

TECHNICAL SPECIFICATIONS

DOUBLE DECKER TRANSIT COACH

2.00.01 Background

Joint Participants in the Heavy Duty Transit Bus RFP is adding an option for double decker transit buses. All applicable provisions of the Heavy Duty Bus Request for Proposals apply to this specification.

2.00.02 Legal Requirements

- A. The bus shall meet all applicable FMVSS, BMCS and ADA regulations in effect at the date of manufacture. The Proposer shall comply with all applicable Federal, State and Local regulations and FTA guidelines. In the event of any conflict between the requirements of these specifications and any applicable legal requirement, then the legal requirement shall prevail.
- B. Prior to acceptance of first bus, the structure of the bus shall have undergone appropriate structural testing and/or analysis, including FTA required Altoona testing, to ensure adequacy of design for the urban transit service. Any items that required repeated repairs or replacement must undergo the corrective action with supporting test and analysis. A report clearly describing and explaining the failures and corrective actions taken to ensure any and all such failures will not reoccur shall be submitted to the awarding agency prior to acceptance of any vehicles.
- C. Gross Vehicle Weight Rating (GVWR) for buses supplied shall be sufficient to accommodate fully loaded bus (fuel, oil and coolant as well as all equipment specified herein) plus full passenger (seated and standing) load for safe and normal in-service transit operation and shall comply with the applicable laws of the joint participant's state.

SECTION 2.01 OVERALL DIMENSIONS AND REQUIREMENTS

2.01.01 General Description

- A. Specifications shall describe a large, three axle, heavy- duty, low floor, double decker transit coach designed for public transportation, commuter purposes.
- B. The unit shall be an air-conditioned (Climate Controlled), transit bus comprised of one (1) unit not to exceed forty-three (43) feet. It shall have seating, as further described and shall have door, step and floor configurations suitable for commuter service as assigned by the joint participant.
- C. It shall be the manufacturer's latest production model, conforming to the detailed requirements listed below as well as all applicable State, Federal

and local laws. Experimental or prototype units will not be considered.

- D. As further described, the bus shall be outfitted with several different components. In all cases, materials must be new and furnished as specified. Where brand names or specific items are used in these specifications, consider the term "approved equal" to follow. Wherever such names appear, approved equals will be considered if presented in writing in accordance with the instructions for this RFP. A review process shall take place and a written response shall be delivered to OEM prior to awarding of the Contract.
- E. Propulsion units shall be mounted at rear of the coach, completely separate from the passenger compartment. The engine, engine appurtenances, automatic transmission and controls, and differential ratio shall be compatible, provide a rate of acceleration and speed at gross vehicle weight rating (GVWR) with all auxiliary equipment in operation, providing performance as specified in this document.
- F. Vehicle shall be classed as a forty-three foot vehicle with an overall height of not more than 14 feet including all GPS and communication antennas, as per Minnesota State Law. Maximum height of antennas is 3 inches.
- G. The Vehicle shall be designed for commuter, city bus operations. No lavatory shall be included in the requested vehicle.

2.01.02 General Dimensions

NOTE: Dimensions used throughout this specification are U.S. standard units; (i.e., inches, pounds, etc.).

<i>Curb Weight:</i>	General Dimensions		
	Front Axle	15,500 Pounds	Min
	Tag Axle	14,000 Pounds	Min
	Rear Axle	21,000 Pounds	Min
	Seating Capacity	80 Passengers	Min
	Aisle Width	20 Inches	Min
	Length of Body W/O bumpers	43 Feet	Max
	Doorway Height –Entrance	76 Inches	Min
	Doorway Height -Exit (rear)	76 Inches	Min
	Width at Body	102 Inches	Max
	Height, including all Antenna or other ancillary devices	168 Inches	Max
	Wheelbase (front to tag)	225 Inches	Max

	Wheelbase (Drive to Tag)	59 Inches	Max
	Ground Clearance excluding Axles	12 Inches	Min
Turning Radius:			
	Inside	35 Feet	Max
	Outside	42 Feet	Max

2.01.03 General Performance

A. Acceleration and Top Speed

The coach shall be capable of achieving the following speeds in the corresponding time intervals, starting from stationary condition, with 150% load:

Time (seconds)	Speed (mph)
5	15.00
10	25.00
15	27.00
20	30.00

The rate of change shall be minimized throughout the acceleration/ deceleration range and shall not exceed 0.3g/sec. This requirement shall be achieved regardless of driver action.

