the bus's 12 VDC power system. The control components shall be capable of operating for the service life of the bus. Controls shall have internal protection for spike voltage of 600 VDC negative and 200 VDC positive.

Functions and control panel shall be easily identified and shall meet BWATC's approval.

Indicator lights or lighted switches shall be incorporated into the control panel which will identify the condition of the master switch and power to the function control.

Function switches shall be a momentary type which will be maintained in the "ON" position by the driver and shall be spring loaded to the "OFF" position.

Logic shall be of the command feedback action position type. Loss of power shall not permit an unsafe condition to exist when power is restored.

All electrical components shall be heavy-duty designs. To the extent practicable, these components shall be designed to last the service life of the ramp or lift system and shall be replaceable in less than fifteen (15) minutes by a 3M mechanic. Sockets of plug-in components shall be weatherproof and polarized where required for proper function and the components shall be positively retained. Any manual reset breakers critical to the operation of the wheelchair ramp or lift shall have double electrical insulation, shall be waterproof, and shall meet specification requirements of SAE Recommended Practice J555 and 3878-Type SXL. Installation shall permit ease of replacement, i.e., without the removal of major components by use of quick disconnect plugs.

2.8.4 HYDRAULIC CONTROLS AND COMPONENTS (if equipped)

An electrical hydraulic pump assembly may be included as part of the assembly or a hydraulic power system may be supplied by the bus manufacturer at their option.

All hydraulic components and controls shall be industrially rated and said ratings shall exceed maximum system pressure.

If a key system is employed to activate an interlock, all buses must be keyed alike. A protective shield is required for underfloor wheelchair ramp mechanisms. All electrically operated hydraulic components shall operate on a nominal 12 VDC electrical power system. If the wheelchair ramp system is powered by the power steering system, then there shall be a quick disconnect from the power steering system which will allow the removal of the entire wheelchair ramp system and isolate the hydraulic power steering pump and lines. Quick disconnect fittings shall be Stratoflex 27303 or approved equal. Hydraulic noise levels shall not exceed 68 dBA at the driver's area during any phase of operation.

The wheelchair ramp hydraulic system shall demonstrate a mean time between repairs in excess of 50,000 miles. Hydraulic system service task shall be minimized and scheduled no more frequently than those of other major bus systems. All elements of the hydraulic system shall be easily accessible for service or unit replacement. Critical points in the hydraulic system shall be fitted with service ports so that portable diagnostic equipment may be connected or sensors for an off board diagnostic system permanently attached to monitor system operation. All lines shall be compatible with the hydraulic fluid and maximum pressures of the system. Flexible lines shall be minimized in quantity and length. Flexible lines shall be Stratoflex 246 or approved equal. Lines of the same size and with the same fittings as those of other piping systems of the bus, but not interchangeable, shall be tagged or marked for use on the lift hydraulic system only.

2.8.5 WHEELCHAIR RAMP DURABILITY TEST

2.8.5.1 General Requirements

A representative production wheelchair ramp or lift must have been tested in accordance with the requirements specified in Sections 2.8.5.2 through 2.8.5.7 and have meet or exceed the durability requirements referenced in California Highway Patrol Vehicle Code Title 13 Article 15. The test results shall be submitted with the other performance test requirements as required in Section 4.8.1.3 of these Technical Specifications.

2.8.5.2 Deployment Cycling

The ramp platform shall be deployed and stowed for 10,000 cycles. The ambient temperature for the first half of the cycles shall be at least +43 degrees C (+110 degrees F). The test may be continuous or separated into groups and may have nonoperating periods between cycles as specified in preceding subsection 2.8.5.2.

2.8.5.3 Low Temperature Operation

After five hours of exposure to a temperature not higher than -7C (-20 degrees F), the wheelchair ramp shall be operated through ten (10) cycles of deploying and stowing at the exposure temperature. Each cycle shall be separated by at least a thirty (30) minute cooling period at a temperature not higher than -7C (+20

degrees F).

2.8.5.4 Self-Damage

The controls shall be held in operating position for five (5) seconds after the ramp meets resistance to its travel under each control position with any limit switches de-activated. The test shall be performed twice at each position of deploy and stow.

2.8.5.6 Proof Load

With the ramp stationary at its deployed position, the platform shall be loaded with 1200 lbs. uniformly distributed around the center of the platform within an area not exceeding 24 x 24 inches.

2.8.5.7 Power and Equipment Failure

A power failure, chain, cable and a hydraulic hose break, shall be simulated. The ramp shall be easily deployed and stowed manually. The ramp shall not require any special tools to perform this test.

2.8.6 WHEELCHAIR RAMP SYSTEM SAFETY REQUIREMENTS

The wheelchair ramp system shall be designed to be fail-safe. Fail safe is here defined to mean that the wheelchair ramp system will revert to a state known to be safe when the equipment failure or other adverse conditions occur which prevent normal operation. The state known to be safe shall be in irretrievable command which interlocks bus brakes and accelerator during ramp operation.

2.8.6.1 Specific Safety Requirements

Wheelchair ramp controls shall have a provision to be interlocked with bus brakes and accelerator to prevent bus movement during ramp operation. The interlock circuits are contained in the bus power control wiring furnished by the bus manufacturer.

Wheelchair ramp controls shall be interlocked within door controls to provide a door "open" signal and to prevent door closure until the ramp has returned to the stowed or stop position. An electrical ground circuit shall be provided to the bus when the ramp is not fully stowed. This ground circuit will be utilized by the bus manufacturer to initiate the bus door and accelerator/brake interlock circuits.

Safety barriers on the sides of ramp shall prevent a wheelchair from rolling off the ramp during loading and unloading of a passenger even when the street side of the bus is five (5") inches higher than the curbside. The side barriers shall protrude a minimum of one (1") inch above the step tread surface when the ramp is in operation.

Safety barriers to prevent wheelchair from rolling off sides of the ramp shall not retract in the event of system or component failure, must be operable by a manual means and withstand a total force of 300 pounds parallel to the platform surface in the unloading direction.

A manual system must be capable of moving the wheelchair ramp from stow to deploy or deploy to stow. This manual method shall be capable of being operated by the driver. The ramp shall be in full view of the driver during these manual operations. Ramp shall not stow when a passenger is on the ramp. All grab rails shall be finished with black and yellow two (2") inch wide reflective striping.

A limit device shall be provided that stops the ramp at the street or curb, thereby preventing damage to the ramp or bus.

2.8.7 Kneeling

The bus shall be equipped with a system that lowers the front entrance to six inches above pavement height. The kneeling system shall be interlocked with the ramp system so the bus cannot be kneeled with the ramp deployed. The system shall provide a *fast fill* feature to bring the bus back to ride height after kneeling. An interlock shall be provided that will not allow the bus to move until the bus is back at ride height after kneeling.

2.9 CLIMATE CONTROL

2.9.1 HEATING SYSTEM - HOT WATER

The bus shall be heated with two separate hot water systems, a front heater and defroster and a cabin heater. Controls for both systems shall be located convenient to the driver and easily accessible.

2.9.1.1 FRONT HEATER AND DEFROSTER

The bus shall be equipped with a front heater and defroster that provides air to the windshield, driver's area and to the passenger compartment. Air can be recirculated or outside air may be utilized. The heater/defroster will have a minimum capacity of forty thousand (40,000) BTU and equipped with a centrifugal fan motor with a minimum of two fans (squirrel cages). Air output shall be no less than 500 CFM.

All coolant lines from the engine to the both heaters shall be 3/4 inch and 5/8 inch silicone hose. Any connections from the heaters to the piping shall be silicone hose, heater grade, located in accessible positions. A booster pump shall be installed on the main supply line to the heaters.

2.9.1.2 CABIN HEATER

The Cabin heater shall be capable of delivering hot air to the floor on both sides of the passenger compartment. It shall have a minimum capacity 45,000 BTU's. Cabin heater must be equipped with a centrifugal fan motors producing a minimum air flow of 400 CFM. The heater shall be floor mounted. Final location of cabin heater will be determined after award.

2.9.2 AIR CONDITIONING

Interior climate control system shall maintain the interior of the bus at a level suitable for all climatological conditions found in the continental United States. The heating, ventilating and cooling systems shall maintain 70 degree F with a relative humidity of 50 percent or less. The system shall maintain these conditions in ambient temperatures of 10° to 95°F with ambient humidities of 5 to 50 percent while the bus is running on the design operating profile with a full standee load of passengers. In ambient temperatures of 10° to -10°F, the interior temperature shall not fall below 55°F while the bus is running on the design operating profile with no passengers. The temperatures measured from a height of 6 inches below the ceiling shall be within + 5°F of the average temperature at the top surface of the seat cushions. Temperatures measured more than 3 inches above the floor shall be within + 10°F of the average temperature at the top surface of the seat cushions. The interior temperature, from front to rear of the bus, shall not vary more than + 5°F from the average.

The cooling mode shall be capable of reducing the passenger compartment temperature from 100° to 70°F in less than 30 minutes after engine startup under the following conditions. Engine speed shall be limited to fast idle that may be activated by a driver-controlled device. The bus shall be soaked in a heated environment for a minimum of one hour with the ambient temperature reaching 100°F and humidity less than 20 percent. There shall be no passengers onboard and the doors shall be closed. The cooling mode may operate independent of the propulsion system and outside air may be cut off during the cool down period.

The climate control system shall be highly reliable since most failures are Class 2. Service valves for routine charging a maintenance of the A/C system shall be attached to a point of ready access to the service technician. BWATC will evaluate the positions of the service valves and approve or deny the position during the prototype evaluation.