The top speed capability of coach shall be 65 miles per hour on a 4% grade road at GVWR with all accessories operating.

B. Operation on Grades

All coaches shall be capable of operation up and down grades of 17% or less, for up to one mile, with full test loads, making intermediate stops without overload or damage, at a sustained speed of 15 miles per hour, on dry pavement, with all accessories operating.

C. Passenger Safety

All design factors shall take into consideration the safety of the passengers. Items requiring safety considerations in design include but are not limited to:

1. Elimination of sharp corners or edges, and pinch or bump hazards.
2. Safe and timely operation of passenger doors.
3. Locations for grab-rails and stanchions.
4. Grab-rails on seats.
5. No obstructions in aisles.
6. Implementation of Federal Motor Vehicle Safety Standards.

7. Intensity and distribution of interior lighting.
8. Exterior lighting at doorways.

D. Maintainability

Prime consideration shall be given to the routine problems of maintaining the coaches. Each coach shall be designed to facilitate disassembly, re-assembly, servicing or maintenance by use of tools and items that are normally available as commercial standards.

Mechanical and electrical components and systems requiring periodic physical work or inspections shall be installed so that minimum time is consumed gaining access to the critical areas. It shall not be necessary to disassemble portions of coach structure or equipment such as seats and flooring in order to gain access to these areas. The rear seat in front of the engine shall be hinged to gain the necessary access to the engine compartment access panels and shall be equipped with a bar to hold the seat in the up position during maintenance. Individual panels or other equipment that may be damaged in normal service shall be able to be replaced or repaired. Ease of repair shall be related to an item's vulnerability to be damaged during service. Interior and exterior finishes shall be designed to avoid accumulation of dirt and debris. Trash deflectors shall be installed where necessary.

E. Noise Control

1. Electrical and electronic subsystems and components shall not emit electromagnetic radiation that interferes with onboard radio communications or violate Federal Communication Commission regulations.
2. Interior and exterior noise produced by any coach shall not exceed 83 dbA + 2 dbA, in any mode of operation. The interior at the driver's compartment shall not exceed 80dbA. The manufacturer shall conduct noise-level tests in accordance with SAE Recommended Procedure J366b meeting the ANSI Specification S1.4.

F. Pollution Control

Motor coaches shall conform to the air-pollution control standards of the Environmental Protection Agency and the State of Minnesota at the time of manufacture.

G. Weight

1. A design goal shall be to construct each coach as light in weight as possible without degradation of safety, appearance, comfort or

performance. Each completed coach shall be weighed and shall comply with Minnesota State Regulations.

2. Design goal, coach weight, when loaded to 150% of capacity shall not exceed axle weight limit of 20,000 lbs. per single axle.