Heat shall be applied to the front step tread to prevent accumulation of snow, ice, or slush. Entrance area heat shall be supplied and controlled by the driver's heater and defroster system.

2.9.2.1 Compressor

The air conditioning compressor(s) shall have a full cycling clutch. Compressor will have service valves attached easily accessible to the mechanic at ground level.

All bidders must quote on supplying buses with R134A refrigerant.

Only designs or manufacturers of compressors will be considered if they incorporate the following:

- 1) 2 year, 100,000 mile warranty
- 2) Lower operating pressures
- 3) Less vibration

4) Reduction of operating/moving parts to less than 20

2.9.2.2 CONTROLS

All interior climate control system requirements shall be attained automatically. The driver shall control only the defroster, driver's heater and cabin heater. The interior climate control system shall switch automatically to the ventilating mode if the refrigerant compressor or condenser fan fails.

2.9.2.3 AIR FLOW

To insure sufficient heat distribution in local conditions of severe cold weather, the heat system shall include heating outlets and blowers incorporated into the system and spaced to provide distribution of air throughout the bus.

Proposers are requested to state the time required to completely change the air in the bus in the ventilating mode.

2.9.3.4 Passenger Area

The cooling mode of the interior climate control system shall introduce air into the bus at or near the ceiling height at a minimum rate of 25 cubic feet per minute per passenger based on the standard configuration bus with full standee load. This air shall be composed of no less than 20 percent outside air. Air flow shall be evenly distributed throughout the bus with air velocity not exceeding 60 feet per minute on any passenger. The ventilating mode shall provide outside air at a minimum flow rate of 20 cubic per minute per passenger. When operating in the ventilation mode, 100 percent of the air introduced into the bus shall be outside air.

Air flow may be reduced to 15 cubic feet per minute per passenger when operating in the heating mode with full standee load. Heated air introduced into the bus shall contain no less than 20 percent outside air. The fans shall not activate until the heating element has warmed sufficiently to assure 70°F air outlet temperature. Outside air flow may be cut off during initial warm-up, provided no manual manipulation is required.

2.9.3.5 Driver's Area

The bus interior climate control system shall deliver at least 100 cubic feet per minute of air to the driver's area when operating in the ventilating and cooling modes.

Adjustable nozzles shall permit variable distribution or shut down of the air flow. Air flow in the heating mode shall be reduced proportionally to the reduction of air flow into the passenger area. A separate heater or windshield defroster unit shall be capable of diverting heated air to the driver's feet and legs. The defroster or interior climate control system shall maintain visibility through the driver's side window.

2.9.3.6 Air Intakes

Outside openings for air intake shall be located to ensure cleanliness of air entering the climate control system, particularly with respect to exhaust emissions from the bus and adjacent traffic. All intake openings shall be baffled to prevent entry of snow, sleet or water.

Outside air shall be filtered before discharge into the passenger compartment. The filter shall meet the ASHRAE requirements for 5 percent or better atmospheric dust spot efficiency, 50 percent weight arrestance, and a minimum dust holding capacity of 120 gram per 1,000 cmf cell. More efficient air filtration may be provided to maintain efficient heater and/or evaporator operation. Air filters shall be cleanable and easily removable for service. Moisture drains from air intake openings shall be located so that they will not be subject to clogging from road dirt.

3.0 CHASSIS

This section, broadly titled "CHASSIS" details the requirements for primary and auxiliary (accessory) mechanical equipment of the transit bus.

3.1 POWER PLANT

3.1.1 VEHICLE PERFORMANCE

3.1.1.1 Power Requirements

Power plant and drive train shall provide power to enable the bus to meet the defined acceleration, top speed, and gradability requirements. Sufficient excess power shall be available to operate all accessories.

3.1.1.2 Top Speed

The bus shall be capable of a top speed of 70 mph (for emergency and passing maneuvers) on a straight, level road at 150 percent of the SLW with all accessories operating.

3.1.1.3 Gradability

Gradability requirements shall be met on grades with a surface friction coefficient of 0.3 and above at SLW with all accessories operating. The standard configuration power plan shall enable the bus to maintain a speed of 45 mph on a 2-1/2 percent grade and 7 mph on a sixteen (16%) percent grade.

3.1.1.4 Acceleration

Average acceleration rate of at least 0.06g shall be achieved at SLW between 0 and 15 mph. The bus shall obtain a speed of 40 mph in no more than 20.0 seconds. Acceleration measurement shall commence when the accelerator is depressed. The contractor shall provide horsepower, torque, acceleration and gradability curves with proposal.

3.1.1.5 Jerk

Jerk, the rate of change of acceleration, shall be minimized throughout the acceleration/deceleration range and shall be no greater than 0.3g/sec. This requirement shall be achieved regardless of driver's action.

3.1.1.6 Operating Range

The operating range of the bus shall be at least 250 miles on a fill up of CNG.

3.1.2 POWER PLANT MOUNTING AND ACCESSORIES

3.1.2.0 OPTION - Complete Power Module

Vendor will provide, as an option, a price on a complete power module, which may include, but not be limited to, a complete engine with accessories , transmission, drop boxes, axles, steering mechanisms or any other part necessary to the replacement of the complete power module.

Vendor will supply with the proposal a complete list of equipment that will be supplied with the power module option.

3.1.2.1 Mounting

All power plant mounting shall be mechanically isolated to minimize transfer of vibration to the body structure. The compartment shall be insulated and soundproofed to minimize the transmittance of engine noise and to provide for fire protection.

3.1.2.2 Service

The power plant shall be arranged so that accessibility for all routine maintenance is assured. No special tools, other than dollies and hoists, shall be required to remove the power plant. Two (2) 3M mechanics shall be able to remove, replace, and prepare the engine and transmission assembly for service in less than twenty (20) total combined man-hours. The muffler, exhaust system, air cleaner, air compressor, starter, alternator, radiator, all accessories, and any other components requiring service or replacement shall be easily removable and independent of the engine and transmission removal.

Engine oil and the radiator filler caps shall be readily accessible and require no special fittings or tools need to top up fluids. All fluid fill locations shall be properly labeled to help ensure correct fluid is added and all fillers shall be easily accessible with standard funnels, pour spouts and automatic dispensing equipment. The checking of engine oil, transmission oil and coolant levels shall be accomplished in a central location. All lubricant sumps shall be fitted with the magnetic type, external, hex head, drain plugs of a standard size.

The engine and transmission shall be equipped with sufficient heavy duty fuel and oil filters for efficient operation and to protect the engine and transmission between scheduled filter changes. The filters shall be of the spin on disposable type. All filters shall be easily accessible and the filter bases shall be plumbed to assure correct reinstallation. The transmission filter shall be of a high efficiency type with a five micron disposable element. Fuel and oil lines within the engine compartment shall be rigidly supported and shall be composed of steel tubing where practicable except in locations where flexible lines are specifically required. Flexible fluid lines shall be kept at a minimum and shall be as short as practicable. They shall be routed or shielded so that failure of a line shall not allow fuel or oil to spray or drain onto any component operable above the auto-ignition temperature of the substance. Flexible lines shall be Teflon with braided stainless steel jackets or approved equal, and shall have standard SAE or JIC brass or steel, reusable swivel, end fittings Stratoflex 246 or approved equal. Hoses shall be individually supported and shall not touch one another or any part of the bus.

3.1.2.3 Accessories

Engine driven accessories shall be unit mounted for quick removal and repair. Accessory drive systems shall operate without failure or unscheduled adjustment for 36,000 miles. These accessories shall be driven at speed sufficient to assure adequate system performance during extended periods of idle operation and low route speed.

3.1.2.4 Hydraulic Drive

Only power steering system may be driven hydraulically. The hydraulic system shall demonstrate a mean time between repairs in excess of 36,000 miles. Hydraulic system service tasks shall be minimized and scheduled no more frequently than those of other major bus systems. All elements of the hydraulic system shall be easily accessible for service of unit replacement. All lines shall be compatible with the hydraulic fluid and maximum pressures of the system. Flexible lines shall be minimized in quantity and length. Lines of the same size and with the same fittings as those on other piping systems of the bus, but not interchangeable, shall be tagged or marked for use on the hydraulic system only. Hydraulic lines shall be individually and rigidly supported to prevent chafing damage, fatigue failures, and tension strain on the lines and fittings. The hydraulic system shall be configured and/or shielded so that failure of any flexible line shall not allow hydraulic fluid to spray or drain onto any component operable above the auto-ignition temperature of the fluid. All elements of the hydraulic system shall meet the noise limits defined in these Technical Specifications.

3.1.3 ENGINE

The bus shall be equipped with a dedicated CNG engine meeting the requirements of these Technical Specifications. The engine shall produce a minimum of 300 horsepower at 4200 rpm and be equipped with the latest type pollution control equipment to provide for optimum fuel economy and minimum exhaust fumes. See Section 5.0 - CNG Requirements, for further descriptions of CNG engine requirements.

The engine shall operate current miles on the design operating profile without major failure or significant deterioration. Components of the CNG control system shall operate for 100,000 miles without replacement or major service.

The engine shall meet all requirements of these Technical Specifications when operating on CNG. Durability of the engine and its components shall not be seriously reduced in the requirement of Section 3.1.8.1 and shall be met by operation on any of the commercially available fuels.

The engine shall be equipped with a fast idle device which is driver controlled. The device shall activate only when the transmission is in "NEUTRAL". The engine starter shall be protected by an interlock that prevents its engagement when the engine is running.

3.1.3.1 OPTION - SPARE ENGINE

Vendor will supply with proposal a price on one (1) complete engine assembly, less accessories.

3.1.4 AUTOMATIC ENGINE SHUT DOWN

The engine shall automatically shut down by any of three (3) fault indications; high engine coolant temperature, low engine oil pressure and high transmission fluid temperature. An override should be provided in order to move the bus short distances for safety reasons. Shut down system shall be approved by BWATC.

3.1.5 COOLING SYSTEM

Temperature of operating fluids on the bus shall be controlled by a cooling system(s). The cooling 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 of - 10°F to 115°F. The engine shall be cooled by a water based, pressure type, cooling system that does not permit boiling or coolant loss during the operations described above. Engine thermostats shall be fully opened at 195 ° and shall be easily accessible for replacement. All low points in the water based cooling system shall be equipped with drain cocks. Air vent valves shall be fitted at high points in the cooling system unless it can be demonstrated that the system is self-purging.

The radiator shall be of durable corrosion resistant construction. Radiator piping shall be stainless steel, aluminized steel or brass tubing. If practicable, rubber hoses shall be kept to a minimum. Necessary hoses shall be premium, silicone rubber type Stratoflex 4244 or approved equal. The hose shall be impervious to all bus fluids. All hoses shall be secured with premium, stainless steel, temperature compensating, tension adjusting, inside sleeve, wide band type clamps with a collared screwdriver head, Breeze Corporation or approved equal. No heat producing components shall be mounted between the engine cooling air intake aperture and the radiator. A hot engine warning system shall be included and located where maximum engine protection is provided.

3.1.6 TRANSMISSION

The transmission shall be automatic transmission. A 3M mechanic, with optional assistance shall be able to remove, and replace the transmission assembly for service in less than twelve (12) total combined man- hours. The transmission supplied shall be the electronically controlled type and shall be equipped with built-in transmission diagnostic test features. One (1) set of diagnostic software shall be supplied as a part of this contract in order to facilitate the trouble shooting of the new transmission. The transmission shall operate for 100,000 miles without repairs.

The transmission oil cooler shall be constructed to permit easy cleaning or replacement. A hydraulic oil overheat/fluid level sensor shall be provided when transmission fluid exceeds permissible operating temperature or goes above or below permissible fluid levels.

Type

Automatic transmission shall be provided with hydraulic converter start and constant mesh planetary gearing. The heat exchanger shall be of maximum size providing the most amount of cooling for the transmission. Remote mounted coolers to maintain the desired transmission fluid temperature shall be allowed.

Drain Plug

A drain plug of magnetic type or a flat magnet attached to bottom of oil pan near drain opening shall be furnished.

Drive Shaft

The drive shaft shall be heavy duty with needle bearing universal joints between the transmission and axle assembly. The shaft shall be guarded to prevent contact with the ground, fuel/brake lines or injury to passengers in case of breakage. A slip joint is to be included for compensation of vertical movement of rear axle. Provisions shall be incorporated to provide routine lubrication to all bearings and slip joints.

3.1.6.1 OPTION - SPARE TRANSMISSION

Vendor will supply with its proposal a price on one (1) spare transmission of the same make and model as proposed for vehicle.

3.1.7 STARTER

The starting motor shall be a reduction gear style or approved equal.

3.1.8 EMISSIONS

3.1.8.1 Gas and Smoke

The bus shall meet all applicable emission standards.

3.1.8.2 Exhaust Location

Exhaust gases and waste heat shall be discharged on the left rear (road side) area of the bus.

3.1.8.3 Exterior Noise

Airborne noise generated by the bus and measured from either side shall not exceed 75 dBA under full power acceleration when operated at or below 35 mph at curb weight and just prior to transmission upshift. The maximum noise level generated by the bus pulling away from a stop at full power shall not exceed 75 dBA when measured on both the curb and street sides. The bus generated noise at curb idle shall not exceed 65 dBA. If the noise contains an audible discrete frequency, a penalty of 5 dBA shall be added to the sound level measured. All noise readings shall be taken fifty (50') feet from, and perpendicular to the centerline of the bus with all accessories operating. Instrumentation, test sites, and other general requirements shall be in accordance with SAE Standard J366. The pull away test shall begin with the front bumper even with the microphone. The curb idle test shall be conducted with the rear bumper even with the microphone. The contractor shall provide certificates of the tests.

3.2 AXLES

3.2.1 FRONT AXLE

The front axle shall have a load rating sufficient for the bus loaded to GVWR. Wheel hubs shall be carried on two opposed tapered roller bearings. Adjustable stop screws at each axle center end shall be provided to adjust bus maximum turn angle and prevent interference with adjacent parts. Front axle wheel bearings shall be lubricated with grease. Wheel seals shall be Stemco or approved equal.

3.2.2 REAR AXLE

The rear axle shall be a single full floating, heavy duty axle with an orlikon bevel drive. The rear axle shall be the driving axle and shall be separable carrier housing construction with a load rating sufficient for the bus loaded to GVWR. Axle housing shall be provided with a standard size external hex head magnetic type drain plug.

The differential assembly, drive pinion and pinion bearing cage shall be mounted in a differential carrier which can be removed as a complete unit from the axle housing.

The inner wheel bearing oil seal and pinion oil seal shall be mounted on replaceable oil seal wiper sleeves. Wheel seals shall be Stemco or approved equal. The rear axle wheel bearings shall be lubricated with

differential lubricant.

The inner wheel bearing oil seal and pinion oil seal shall be mounted on replaceable oil seal wiper sleeves. The rear axle wheel bearings shall be lubricated with differential lubricant.

The rear axle ratio for the bus shall be the manufacturer's standard for the service area and duty environment of the Greater Detroit area and should be designed to ensure proper performance, economy and durability.

Transfer of gear noise to the bus interior shall be minimized. The driven axle shall operate for 250,000 miles or 5 years whichever comes first without repairs.

3.3 SUSPENSION

3.3.1 GENERAL REQUIREMENTS

An air suspension system is required with controls to compensate automatically for load variations. The air suspension generally consists of suspension support beams, air springs (bellows), leveling valves, height control valves, radius rods and assemblies, shock absorbers and axle stops. The basic suspension system shall last the life of the bus without major overhaul or replacement. Consumable items such as bushings and air springs shall be easily and quickly replaceable by a 3M mechanic. Adjustment points shall be minimized and shall not be subject to a loss of adjustment in service. Necessary adjustments shall be easily accomplished without removing or disconnecting the components.

The suspension system shall permit a minimum wheel travel of 3.5 inches in jounce and three (3") inches in rebound. Elastomeric bumpers shall be provided at the limit of jounce travel. Rebound travel shall be limited hydraulically by the shock absorbers.

Suspension system shall incorporate appropriate devices for automatic height and leveling control so that regardless of load the bus height relative to the centerline of the wheels does not change more than 2-1/2 inches at any point from the height required in Section 2.1.5.1.

3.3.2 AIR SPRINGS AND SHOCK ABSORBERS

3.3.2.1 Air Springs

Air springs shall be rolling lobe type air bellows, Goodyear or approved equal, minimum two (2) front and two (2) rear. The air springs shall act as the vertical flexible connection between the axles and body to minimize road shocks. Special cold weather air bellows are acceptable.

3.3.2.2 Shock Absorbers

Shock absorbers shall be telescoping double acting hydraulic type, one on each side of the front and rear of the bus to the suspension arms or axles and attached to an appropriate location on the chassis. The shock

absorbers are to dampen the road shocks and to provide a smooth ride and shall be sufficient to control bus motion to four (4) cycles. Shock absorbers shall be Monroe or approved equal and shall be replaceable by a 2M mechanic in less than fifteen (15) minutes.

3.3.2.3 Lubrication

All elements of steering, suspension and drive systems requiring scheduled lubrication shall be provided with grease fittings conforming to SAE Standard J534. These fittings shall be located for ease of inspection and shall be accessible with a standard grease gun without flexible hose end from a pit or with the bus on a hoist. Each element requiring lubrication shall have its own grease fitting with a relief path. Lubricant specified shall be standard for all elements on the bus serviced by standard fittings.

3.3.3 NON AIR SUSPENSIONS

Non air suspensions may be proposed. Complete description of suspension system must be provided with proposal.

3.4 STEERING

3.4.1 STRENGTH

Fatigue life of all steering components shall exceed 250,000 miles. No element of the steering system shall fail when one of the tires strikes a severe road hazard. Inadvertent alterations of steering as a result of striking road hazards are steering failures.

Wear parts such as ball joints, tie rod ends, idler and pitman arms shall have a minimum life of 50,000 miles before requiring replacement.

Any component failing under this section of the specification will be considered a fleet defect and will be remedied on all vehicles purchased at the vehicle manufacturer's expense.

3.4.2 TURNING RADIUS

Outside body corner turning radius for a standard less than thirty (30) foot bus foot bus at SLW shall not exceed thirty eight (38) feet.

3.4.3 TURNING EFFORT

The steering wheel shall be no less than 18 inches in diameter and shall be shaped for firm grip with comfort for long periods of time. The steering wheel shall be "tilt" type and shall be removable with a standard or universal puller.

Hydraulically assisted power steering shall be provided. The steering gear shall be an integral type with flexible lines eliminated or the number and length minimized. Steering unit torque shall be so designed

that the bus can be easily steered by the operator. Power steering failure shall not result in loss of steering control. Perceived free play in the steering system shall not materially increase as a result of power assist failure. Gearing shall require no more than five (5) turns of the steering wheel lock to lock. 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 dismounting parts.

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

Power steering pump shall be an engine driven hydraulic pump.