SECTION 2.02 BODY

2.02.01 Structure and Construction

- A. The body shall be reinforced at joints where stress concentration may occur. The coach shall safely withstand road shocks and other conditions found in city service.
- B. High strength corrosion-resistant material shall be used in construction of the body. All metal body parts shall be covered with approved type protective coatings (see 2.02.01E below). The body and all joints shall be protected against corrosion and leakage. All contact areas of dissimilar metals shall be protected against corrosion and leakage. All contact areas of dissimilar metals shall be insulated to protect against failure from conventional and electrolytic corrosion. The coach shall maintain structural integrity throughout its service life, in accordance with the procedures specified in the service manual. Service life shall be 14-year minimum.
- C. The exterior and body features, including grilles and louvers shall be shaped to allow complete and easy cleaning by automatic bus washer without snagging washer brushes. Water and dirt shall not be retained in or on any body feature to freeze on or bleed out onto the coach after leaving the washer.
- D. Manufacturers shall submit a description of the body structure and construction methods including all materials and fastenings used.
- E. **Corrosion Protection**
 1. The main welded structures, i.e. understructure, roof, sides and ends shall be washed and treated with a phosphorous solution. The understructure shall then be undercoated as follows:
 - a. One coat, 25 micron of Sikkens wash primer SI5/55 black or approved equal.
 - b. One coat, 20-25 micron of Sikkens SI5/84 red or approved equal.
 - c. One coat, 50-60 micron of Sikkens Resincoat DHB white or approved equal.
 2. Underbody components, i.e., suspension, beams, radius rods and

air tanks shall also be undercoated with the Sikkens or approved equal. Other items (i.e., heater box, fuel tank and air tanks) shall be sprayed with Tectyl CWG 127 or approved equal prior to installation.

3. After the underbody is assembled and the sides, roof, ends etc. welded to it, the entire upper structure shall be sprayed with Sikkens or approved equal using the same processes as for the understructure.
4. After completion of assembly, the underbody shall be sprayed with Tectyl 127, CGS* or approved equal (including inside all open-ended box sections). All tubing used in the side frame shall be vented to atmosphere to promote drainage and drying of condensation.
 - a. *White colored undercoating which is a solvent cut wax based jelly compound, corrosion preventative and resistant to cracking and peeling.
5. The underbody shall be sealed using a caulking compound containing a chromate inhibitor.
6. Also as a corrosion preventative measure, all panel fasteners shall be stainless steel.
7. The outside of the coach shall be painted with polyurethane acrylic enamel paint, and then heat cured.
8. On the interior all fasteners used on the floor areas shall be stainless steel. Any trim used on the floor area shall also be stainless steel.
9. Aluminum panels shall be washed and treated with phosphoric acid and neutralized clean, etched and sealed. After drying, all surfaces shall be sprayed with zinc chromate primer.

2.02.02 Exterior Panels

- A. Exterior panels shall be sufficiently stiff to prevent vibration drumming or flexing while the coach is in service. The panels shall be lapped, (if designed to do so), with the upper or forward panels acting as a watershed. Sealing and fastening of joints shall prevent entrance of moisture and dirt. All exterior panels shall be bonded or welded to the body frame.
- B. Reinforced fiberglass and plastic materials may be considered for the basic body construction, except for replaceable panels or doors.
- C. Chromium-plated trim pieces are not acceptable. Any bright metal exterior trims shall be stainless steel or anodized aluminum. No sheet metal screws shall be permitted on body panels. All exterior side panels between window belt and rub rail and rear of coach shall be 22-gauge

galvanized steel, aluminum, and stainless steel or approved equal; treated and painted in the joint participant's colors.

D. Construction -Roof

Roof shall be of all fiberglass or approved equal construction in accordance with the manufacturer's standard and of sufficient strength and stiffness to prevent vibration, drumming or flexing in service. The lines of the roof shall be arched type and shall present a pleasing symmetrical contour.

E. Special care shall be taken with the outside sheathing, roof, roof bonnets and the interior finish so that all kinks and buckles are removed before assembly and so that they present a true, smooth finish without grinding or cutting material below its standard thickness. There shall be covers or doors covering any and all access to engine or components such as coolant cap or others.