3.5 BRAKES

3.5.1 SERVICE BRAKE

3.5.1.1 General

Braking shall be applied hydraulically by four (4) wheel disc/caliper brakes. Force to activate the brake pedal control shall be an essentially linear function of the bus deceleration rate and shall not exceed seventy (70) pounds at a point seven (7") inches above the heel point of the pedal to achieve maximum full service braking. Brakes shall be capable of stopping the vehicle from a speed of 20 mph with a seated load weight (SLW) at a rate of deceleration equivalent to a stop within twenty two (22') feet. The entire brake system, excluding friction material and discs, shall have an overhaul or replacement life design goal of at least 100,000 miles and a required life of the friction material and discs of at least 40,000 miles. The brake system shall comply with FMVSS 121, the latest requirements in effect as of the date of start of bus manufacture. Brake shall not "squeal" excessively in bus operation. All four (4) brakes shall be applied proportioned simultaneously and will not, by design, pull the bus to the right or left of the centerline of travel.

3.5.1.2 Friction Materials

Brakes shall be of two (2) pad, caliper mounted non-asbestos design to assure uniform pressure and so constructed as to last the design life as indicated in Section 3.5.1.1 and should be sufficiently sized to achieve the performance requirements set for in Section 3.5.1.1.

3.5.1.3 Hubs

Wheel bearing seals shall run on replaceable wear surfaces. Wheel bearing and hub seals shall not leak or weep lubricant for 100,000 miles when running on the design operating profile.

3.5.2 AIR SYSTEM

3.5.2.1 Air Compressor (If equipped)

The bus air system shall operate all accessories and the suspension system with reserve capacity. The air compressor shall be sized to charge the air system from 40 PSI to the governor cutoff pressure in less than three (3) minutes. Air for the compressor shall be filtered through the main engine air cleaner system.

3.5.2.2 Air Governor

Air pressure to be governed between 120 psi and 135 psi.

3.5.2.3 Air Lines

All lines subject to temperatures over 200 degrees F shall, conform to the installation and material requirements of SAE Standard J844-Type 1 for copper tubing with standard, brass, flared or ball sleeve fittings.

All other lines may use SAE Standard J844 type 3B nylon tubing if not subject to temperatures over 200°F. Accessory and other non-critical lines may use type 3A tubing. Nylon tubing shall be installed in accordance with the following color-coding standards:

Green - indicates primary brakes and supply

Red - indicates secondary brakes

Brown - indicates parking brake

Yellow - indicates compressor governor signal

Grey - indicates accelerator

Black - indicates accessories

Blue - indicates suspension

Line supports shall prevent movement, flexing, tension strain, and vibration. Copper lines shall be supported by looms to prevent the lines from touching one another or any component of the bus. To the extent practicable and before installation, the lines shall be pre-bent on a fixture that prevents the flattening or excessive local strain. Copper lines shall be bent only once at any point, including prebending and installation. Rigid lines shall be supported at four (4') foot intervals. Nylon lines may be grouped and shall be continuously supported.

The compressor discharge line shall be flexible Stratoflex 246 or approved equal Teflon hose with a

braided stainless steel jacket. End fittings shall be standard SAE steel, flanged, reusable, swivel type fittings. Flexible hoses shall be as short as practicable and individually supported. They shall not touch one another or any part of the bus except for the supporting grommets. Flexible lines shall be supported at two (2') foot intervals or less. Air lines shall be cleaned and blown out before installation and shall be installed to minimize air leaks. New buses shall not leak down more than 6 psi as indicated on the instrument panel mounted air gauges within fifteen (15) minutes from the point of governor cut off.

All air lines shall be sloped toward a reservoir and routed to prevent water traps. Grommets shall protect the air lines at all points where they pass through understructure components.

One (1) quick disconnect fittings shall be provided at the front of the bus. The connection shall include a manual "shut-off" petcock valve, and be piped to main air tank with a minimum 3/8" I.D. line.

3.5.2.4 Air Dryer - OPTION

Shall be a **Bendix AD-SP** or approved equal. Dryer shall be equipped with sump heater of sufficient wattage for the Metro-Detroit area climate conditions. Unit should be self-contained with no additional reservoirs required. Descant cartridge must be spin on type. Mounting to be easily accessible for cartridge changing.

3.5.2.5 Air Reservoirs

All air reservoirs shall meet the requirements of SAE Standard J110b and SAE Standard J813 and shall be equipped with clean out plugs, manual drain valves, and automatic moisture ejectors. These valves and any automatic moisture ejector valves shall be protected from road hazards by major structural members.

Reservoirs shall be sloped toward the drain valve. The air system shall have pressure relief valves set at 150 psi and shall be equipped with check valves and pressure protection valves to assure operation of individual subsystems in case of line failure.

3.5.2.6 Air Gauge

One (1) air pressure gauge shall be installed to indicate air pressure in the system. Air gauge shall have an indicator for minimum operating pressure.

3.5.3 PARKING BRAKE

A parking brake which meets the requirements of FMVSS 121 shall be provided. When set, the brake shall hold the bus, at curb weight, on a five (5%) grade.

3.6 WHEELS AND TIRES

3.6.1 WHEELS

Wheels are to be correct to accommodate tire size 225/75R 16.5 or approved equal and to insure proper cooling and air circulation between the brakes and wheel to reduce brake overheating and eliminate the possibility of tire failure due to overheated tire bead.

Wheels shall be Motor Wheel (or approved equal), single front and dual rear and of same offset for interchangeability with the current fleet.

Wheel color to be brilliant white.

3.6.1.1 ALUMINUM WHEELS (OPTION)

An option proposal for polished aluminum wheels is requested. Information on proposed wheels shall be submitted with proposal.

3.6.2 TIRES

Tires are to be Goodyear Model G949 AP in 225/750Rx16.5 size or approved equal. Provide one (1) spare wheel and tire assembly with each bus.

3.7 FUEL SYSTEM

See Section 5.0 - CNG Requirements

3.8 BUMPER SYSTEM

3.8.1 Location

Bumpers shall provide impact protection for the front and rear of the bus up to twenty six (26") inches above the ground. The bumpers shall wrap around the bus to the extent practicable without exceeding allowable bus width.

3.8.2 Front Bumper

No part of the bus, including the bumper, shall be damaged as a result of a 5 mph impact of the bus at curb weight with a fixed, flat barrier perpendicular to the bus's longitudinal centerline. The bumper shall protect the bus from damage as a result of 6.5 mph impacts at any point by the striker defined in FMVSS #215 loaded to 4,000 pounds parallel to the longitudinal centerline of the bus and 5.5 mph impacts into the corners at a thirty (30°) degree angle to the longitudinal centerline of the bus. The energy absorption system of the bumper shall be independent of every power system of the bus and shall not require service or maintenance in normal operation during the service life of the bus.

3.8.3 Rear Bumper

The rear bumper and its mounting shall provide impact protection to the bus at curb weight from a 2 mph impact with fixed, flat barrier perpendicular to the longitudinal centerline of the bus. When using a yard tug with a smooth, flat plate bumper 2 feet wide contacting the horizontal centerline of the rear bumper, the bumper shall provide protection at speeds up to 5 mph, over pavement discontinuities up to 1 inch high, and at accelerations up to 2 mph/sec. The rear bumper shall protect the bus, when impacted anywhere along its width by the striker defined in FMVSS #215 loaded to 4,000 pounds, at 4 mph parallel to, or up to a 30 degree angle to, the longitudinal centerline of the bus. The rear bumper or bumper extensions shall be shaped to preclude unauthorized riders standing on the bumper and shall wrap around the bus to protect the engine compartment doors and radiator. The bumper extensions shall not hinder service and shall be flared into the bus body with no protrusion or sharp edges.

The bumper shall be independent of all power systems of the bus and shall not require service of maintenance in normal operating during the service life of the bus. Any flexible portion of the bumper may increase the overall bus length specified in Section 1.5.1.1 by no more than 6 inches. The bumper shall be a Romeo-Rim, Inc. "Help-S" energy absorbing bumper or approved equal.

3.8.4 Bumper Material

Bumper material shall be corrosion resistant. Visible surface shall be color coordinated with the bus exterior. These qualities shall be sustained throughout the service life of the bus.

3.9 ELECTRICAL SYSTEM

3.9.1 General Requirements

The electrical system shall provide and distribute power to ensure satisfactory performance of all electrical components. The system shall supply a nominal 12 volts of direct current and up to 220 amps. All electrical power requirements shall be in compliance with the 12VDC power supply. 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 low idle. All circuits, except for those involved in engine start up, shall be protected by circuit breakers.

Redundant grounds shall be used for all electrical equipment, except where it can be demonstrated that redundant grounds are not feasible or practical. One ground may be the bus body and framing. Grounds shall not be carried through hinges, bolted joints (except those specifically designed as electrical connectors) or power plant mountings.

Electrical equipment shall not be located in an environment that will reduce the performance or shorten the life of the component or electrical system. Major wiring harnesses shall not be located under the bus floor, and underfloor wiring shall be eliminated to the extent practicable. Wiring and electrical equipment

necessarily located under the bus shall be insulated from water, heat, corrosion and mechanical damage. All relays, diodes and circuit breakers shall have plug in type and shall require BWATC's approval.

3.9.2 Modular Design

Design of the electrical system shall be modular so that each major component, apparatus panel, or wiring bundle is easily separable with standard hand tools or by means of connectors. Each module, except the main body wiring harness, shall be removable and replaceable in less than thirty (30) minutes by a 3M mechanic. Power plant wiring shall be an independent wiring module. Replacement of the engine compartment wiring module(s) shall not require pulling wires through any bulkhead or removing any terminals from the wires. Destination signs wiring shall be an independent circuit.