F. Crash Worthiness

1. The bus body and roof structure shall withstand a static load equal to one hundred fifty (150) percent of the curb weight evenly distributed on the roof with no more than a six (6) inch reduction in any interior dimension. Windows shall remain in place and shall not open under such a load.
2. The bus shall withstand a 25 mph impact by a 4,000 pound, post 1973, American automobile at any point, excluding doorways, along either side of the bus with no more than three (3) inches of permanent structural deformation at seated passenger hip height. This impact shall not result in sharp edges or protrusions in the bus interior.
3. Exterior panels below the rub rail and their supporting structural members shall withstand a static load of 2,000 pounds applied perpendicular to the bus anywhere below the rub rail by a pad no larger than five (5) inches square. This load shall not result in deformation that prevents installation of new exterior panels to restore the original appearance of the bus.
4. Coach shall be able to withstand a side leaning condition of a minimum of 27 degrees without the possibility of rollover.

2.02.03 Painting, Decals and Undercoating

A. Painting (refer to Attachment A)

1. All metals and exterior surfaces shall be thoroughly cleaned by methods in accordance with the paint manufacturer's recommendations immediately before the first coat of the overall sealer is applied.

2. Coach exteriors shall be painted to the general graphic design submitted by Participating Agency. Minor variations to this general graphic design scheme may be required in order to accommodate the specific styling or construction of coaches. Any variations shall be approved by the Participating Agency.
3. The exterior of the coaches shall be finished with PPG's Delta 3500 Low VOC polyurethane enamel or approved equal. All primers, sealers, wax and grease removers, paint and any other systems used shall be of the same manufacturer to assure chemical bond, adhesion, overall gloss retention, and to assure full warranty by manufacturer and contractor.
 - a. Finish coat thickness and application methods shall be as specified by the finish coat manufacturer.
 - b. All bare metal treatment, primers, and sealers applied before the finish coat shall be approved as to material, thickness, and application by the manufacturer of the final finish.
 - c. All surface preparations shall be similarly approved by the manufacturer of the final finish.
4. The finish coat shall be free of runs, sags, orange peel, fish eyes, and areas of no gloss. Fiberglass shall be free of air, dry fiberglass chop, matt or roving.
5. There shall be no bare or exposed metal surfaces showing on the exterior of the coaches, exclusive of ornamentation, accessories, and bumpers. There shall be no contractor's name or insignia on the exterior of the coach.
6. Paints, primers, and sealers for overall paint project or approved equals:
 - PPG's Durethane Polyurethane enamels for overall finish top coats.
 - PPG's DP-40 Epoxy Primer with DP-401 Catalyst for overall sealer.
 - PPG's Preet 33 Primer-Surfacer for filling surface imperfections and leveling highly shaded areas.

Paint codes
Paint code to be determined by preproduction.

QTY	Decal Name	Size	Colors	Approx. Location
2	Symbol for No Smoking, Eating, and Radio Playing Prohibited	4.5" x 12.5"	Blue symbols White Background Red Circle and cross	Fitted at front of coach on upper and lower Deck
1	Watch Your Head	282mm wide x 40mm high	Red Lettering, Red Border, White	On Pulpit adjacent to 1 st step above

			background	head
1	Low Ceiling 5'7"	177 mm wide x 67 mm high	Black/Red Lettering, Red Border, White Background	Upper Deck rear GRP Seat/decency panel
1	Stand Behind Line while Bus is in Motion	108mm wide x 133 mm high	Red Lettering, Red Border, White panel (fwd)	On Staircase partition panel (fwd)
1	Prohibited Area	108mm wide x 47mm high	Red Lettering, Red Border, White Background	On Staircase Partition
1	Vehicle Height 14'	40mm wide x 30mm high	Black Lettering, White Background	In front of Driver
1	STAIRCASE WARNING	144mm wide x 210mm high	Black Lettering, Red symbol, White Background, and Black	Staircase wall Border
1	Use Handrails for Safety	157mm wide x 57mm high	Red Lettering & Border, White Background	On Step riser at about eye level from lower level
1	Fire Extinguisher Symbol	5" x 5" approximate size	Red Symbol, white background	At Fire ext. location
20	Pull to Close	93mm wide x 20mm high	White letters and Border, clear background	On opening passenger windows
4	Maintain Firm Handhold While bus in Motion	108mm wide x 133mm high	Red Lettering. Red Border, White background	Front and rear of both levels

B. Undercoating

Underneath portion of the underframe, flooring and stepwells, wheelhousings and all exposed underfloor surfaces shall be generously sprayed with fire-retardant Tectyl No. 506G, Isoclad, or approved equal undercoating material shall be colored white as per section 2.02.01 E.

C. Decals/Graphics

Interior signs may be decals or pressure sensitive appliques. Exterior numbers/graphic design shall be decals. At least two (2) signs shall be provided in area of the most accessible lower level of the coach to indicate priority seating for the elderly and disabled. The exact wording, size, color, will be determined at pre-production for the interior decals. All materials and signs shall be subject to the Participating Agency's approval. There shall be roof coach numbers installed by OEM before

delivery. They shall be 20 inch numbering reflecting the property vehicle number. Property coach numbers to be determined by pre-production.

- D. Interior Decal List
The interior of the coaches shall have, but not limited to, the above decals, provided by OEM.

2.02.04 Gutters, Rubrails, Limb Guards, and Water Testing

- A. Gutters
Roof gutters shall be installed, if body style does not stop water flow into or on windows, doors, and mirrors. They will be installed over the side windows and doors if necessary. Drain holes shall not drain water on windows, doors, or passenger boarding area. Cross-section of the gutters shall be approximately .025 square inch.
- B. Rubrails
Rubrails composed of flexible, resilient materials shall be provided, if necessary, to protect both sides of the coach body from damage caused by minor, sideswipe accidents with automobiles. Rubrails shall have vertical dimensions of approximately 2 ¼ inches with the centerline approximately thirty-four inches (34) above the ground.
- C. There shall be a Limb Guard mounted on the top front of the coach. This guard shall protect both streetside and curbside corners, as well as all the way across the front to protect front upper Mask assembly including all clearance and marker lights on the upper level. It shall be attached to the coach structure so as to not come loose.
- D. After the coach exterior is complete, a water leak test shall be performed on each coach. This leak test shall be in accordance with procedures specified in FTA White book guidelines.

2.02.05 Bumpers, Towing and Jacking Facilities

- A. Front and Rear Bumpers
Bumpers shall be blended into the body with rounded and an appealing look. No part of the coach, including the bumper, shall be damaged as a result of a five (5) mph impact of the coach at curb weight with a fixed, flat barrier perpendicular to the longitudinal centerline of the coach. The installed bumper shall protect the coach and a stationary 4,000 lb., post-1973, American automobile from damage as a result of impacting at 6.5 mph into the rear bumper of the automobile parallel to the longitudinal centerline of the coach. The energy absorption system of the bumper shall be independent of every power system of the coach and shall not require service or maintenance in normal operation during service life of

the coach. The exterior surface shall be discussed and viewed after award due to the body styling differences between OEM's, or OEM can submit a variance. Excessive gaps between bumper and the body and between modules shall be avoided.

B. Towing

1. Tow eyes shall be provided for attaching a rigid towing device on the front and rear of the coach. Any special equipment required specifically for coach towing shall also be provided with the order, one (1) tow bar shall be required for flat towing.
2. The towing device shall withstand turning of the coach at its specified turning radius with grades up to six (6) percent and lifting both front wheels off the ground without causing permanent deformation to the towing device and/or coach.
3. Skid pads shall be installed under engine and transmission as well as all four corners of the coach. Skid plate mounting shall be a minimum of 2 inches below the lowest point of the engine and transmission to prevent damage to the power train or structure.
4. Upon request, OEM shall provide towing training to the Participating Agency towing contractor and shop personnel when the first bus is delivered to the Participating Agency.