3.9.3 Wiring and Terminals

All wiring between major electrical components and terminations, except battery wiring, shall have double electrical insulation, shall be waterproof, and shall meet specification requirements of SAE Recommended Practice J5545, and J878, Type SXL. Except as interrupted by the master battery disconnect switch, battery and starter wiring shall be continuous cables with connections secured by bolted terminals and shall conform to specification requirements of SAE Standard J1127 Type SGT or SGX and SAE Recommended Practice J541. All wiring shall be properly grouped, numbered, and color coded full length. Installation shall permit ease of replacement. Wiring harnesses shall not contain wires of different voltages unless all wires within the harness are sized to carry the current and insulated from the highest voltage wire in the harness. Double insulation shall be maintained as close to the terminals as practicable. The requirement for double insulation shall be met by wrapping harnesses with non-conductive, rigid or flexible conduit. Grommets or cushions of elastomeric material shall be provided at points where wiring penetrates metal structure. Wiring supports shall be non-conductive. Wiring design shall incorporate all necessary precautions to avoid damage to wiring from heat, water solvents, or chafing during bus operation. Wiring length shall allow replacement of end terminals twice without pulling, stretching, or replacing the wire. Except for those on large wires such as battery cables, terminals shall be crimped to the wiring and may be soldered only if the wire is not stiffened above the terminal and no flux residue remains on the terminal. Terminals shall be full ring type or interlocking and corrosion resistant. Weatherpac or approved equal fittings shall be used at all locations for connections of harnesses where feasible.

3.9.4 Junction Boxes

All relays, controllers, flashers, automatic resetting circuit breakers, and other electrical components should be mounted in easily accessible locations. The components and circuits in each location shall be identified and their identifications recorded on a schematic drawing which shall be permanently glued to or printed on the side of the location cover or door and a printed booklet shall be provided to BWATC at the time of delivery. The drawings shall be protected from oil, grease, fuel and abrasion.

3.9.5 Multiplexed systems

Multiplexed systems may be proposed. Full documentation describing the system shall be supplied with

proposal.

3.10 ELECTRICAL COMPONENTS

3.10.1 General Requirements

All electrical components, including switches, relays, flasher, diodes and circuit breakers, shall be heavy duty designs and shall be replaceable in less than five (5) minutes by a 3M mechanic.

3.10.2 Batteries

Batteries shall be easily accessible for inspection and serviceable only from outside the bus and shall be securely mounted on trays. Batteries shall be of premium construction and marked with the date of manufacture and in service date code. The batteries shall be fitted with corrosion resistant, threaded type stud terminals. The battery terminals and cables shall be arranged to prevent incorrect installation. Battery terminals shall be located for access in less than thirty (30) seconds with jumper cables. No less than two (2) Group 31, 900 AMP Hour maintenance free deep cycle batteries or approved equal shall be supplied and installed. Reverse current protection shall be incorporated in the battery package design. Reserve capacity (minutes) at 25 amps, 10.5 volts at 80°F shall be no less than 150 minute amps. Amps for load test shall be no less than 275 amps per battery. The battery tray shall pull out or swing out easily and properly support the batteries during service, inspection, and replacement. A positive lock shall retain the battery tray in the normal position. Battery cables shall be flexible and sufficiently long to reach the batteries in extended positions without stretching or pulling on any connection and shall not lie on top of the batteries. The battery terminals and cable shall be color coded with red for the primary positive, black for negative, and another color for any intermediate voltage cables. The battery cables shall have shrunk-in-place insulation.

3.10.3 Master Battery Switch -RESERVED

3.10.4 Voltage and Current Regulator

A solid state voltage regulator shall be installed. The voltage regulator shall be constructed of materials and installed in a manner to minimize the adverse effects of temperature extremes in the BWATC service area (See Section 1.6.5). Regulator shall be designed to provide for battery charging current at low engine idle speed.

3.10.5 Fire Detectors - RESERVED

3.10.6 Electrical Motors

Motors shall be balanced with fan assemblies and shall be nominal 12 VDC.

3.10.7 Radio Noise Suppression

Proper suppression equipment shall be provided in the electrical system to eliminate interference with radios and television transmission and reception. This equipment shall not cause interference with any electronic system on the bus.

3.12 RADIOS

Provision shall be made for two-way radio antenna installation. There shall be an access door or cover provided directly under the antenna junction. There shall be a conduit provided for the feed line from the antenna junction to the radio location. The total feed line length from the antenna junction to the radio location shall not exceed twenty (20') feet. A ground plane plate shall be installed at the antenna location.

Provision shall be made so the radios contain their own fuses and/or circuit breakers. The power to the radios shall be filtered so that there is no noticeable electrical noise caused by the operation of the vehicle charging system, lighting, or any other vehicle electrical system.

All mountings and locations are to be approved by the Commission.

A minimum warranty of one year shall apply to all radio components and mountings.

3.12.1 OPTION - SPARE TWO WAY RADIO- RESERVED

3.12.2 OPTION - AM/FM/CD Radio

The Vendor shall furnish, as an option, a premium quality AM/FM /CD radio convenient to the driver as an integral part of the PA system (see Section 2.6.1.5). Radio should have sufficient power to supply all four PA speakers with clear, undistorted sound through the entire volume range. Please submit proposed make and model with proposal.

Antenna for the AM/FM radio shall be hidden as much as is practical to preclude damage from automatic bus washers and low tree branches.

3.13 BIKE RACK

Each bus shall be equipped with a bike rack securely mounted to the front of the bus. Rack to be a Sportworks NW, Inc. Model DL2, STAINLESS STEEL, or approved equal. Complete specifications and customer list must be submitted if approved equal is requested.

3.1.3.1 OPTION - SPARE BIKE RACK

Vendor will supply with proposal a price for one (1) spare bike rack with all necessary mounts and brackets.

4.0 QUALITY ASSURANCE REQUIREMENTS

4.1 QUALITY ASSURANCE ORGANIZATION

The contractor shall have an effective in-plant quality assurance organization. It shall be a specifically defined organization and should be directly responsible to the contractor's chief executive.

4.1.1 Control

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

4.1.2 Authority and Responsibility

The quality assurance organization shall have the authority and responsibility for reliability, quality control, inspection planning, establishment of the quality control system, and acceptance/rejection of materials and manufactured articles in the production of the transit buses.

4.2 QUALITY ASSURANCE ORGANIZATION FUNCTIONS

4.2.1 Work Instructions

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

4.2.2 Records Maintenance

The quality assurance organization shall maintain and use records and data essential to the effective operation of its program. These records and data shall be available for review by the Resident Inspectors. Inspection and test records for this procurement shall be available for a minimum of one (1) year after inspections and tests are completed.

4.2.3 Corrective Actions

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

4.3 STANDARDS AND FACILITIES

The following standards and facilities shall be basic in the quality assurance process.

4.3.1 Configuration Control

The contractor shall maintain drawings and other documentation that completely describe a qualified bus that meets all of the requirements of this specification. The quality assurance organization shall verify that each transit bus is manufactured in accordance with these controlled drawings and documentation.

The contractor shall provide BWATC a copy of the complete bus history log for each bus which accurately lists each serialized component and the correct corresponding serial number for each such component put on the delivered bus. The bus history log shall be a part of the bus when delivered.

4.3.2 Measuring and Testing Facilities

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

Performance testing required under Section 4.8.1.3 shall be conducted at an independent test center capable of conducting the said testing. The contractor shall indicate which test center shall conduct the performance testing.

4.3.3 Production Tooling as Media of Inspection

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

4.3.4 Equipment Use by Resident Inspectors

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

4.4 CONTROL OF PURCHASES

The contractor shall maintain quality control of purchases.

4.4.1 Supplier Control

The contractor shall require that each supplier maintains a quality control program for the services and supplies that it provides. The contractor's quality assurance organization shall inspect and test materials provided by suppliers for conformance to specification requirements. Materials that have been inspected, tested, and approved shall be identified as acceptable to the point of use in the manufacturing or assembly

processes. Controls shall be established to prevent inadvertent use of non-conforming materials.

4.4.2 Purchasing Data

The contractor shall verify that all applicable specification requirements are properly included or referenced in purchase orders of articles to be used on the proposed vehicles.

4.5 MANUFACTURING CONTROL

The contractor shall ensure that all basic production operations, as well as all other processing and fabricating, are performed under controlled conditions. Establishment of these controlled conditions shall be based on the documented work instructions, adequate production equipment, and special working environments if necessary. Bus construction and employees effecting this construction shall be of a quality to meet the highest standards recognized in the industry.

4.5.1 Completed Items

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

4.5.2 Non-conforming Materials

The quality assurance organization shall monitor the contractor's system for controlling non-conforming materials. The system shall include procedures for identification, segregation and disposition.

4.5.3 Statistical Techniques

Statistical analysis, tests, and other quality procedures may be used when appropriate in the quality assurance processes. All sampling shall be in accordance with MIL STD 105D "Sampling Procedures and Tables for Inspection by Attributes".

4.5.4 Inspection Status

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

4.6 INSPECTION SYSTEM

The quality assurance organization shall establish, maintain, and periodically audit a fully documented inspection system. The system shall prescribe inspection and test of materials, work in progress, and completed articles. As a minimum, it shall include the following controls.

4.6.1 Inspection Stations

Inspection stations shall be at the best locations to provide for the work content and characteristics to be inspected. Stations shall provide the facilities and equipment to inspect any and all components and assemblies for compliance with the design requirements.

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

4.6.2 Inspection Personnel

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

4.6.3 Inspection Records

Acceptance, rework, or rejection identification shall be attached to inspected articles. Articles that have been accepted as a result of approved materials review actions shall be identified. Articles that have been reworked to specified drawing configurations shall not require special identification. Articles rejected as unsuitable or scrap shall be plainly marked and controlled to prevent installation on the bus. Articles that become obsolete as a result of engineering changes or other actions shall be controlled to prevent unauthorized assembly or installation. Unusable articles shall be isolated and then scrapped.

Discrepancies noted by the contractor or resident inspector during assembly shall be entered by the inspection personnel or a resident inspector during assembly on a record that accompanies the major components, sub-assembly, 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 non-conformity 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 non-conforming materials, BWATC shall approve the modification, repair, or method of correction to the extent that the contract specifications are affected.

4.6.4 Quality Assurance Audits

The quality assurance organization shall establish and maintain a quality control audit program for BWATC buses being manufactured. Records of this program shall be subject to review by BWATC.

4.7 RESIDENT INSPECTOR

BWATC shall be represented at the contractor's plant by Resident Inspectors. They shall monitor, in the contractor's plant, the manufacture of vehicles built under this contract. The Resident Inspectors shall be

authorized to approve the pre-delivery Quality Assurance tests, and to release the buses for delivery. Upon request to the quality assurance supervisor, the Resident Inspectors shall have access to the contractor's quality assurance files related to this contract. These files shall include drawings, material standards, parts lists, inspection processing and reports, and records of defects.

No less than thirty (30) days prior to the beginning of bus manufacture, the Resident Inspectors shall meet with the contractor's quality assurance manager. They shall review the inspection procedures and checklists. The Resident Inspectors may begin monitoring bus construction activities two (2) weeks prior to the start of bus fabrication.

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, file cabinet, chairs, and clothing lockers sufficient to accommodate the Resident Inspector's staff.

The presence of these Resident Inspectors in the plant shall not relieve the contractor of its responsibility to meet all the requirements of this contract.

4.8 ACCEPTANCE TESTS

Fully documented tests shall be conducted on each production bus following manufacture to determine its acceptance to BWATC. These acceptance tests shall include pre-delivery inspections and testing by the contractor and BWATC inspectors. Additional pre-delivery inspections and testing will be conducted by BWATC after the buses have been delivered.

4.8.1 PRE-DELIVERY TESTS

The contractor shall conduct Quality Assurance at his plant on each bus following completion of manufacture and before delivery to BWATC. These pre-delivery tests shall include visual and measured inspection, as well as testing the total bus operation. The tests shall be conducted and documented in accordance with written test plans. Additional tests may be conducted at the contractor's discretion to ensure that the completed buses have attained the desired quality and have met the requirements of these technical specifications. This additional testing shall be recorded on appropriate test forms provided by the contractor.

The pre-delivery tests shall be scheduled and conducted with sufficient 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 made 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 a 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.

4.8.1.1 Engine Start-Up

The fuel system shall be pressure tested after installation of the engine into the vehicle and before it is started for the first time. The pressure test shall assure that the fuel system is free of leaks. Ether or other secondary starting aids shall not be used to initially start the engine during testing, or, during bus assembly. If leaks are discovered during the test procedure, corrective action shall be taken to the Procuring Agency's satisfaction and its approval.

4.8.1.2 Inspection - Visual and Measured

Visual and measured inspections shall be conducted with the bus in a static condition. The purpose of the inspection testing is to verify overall dimensional and weight requirements, to verify that required components are included and are ready for operation, and to verify that components and sub-systems that are designed to operate with the bus in a static condition do function as designed.

4.8.1.3 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 sub-system that can be operated only while the bus is in motion. Each bus shall be driven for a minimum of fifteen (15) miles during the road tests. Observed defects shall be recorded on the test forms. The bus shall be retested when defects are recorded and adjustments are made. This process shall continue until defects or required adjustments are no longer detected. Results shall be pass/fail for these bus operation tests.

4.8.1.4 Performance Testing

The first production prototype bus for BWATC under this contract shall be tested to determine whether or not the bus, as delivered, meets the BWATC Technical Specifications. The bus shall be tested to verify acceleration, deceleration, jerk limit, and gradability. The prototype bus will be placed into revenue service for a period of 60 calendar days to assure that the vehicle performs as specified. (See Section X.X.X of Part One Legal requirements for further requirements)

4.8.2 POST DELIVERY TESTS

After final acceptance and testing of the prototype vehicle, BWATC shall conduct acceptance tests on each additional delivered bus. These tests shall be completed within fifteen (15) days after bus delivery and shall be conducted in accordance with written test plans. The purposes of these tests is to identify defects that have become apparent between the time for bus release and delivery F.O.B. to BWATC. The post- delivery tests shall include visual inspection and bus operations. Buses that fail to pass the post-delivery tests are subject to non-acceptance.

4.8.2.1 Visual Inspection

The post-delivery inspections shall be conducted with the bus in a static condition. Any visual delivery damage shall be identified and recorded during the visual inspection of each bus. The defects detected during the static inspection shall be repaired by the contractor. Defects/damages occurring in the process of delivery shall be recorded and a copy submitted to BWATC.

4.8.2.2 Acceptance

BWATC shall evaluate total bus operation during road tests. The purpose of the road test is to observe and verify the operation of the bus as a system and to verify the functional operations of the various sub- systems that can be operated only while the bus is in motion. Each bus shall be driven for a minimum of fifteen (15) miles during the road test. Observed defects shall be recorded on test forms. This process shall continue until defects or required adjustments are no longer detected. When defects are no longer detected the bus shall be accepted.

Acceptance is revocable in accordance with UCC Articles 1 and 2 (R.C. Chapters 1301 and 1302) until such time as the accepted bus has been used in revenue service for a period of seventy five (75) revenue service days. Defects discovered after the seventh fifth (75th) day of revenue service shall be deemed warranty items.

Upon acceptance by BWATC, a Certificate of Acceptance shall be prepared and issued.

BWATC may withhold up to two (2%) percent of the total cost of each delivered and accepted bus to assure correction of infancy failures and fleet defects. The withheld funds shall be paid in full to the contractor within seventy-five (75) days of bus acceptance, unless specific defects are found in the bus or in the fleet. The defect(s) found shall be described and submitted in writing, including the relevant specification requirements, to the contractor when identified and within the seven five (75) day withholding period. The withheld funds shall be paid in full to contractor upon cure of such defects.

Acceptance as described in this Section 4.8.2.2 shall not be regarded as affecting or limiting the rights of BWATC under the Warranty Provisions of this Agreement.

4.9 QUALITY ASSURANCE REPORTS (ATTACHMENT 2)

4.9.1 Pre-Delivery Configuration Audit

The pre-delivery configuration audit will be conducted on the first bus. (The prototype bus)

4.9.2 Pre-Delivery Visual

Pre-delivery Visual and measured inspection and road test will be done on all buses.

4.9.3 Post Delivery

Visual inspection and road test, will be done on all buses.

All attached tests may be modified at the discretion of BWATC.

5.0 WARRANTY PROVISIONS

5.1 WARRANTY REQUIREMENTS

The Contractor is responsible for all warranty covered repair work and shall be the only point of contact for any warranty related issues and work. This includes all components and subsystems.

Warranties in this document are in addition to any statutory remedies or warranties imposed on the contractor. Consistent with this requirement the contractor warrants that it will comply with the general and specific terms and requirements of BWATC specifications with respect to providing BWATC with the buses specific subsystems, components and replacement parts of the quality, design, materials and construction specified in the Technical Specifications.

5.1.1 Complete Bus

The bus is warranted and guaranteed to be free from any defects for one (1) year or 50,000 miles, whichever comes first, beginning on the date of acceptance of each bus. During this warranty period, the bus shall maintain its structural and functional integrity. The warranty is based on regular operation of the bus under the operating conditions prevailing in the Greater Detroit Metropolitan Area. The contractor further warrants that it will cure any nonconforming deliveries according to Section 5.8 of the Warranty Provision.

5.1.2 Subsystems and Components

Specific subsystems and components are warranted and guaranteed to be free from defects and related defects for the mileages given in below:

SUB-SYSTEM AND COMPONENT WARRANTY WHICHEVER OCCURS FIRST

ITEM	YEARS	MILES
Engine	5	100,000
Transmission	5	100,000
Drive Axle	5	250,000
Brake System (excluding Friction Material)	2	100,000

Friction Material	1	40,000
Air Conditioning System (Includes, but not limited to, Compressor, Condenser and Evaporator)	2	100,000
Basic Body Structure	7	250,000
Suspension Components	2	100,000
Floors (excluding covering)	7	350,000
Wheelchair Ramp	2	100,000
CNG Tanks and Piping	18	500,000

The contractor shall warrant that any components, subsystems, etc., which are not accessible under Section 1.6.4.5 of the Technical Specifications shall carry with them an implied warranty and they are merchantable and reasonably fit for the general use intended and the same warranty exists where an examination, though available, would be fruitless as in the case of latent defects.

5.2 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 affect adversely its performance or reliability, except insofar as such repairs were in accordance with the contractor's maintenance manuals and the workmanship was in accordance with recognized standards of the industry.

5.3 Exceptions to Warranty

The warranty shall not apply to scheduled maintenance items, and items such as tires, nor to items furnished by BWATC, except insofar as such equipment may be damaged by the failure of a part or component for which the contractor is responsible.

5.4 Detection of Defects

If BWATC detects a defect within the warranty periods defined in Section 5.1.1 and 5.1.2 it shall promptly notify the contractor's representative. Within five (5) working days after receipt of notification, the contractor's representative shall either agree that the defect is in fact covered by warranty, or reserve judgment until the subsystem or component is inspected by the contractor's representative or is removed and examined at BWATC's property or at the contractor's plant. At that time the status of warranty coverage on the subsystem or component shall be mutually resolved between BWATC and the contractor.