C. Jacking Facilities

1. It shall be possible to jack up the coach, at curb weight, with a common 10-inch, high hand or floor jack when a tire or dual set is completely flat and the coach is on a level, hard surface without crawling under any portion of the coach and without relocating the coach. Jacking shall be able to be completed by a serviceman in less than two (2) minutes from the time the coach is approached with the jack until the coach is sufficiently high to remove and reinstall a wheel and tire assembly. The coach shall withstand such jacking to a minimum height of 18 inches at any one or a combination of wheel locations without permanent deformation or damage.
2. The coach axles or jacking plates shall accommodate the lifting pads of a three-post hoist system. Jacking plates, if used as hoisting pads, shall be approximately five inches (5) square, with a turned-down flange not less than one inch (1) deep on each side to prevent the coach from falling off the hoist. Other pads or the coach structure shall support the coach on jack stands independent of the hoist.

2.02.06 Wheel-housings, Splash Aprons and Fenders

A. Wheel-housing

1. Rear wheel-housings shall be sturdy construction, corrosion resistant stainless steel, and a minimum of 14-gauge. Front wheelhousing interior shall be of fiberglass construction with exterior being stainless steel. Construction design shall be able to withstand transit service.
2. The wheelhousing shall be trimmed and sealed at its mating edges. The color of the wheelhousing shall compliment coach interior.
3. The wheelhousing shall be finished on the coach interior to withstand scuffing, wear and abuse from passenger feet.
4. All wheel-housings shall be free of protrusions.

B. Splash Aprons

1. Splash aprons, made of 1/4 inch composition or rubberized fabric, shall be installed the full width of the coach on the rear of each wheelhousing, projecting downward to a point approximately 3 inches above the ground. The full width splash apron may consist of 3-section design.
2. The installation of the splash apron and the wheelhousing design shall preclude the accumulation of dirt and ice. Vendor shall provide a description of splash apron to be used.
3. Other splash aprons shall be installed where necessary to protect coach equipment.

C. Fender Skirts

Rubber fenders shall be applied to the exterior contour of the wheel wells to control wheel splash. Fenders shall be fastened with stainless steel screws and anti-seize to assist in the ease of removal and replacement.

2.02.07 Access Doors and Panels

- A. Access doors shall be provided, where necessary, for the easy maintenance of equipment and safety of the public. This includes, but is not limited to, the engine compartment, surge tank or radiator fill, side access to engine compartment (radiator etc.), A/C condenser, fuel door.
- B. Access doors shall be provided with positive hold open devices and corrosion resistant latches. Side access doors shall have flush type latches. Doors shall be of a rugged construction and shall be capable of withstanding severe abuse. A special access cover shall be provided for access to the steering gear box.
- C. Interior access doors shall blend in with the appearance of the coach interior.

- D. Access openings in the floor shall be avoided with the exception of access for the fuel tank sending unit and driveshaft. Any access openings in the floor, if required for maintenance, shall be sealed to prevent the entry of fumes, water, or dust, and shall be securely fastened with approved fasteners, and shall not create a tripping hazard.
- E. Doors shall be hinged at the top or forward edge and shall be prevented from coming loose or opening during transit service and during coach washing operation.
- F. All exterior access doors larger than 2 square feet in size shall be retained in the open and closed position by gas-filled springs or approved equal. Smaller access doors shall be retained in the open and closed position by methods approved by the Participating Agency.
- G. Roof Escape Hatch
 - 1. Two emergency roof escape hatches shall be provided in each coach, one located in the front and one in the rear, (or approved by FMVSS and the Participating Agency). The hatches shall have an extruded rubber seal around the opening, and shall be opened by pulling the release handle downward, or approved equal, Instruction decals shall be placed on the underside of the hatch.
 - 2. If break glass style emergency exits are provided, a break glass hammer with retractable cord shall be provided at each and every location.
- H. Engine compartment access door
When engine access door is open, it shall not obstruct the rear coach lights, or approved equal. There shall be a grab handle provided to assist in the opening of the engine compartment door.
- I. No tools shall be required to gain access to any access door. With exception for engine compartment, transmission compartment, radiator compartment, and radio compartment doors. ("T"-key style is acceptable).
- J. There shall be an access door, which requires no tools to gain access, for emergency workers to access to the "battery disconnect" and it shall be labeled as such.