Work necessary to effect the repairs defined in Section 5.8 shall commence within ten (10) working days after receipt of notification by the Contractor.

5.5 Scope of Warranty Repairs

When warranty repairs are required, BWATC and the contractor's representative shall agree within five (5) days after notification on the most appropriate course for the repairs and the exact scope of repairs to be performed under the warranty. If no agreement is obtained within the five (5) day period, BWATC reserves the right to commence the repairs in accordance with Section 5.9.

The contractor warrants that whenever any change is required to strengthen or correct a defect or efficiency of the buses, this correction would be made for all of the buses where said defect or deficiency exists at the contractor's expense.

5.6 FLEET DEFECTS

A fleet defect is defined as the failure of identical items covered by the warranty and occurring in the warranty period in a portion of the buses delivered under this contract. The proportion shall be twenty (20%) percent. The corrective action for a fleet defect shall be warranted for the unexpired warranty time remaining, or for one (1) year, whichever is greater. This extended warranty shall start when the defect is corrected on each bus, on a bus by bus basis.

5.6.1 Scope of Warranty Provisions

The contractor shall correct a fleet defect under the warranty provisions defined in Section 5.0 "Warranty Provisions" of these Technical Specifications.

After correcting the defect, the contractor shall promptly undertake and complete a work program reasonably designed to prevent the occurrence of the same defect in all other buses purchased under this contract. The work program shall include inspection and/or correction of the potential or defective parts in all buses.

5.6.2 Voiding of Warranty Provisions

The fleet defect provisions shall not apply to bus defects caused by noncompliance with the contractor's recommended normal maintenance practices and procedures.

5.6.3 Exceptions to Warranty Provisions

Fleet defect warranty provisions shall not apply to damage that is a result of normal wear and tear in service to such items as seats, floor covering, windows, interior trim and paint. The provisions shall not apply to BWATC supplied items such as fare boxes, radios, and tires.

5.7 REPAIR PERFORMANCE

The Contractor is responsible for all warranty covered repair work and shall be the only point of contact for any warranty related issues and work. This includes all components and subsystems.

BWATC shall require the contractor or its designated representative to perform warranty covered repairs that are clearly beyond the scope of its capabilities or if BWATC determines that the lack of parts, manpower, or test equipment prevents timely repair by BWATC. Other warranty work may be done by BWATC's personnel with reimbursement by the contractor.

5.8 REPAIRS BY CONTRACTOR

If BWATC requires the contractor to perform warranty covered repairs, the contractor's representative must begin work necessary to effect repairs within ten (10) working days after receiving notification of a defect from BWATC. BWATC shall make the bus available to complete repairs timely with the contractor repair schedule.

The contractor shall provide at its own expense all spare parts, tools, and space required to complete repairs. At BWATC's option, the contractor may be required to remove the bus from BWATC's property while repairs are being effected. If the bus is removed from the Authority's property, the contractor shall be responsible for the transportation costs and all repair procedures must be diligently pursued by the contractor's representative.

5.9 REPAIRS BY BWATC

5.9.1 Parts Used

If BWATC performs the warranty covered repairs, it shall correct or repair the defect and any related defects using contractor specified spare 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 warranty shall be submitted by BWATC to the contractor for reimbursement or replacement of parts. The contractor shall provide forms for these reports. Reimbursement for BWATC supplied parts shall be calculated from the OEM parts price list in effect at the time of the repair.

5.9.2 Contractor Supplied Parts

BWATC may request that the contractor supply new components or parts necessary for warranty covered repairs being performed by BWATC. These parts shall be shipped prepaid to BWATC from any source selected by the contractor within ten (10) working days of receipt of the request for said parts.

5.9.3 Defective Components Return

The contractor may request that parts covered by the warranty be returned to the manufacturing plant. The total cost for this action shall be paid by the contractor. Materials shall be returned in accordance with

contractor's instruction except that returns shall be to the contractor's plant, and not drop shipped to various suppliers.

5.9.4 Reimbursement for Labor

BWATC shall be reimbursed by the contractor for labor of repairs eligible under the warranty. The amount shall be eighty five (85.00) dollars per hour with a minimum cost escalator of two (2) percent per annum for the duration of the contract. Also, the cost of towing the bus shall be reimbursed if such action was necessary and if the bus was in the normal service area.

5.9.5 Reimbursement for Parts

BWATC shall be reimbursed by the contractor for defective parts and for parts that must be replaced to correct the defect. The reimbursement shall be calculated from OEM parts price list in effect at the time of repair and shall include taxes where applicable and fifteen (15%) percent handling costs.

6.0 SYSTEM SUPPORT SERVICES

6.1 GENERAL REQUIREMENTS

This Section establishes the requirements for contractor supplied services in support of the purchase of vehicles. These services shall be provided both prior to, during, and after delivery of vehicles to BWATC and BWATC. System support services includes, but is not limited to lesson plans and outlines, special studies to improve vehicle safety, reliability, general economy and BWATC maintenance procedures relating to the successful deployment of the acquired vehicles. This section outlines specific requirements for education/training, publications, field service engineering, spare parts and special tools and equipment for maintenance, fault diagnosis, and testing.

6.2 EDUCATION AND TRAINING

6.2.1 General

The contractor shall provide an educational program for BWATC and BWATC Training Instructors, Supervisory staff and maintenance personnel of a quality and depth sufficient to permit satisfactory deployment, use, servicing and maintenance of the vehicles furnished. The training program shall include formal and informal instruction with extensive use of models, mock ups, samples, manuals, diagrams, parts catalogs, schematics, wall charts and other training aids.

The contractor shall assume that BWATC has no knowledge of the features of the buses and shall design the education and training program to bring the level of knowledge to one fully adequate for the successful deployment, operation and maintenance of the buses. The contractor may assume that BWATC personnel have the basic skills pertinent to their crafts. The contractor's approach to this effort shall be based on the assumption that his own interests, immediate and long-term, are best served by a satisfactory program. All courses of instruction shall be presented in the English language.

6.3 PUBLICATIONS AND CATALOGS

6.3.1 General

The publications shall be furnished in both printed (loose leaf book) and digital (USB Drive or CDROM disk) form.

Proposers are encored to offer electronic or web based fully interactive parts and service manuals. Cross referencing parts and service manuals are highly recommended. They shall be designed for continuous, long term service except for a loose leaf feature which shall accommodate revisions to the manuals. All covers shall be heavy-duty, resistant to oil, moisture, and wear to a high degree commensurate with their uses. Diagrams and illustrations shall not be loose or in pockets. Line drawings are required in reduced size. All manuals and software shall be delivered no less than two (2) weeks after delivery of the prototype bus except as otherwise provided for herein. All manuals shall be delivered to the Maintenance Superintendent at BWATC, 2021 Lapeer Avenue, Port Huron, MI. 48060

6.3.2 Manual Organization

The bus shall be treated as a whole and not as a grouping of disassociated parts. The material in all manuals and the parts catalogs shall be similarly organized and indexed with a standard numbering system. The maintenance and service manuals shall be written in such a way as to represent a clear and adequate explanation and illustration of their respective subjects. The manuals shall conform to Air Transport Association Specification A-0100 to the maximum extent practicable.

6.3.3 Types of Manuals

6.3.3.1 Operators Manual shall contain all information needed for the operation of the vehicle. The manuals shall be bus specific. It shall include general vehicle familiarization material, locations, function, and operation of all controls, gauges, indicators and switches; emergency procedures; trouble symptoms and diagnostic methods; safety devices and precautions. Twenty five (25) manuals and two (2) CD ROM'S shall be provided.

6.3.3.2 Running Maintenance and Service Manual shall enable the maintainer to have with him, in convenient form, all information needed for on-bus running maintenance and adjustment, and on-line trouble diagnosis of each system including such data as troubleshooting guides and schematics for the bus and each of its systems including chassis OEM engine and chassis manuals. Four (4) manuals and two (2) CD ROM's shall be provided.

6.3.3.3 Heavy Repair Maintenance Manual shall contain a detailed analysis of each component of the bus so that maintainers can effectively and safely service, inspect, maintain, adjust, troubleshoot, repair, replace, and overhaul the bus. The manuals shall be bus specific and include OEM engine and chassis manuals. Four (4) manuals and two (2) CD ROM's shall be provided.

6.3.3.4 Parts Catalogs shall enumerate, describe, and illustrate every component with its related parts, including the OEM supplier's number, the contractor's number, the commercial equivalents and provisions for entry of BWATC part numbers. The illustrated parts catalog shall be bus specific. Cutaway and isometric exploded drawings shall be used to permit identification of all parts. Parts common to different components (i.e. bolts, nuts and washers) shall bear the contractors' part number. Each part or component shall be identified as being part of the next larger assembly. Parts Catalogs shall be delivered to BWATC not less than two (2) weeks after to delivery of the prototype vehicle. Two (2) parts catalogs and two (2) CD ROM's shall be provided.

6.3.3.5 Flat Rate Manual shall contain standard repair times for all vehicle components. Two (2) flat rate manuals and two CD ROMS shall be provided.

6.3.4 Changes and Revisions

Following the issue of each publication, the contractor shall provide revised pages covering any change, whether required by change of design or procedures or due to error, and the revisions shall be kept current for the life of the bus or BWATC's ownership. Manual and catalog revisions shall be supplied before or coincident with the arrival of altered parts or components.

6.4 FIELD SERVICE SUPPORT

6.4.1 General

The contractor shall have a competent engineering staff available to assist BWATC in the solution of engineering or design problems within the scope of these Technical Specifications that may arise during the expected service life of the vehicles.

6.4.2 Field Service Engineer

The contractor shall have competent technical personnel available to assist BWATC in any problem which BWATC might have on buses after delivery at no additional cost to BWATC. This does not relieve the contractor of responsibilities under the Warranty Provisions of Section 5.0 of these Technical Specifications. The contractor's field service engineer shall be capable of performing adjustments to each bus as required during the warranty period and providing technical support to BWATC during revenue service operations. Such personnel shall be available to perform these tasks within twenty four (24) hours after being requested to do so by BWATC at no additional cost to BWATC.

6.5 SPARE PARTS

6.5.1 General

The contractor shall guarantee the availability of replacement parts for the acquired buses for at least seven (7) years after the date of acceptance of the last bus delivered to BWATC. Spare parts shall be

interchangeable with the original equipment and shall be manufactured in accordance with the highest quality assurance practices in the industry. Spare parts shall be obtainable through commercial distribution channels to the maximum extent practicable minimizing captive sole-source distribution practices. Any parts the Vendor is not able to supply within three (3) calendar weeks of issuance of the purchase order because of shortage of stock, long lead times or any other reason shall release, upon request, to BWATC the OEM part number and any related drawings for the item or items so BWATC may procure the item or items through alternate sources or have it made.

Should the manufacturer of the vehicle change the model, type, specification or any other salient characteristic of any component supplied on vehicles ordered within the term of this contract and is not able to supply the original readily interchangeable part, the manufacture shall supply the new model part with all necessary supplies to effect the change at the cost of the originally equipped part.

6.5.2 Recommended Spare Parts List and Package

The Contractor shall prepare and submit to BWATC with its proposal a recommended spare and replacement parts list and a price for spare parts package. The spare and replacement parts list shall group parts by the subsystem of the vehicle system. The listing for each item shall give complete ordering and procurement information for that item. Long lead-time items shall be specifically noted. Each item listing shall contain at least the following information: item name, description, rating, price, manufacturer's name, part number, and drawing reference number. Items that are common to more than one (1) subsystem shall be suitably cross referenced. The contractor shall recommend the minimum essential quantity of spare parts required to perform normal routine maintenance and to maintain the operation of the fleet assuming standard failure rates of component units. The contractor shall state the expected failure rate of major components to the extent practicable.

6.5.3 Parts Ordering

OEM parts may be ordered directly through the vehicle manufacturer or its designated distributor. The manufacturer will supply contact information to effect parts orders as well as information with ordering through its distributor.

6.5.4 Electronic Parts Ordering

The Contractor shall make available an electronic parts ordering system where BWATC will have access to the Contractors ordering computer via internet. Software necessary to run this system shall be provided by the Contractor.

6.6 SPECIAL TOOLS AND EQUIPMENT

6.6.1 Recommended Tool List

The contractor shall prepare and submit to BWATC not less than six (6) weeks prior to the delivery of the

prototype vehicle, a recommended tool and equipment list. This listing will become a working document to be used by BWATC to plan for the deployment, servicing and maintenance of the acquired vehicles. The tool list shall identify those items of equipment necessary for the removal and re-installation of all units and component parts of the buses. Tools and equipment not available through normal commercial distribution channels shall be specifically noted.

6.6.2 Contractor Supplied Tools and Equipment

The contractor shall deliver to BWATC concurrent with delivery of the prototype vehicle the special tools and equipment specified herein:

Maintenance Tools. Specialized tools and items of a proprietary design not available from normal commercial distribution channels and identified as such in accordance with the specified requirements of Section 6.6.1 shall be supplied to BWATC in sufficient quantity to equip one (1) service garage and one major overhaul facility. See Section 1.6.4.7. One (1) set of equipment shall be supplied as a part of this contract.

Diagnostic Test Equipment. One (1) Set of diagnostic test equipment as specified in Section 3.1.6 shall be supplied by the Contractor as a part of this contract.

7.0 GRAPHICS

7.1 EXTERIOR COLORS AND FINISHES

7.1.1 General Requirements

All exterior colors and finishes shall conform to BWATC's vehicle identity program as herein specified. Each proposer shall submit to BWATC a scheme consistent with the outline drawing (Figure 1) with their proposal.

7.2 NUMBERING AND SIGNING

7.2.1 General Requirements

7.2.2 Exterior Lettering and Striping

A. All exterior lettering and BWATC logo shall be die cut non-reflective vinyl. Logo art work to be supplied upon award of contract.

B. Size, colors, shape and configuration of markings are to be fabricated in accordance with BWATC specifications for each item.

C. Markings to be screen printed shall be processed in accordance with the following instruction bulletins published by 3M company; D-XIB-1 A-2, DXIB-1 B-3, D-XIB 5-3, D-XIB 6-4.

(1) Oven drying (non-reflective markings)

Screen printing marking must be oven dried twice. Once after the final color and again after the clear coating in accordance with Instruction Bulletin D-XIB-1 A-2.

(2) Oven Drying (Reflective markings)

Screen printed markings must be oven dried between colors, after the final color and again after application of the clear coat in accordance with Instruction Bulletin D-XIB-1 B-3.

D. Preparation of substrates and application of marking shall be done by qualified personnel in strict accordance with Instruction Bulletin D-XIB-7-4, D-XIB-19, and D-XIB-20-1 published by 3M Company.

E. BWATC, or an authorized representative, shall have complete access to the application site for the purpose of inspecting procedures, techniques, materials and any other items related to the application of these markings.

F. Registration of all copy shall be equal to, or better than, acceptable commercial multicolor printing standards.

G. All cut edges shall be smooth and free of ragged areas.

H. Color, copy, type, style and logo type rendition shall be approved by BWATC prior to production.

I. The fabricator shall follow graphic standards defining the geometry and spacing of all letters and numbers.

J. See contract drawings for location, size and details of all exterior lettering and striping.

K. Interior signs and fleet number locations and size shall be in accordance with the drawings furnished by the Authority.

7.2.3 Interior Signs – adhesive backed vinyl

At a minimum, the following interior signs shall be provided. Additional signage may be required. Locations and sizes are indicated as reference only. Final locations and sizes will be determined during production.

Unless otherwise specified they shall be 2 mil polyester film Mylar Type 0 pressure sensitive adhesive decals. Dimensions specified are approximate.

1. NO SMOKING - 11" x 8.5". Combination blue letters on white background and in addition the standard symbol for nonsmoking, red and black on white background. One located on front destination sign box door. Two additional in passenger compartment per BWATC instructions.

2. WATCH YOUR STEP - 19" x 3". Black letters on yellow background. One located near entrance door step.

3. FIRE EXTINGUISHER (with directional arrow) - 5.5" x 1". White letters and arrow on red background. One located on door of front dash safety compartment panel.

4. PULL TO SIGNAL DRIVER TO STOP (lettering horizontal) - .6" x 1". Blue letters on white background. Six spaced along length of horizontal passenger signal cord/tape, adjacent to cord/tape, on each side of bus.

5. NOTICE TO OPEN EMERGENCY EXIT (with instructions) - 5" x 2". Combination white letters on blue background and blue letters on white background. One located adjacent to, or on emergency escape hatch.

6. EMERGENCY EXIT PULL (with directional arrow) - 2.5" x 2". White letters and arrow on blue background. One located adjacent to emergency escape hatch lever.

7. NOTICE TO OPEN EMERGENCY DOORS (with instructions) - 4.5" x 1.5". Combination white letters on blue background and blue letters on white background. One prominently located adjacent to emergency control at entrance door/exit door.

8. TO OPEN DOOR MANUALLY PULL VALVE (with directional arrow). 5" x 1". White letters and arrow on blue background. One located on driver control panel adjacent to door control valve.

9. DANGER HIGH VOLTAGE - 3" x 3". (For use with only high voltage lamps) Combination white letters on red background and black letters on white background. One located on inside of lens of each fluorescent light fixture and adjacent to light in front destination sign box.

10. 12 VOLT & 24 VOLT (For use only if bus provides combination 12 volt and 24 volt electrical system). 1" x 5". One to indicate main lead terminal in main electrical junction block for each voltage.

11. Bus Identification number shall be placed on front destination sign door. Numerals to be a minimum of three (3) inches in height. Color and final size to be determined after award.

7.2.4 Exterior Signs – adhesive backed vinyl

Exterior signs shall be provided as necessary for the proper operation of the bus and safety of the operating and maintenance personnel. They shall include, but not be limited to;

- a.) A sign at the CNG filling point indicating “CNG Only”
- b) A sign indicating CNG shut off vales at each accessible shutoff point
- c) CNG diamond on rear of bus
- d) Signs on curbside and roadside rear corners of bus stating “THIS VEHICLE RUNS ON CLEAN NATURAL GAS” (May be stacked)
- e) Sign at the radiator water filler pipe indicating warning to avoid injury from hot water or steam.
- f) If the bus provides combination 12 volt and 24 volt electrical system, signs should indicate the 12 volt and 24 volt leads from the batteries.
- g) The exterior bus 4 inch identification numerals shall be non - reflective. Six locations and colors for identification numerals will be determined after award.
- h) Three (3) BWATC logos. Locations and sizes to be determined after award.
- i) One each side “Blue Water Area Transit” Font and size to be determined after award.

Vendor will assure that all signage require by law and NFPA 52 will be placed on bus.

The Vendor will supply with each bus one complete set of set of exterior signs as spares.

End Part IV – Technical Specifications