2.02.08 Stepwells / Entrance Area and Stairways

- A. All step edges, thresholds, and the boarding edge of wheelchair ramps shall be stainless steel construction with minimum thickness 5/16 rubber

covering and 4 inch yellow nosing.

- B. A transverse standee line shall be provided at the aft end of the front door entrance plate. Stepwell tread shall have a non-skid / non-slip covering or coating.
- C. A straight staircase design will be fitted in the forward floor position. It shall be a forward ascending design providing enhanced access to upper deck by incorporating wide parallel steps of equal height and increased upper shoulder width. Be manufactured with structural composite stiffening added where necessary to provide rigidity. Incorporate a protective toughened glass decency screen between stairs and lower deck.
- D. A second straight staircase design will be fitted in the rearward floor position. It shall be a forward ascending design providing enhanced access to upper deck by incorporating wide parallel steps of equal height and increased upper shoulder width. Be manufactured with structural composite stiffening added where necessary to provide rigidity. Incorporate a protective toughened glass decency screen between stairs and lower deck.
- E. The LHS front wheel box housing will be integrated into staircase assembly and shall house the driver's locker as well as a large electronic communications box with a lockable latch.
- F. Risers shall be vertical and shall be 7.5 inches minimum to 10 inches maximum, and equal within variation of 0.5 inch. Stepwell design and construction shall be approved by the Participating Agency.

2.02.09 Stairway Safety Panels

- A. Pulpit Panel
A waist height pulpit panel will be formed around stairwell and designed to accept a handpole stanchion and upper guardrails for passenger safety. The pulpit panel will be faced on gangway side and compact board on stairwell side. The pulpit panel will be adequately supported to avoid excessive flexing while using attached handrails.
- B. Decency Panel
A waist height decency panel will be formed at forward end of staircase and designed to accept a handpole stanchion. The decency panel will be faced on saloon side and compact board on stairwell side.

2.02.10 Interior Insulation

- A. Roof and sidewalls shall be insulated with minimum 2 inches thick, medium density fiberglass compressed on installation or a hardened Styrofoam with similar density. Sidewall insulation shall be encased in waterproof envelopes.
- B. Complete rear bench seat area shall be heavily insulated for both noise and heat protection with fiberglass blankets or approved equal. Thickness and type of fiberglass shall be as follows:
 - 1. Under rear, cross-seat, riser and rear cross-seat back shall be a minimum total of 1 ½-inch thick, high-density fiberglass blankets. Cover panel behind rear cross-seat shall be 1-inch thick foamed polyurethane with Mylar facing. Area behind and below rear window shall be 2-inch thick, medium density fiberglass with ¾-inch thick, heavy density, fiberglass mat cemented to the inner face of the fiberglass rear window.
 - 2. If a different system or material is to be used, it shall NOT be of polyurethane materials and shall be approved by the Participating Agency prior to production.
 - 3. There shall be a minimum of 3 access panels to gain access to the engine compartment through the rear seat, or approved equal. Locations shall be left, center, and right sides under rear seat, or approved by the Participating Agency.

2.02.11 Floor and Floor Covering

- A. A composite material such as ¾-inch, Sea Board HDPE (high density polyethylene) or other composite material, on the lower level is preferred and shall be approved by the Participating Agency. The floor shall be at a minimum, ¾ - inch, 7-ply marine grade plywood treated to resist decay and mold or approved equal. All plywood edges shall be treated or sealed with titanium dioxide sealant or approved equal before installation to prevent entrance of moisture.
 - 1. The plywood sections shall be as large as is practical, free of checks and knots, and all splices of the flooring shall be made directly on a structural member and/or satisfactory extension thereof.
- B. Floor fasteners shall be placed on each side of the splices and shall be secured and protected for the life of the coach. An anti-squeak material shall be placed between the floor and under frame members and around wheel housing.
- C. The walking area of the floor shall be as level as practicable in each section.

- D. Under frame shall have sufficient stiffeners to keep the floor from excessive flexing under maximum loads.
- E. The floor aisle shall be covered with one-piece (as much as possible, and welded joints where it cannot be accomplished) 2.7 mm, non-skid, sanded back, flooring material for all of the coach floor sections. This flooring material shall be Heritage Maple FWSA2010 or approved equal. Color shall be provided prior to manufacture.
- F. Covering on wheelchair ramp shall be a nonskid material. All flooring shall be non-skid.
- G. Floor Covering - Installation
Entrance and rear step treads shall include integral molded yellow noses on stainless steel metal backing. Backing shall be totally enclosed in rubber, or approved equal.
- H. The floor under the seats shall extend up the sides of the body approximately 3 inches. The floor covering shall be 2.7mm thick, sanded back, smooth top flooring material as utilized throughout the coach.
- I. The operator's platform areas shall be covered with the same flooring material used throughout the coach interior.
- J. All holes in the floor material (plywood or approved equal), for mounting bolts, seams, etc. shall be caulked and sealed before sanding.
- K. Just prior to the application of the floor covering, the entire floor shall be thoroughly sanded or properly prepared and then completely cleaned of all foreign material. The floor covering shall be butt-joined and cemented to the flooring material to comply with the floor covering and adhesive manufacturer's recommendations. There shall be no gaps at any butt joints, and all butt joints shall be sealed/welded to prevent moisture from entering.

2.02.12 Side Windows

- A. The side window (and rear window, if applicable) areas shall be as large as possible to give the seated and standing passengers an unobstructed exterior view.
- B. Side windows shall have the look of a seamless or continuous window when viewed from exterior of the coach. All windows shall be ¼-inch Safety Glass or approved equal. Exterior of the windows shall withstand damage and scratching from use of the Participating Agency's bus wash

system. This would include, but not be limited to, soaps, spinning brushes, as well as hand brushes.

- C. A positive lock type emergency latch meeting FMVSS No. 217 regulations shall be furnished on each large window frame on the lower level. Each window shall have a permanent metal decal describing emergency window operation procedures. Location shall be determined by the Participating Agency.
- D. Side windows shall be designed to prevent the entrance of air and water under all conditions (wind, rain, etc.) when windows are closed. The window seal rubber shall be installed so that passengers cannot remove it and rubber shall be of such quality to resist vulcanizing to other sash or sills.
- E. This style of window shall comply with FMVSS, as well as DOT safety regulations and have window frames incorporated for strength. The window assembly shall be approved by the Participating Agency before built.
- F. All glass shall be tinted to a minimum of 76% light transmission.
- G. It shall be unacceptable to have any glass bonded to the coach body or frame.

2.02.13 Windshields and W/S Wipers

- A. The windshields shall be set in rubber glazing channels and shall be easily replaceable. Windshields shall be angled sufficiently to reduce glare from the interior coach lighting.
 - 1. Both windshields shall be glazed with ¼-inch laminated safety glass or approved equal. Windshield shall be tinted and sun glazed to meet FVMSS standards.
 - 2. A fully adjustable sun visor shall be installed for operator's use. The installation shall preclude vibration in normal street operation. Sun visor shall be a New-View Industries product, "Roll A Visor," or approved equal. The visor shall be a full see through, mesh style for two thirds of the full length with the bottom third being a solid material. The Visor shall have a release cord that allows the visor to return to the normal position.
- B. Two (2) electric-operated heavy-duty windshield wipers with self-parking feature shall be furnished for the lower windshield. The wiper motors shall be variable speed having at least a high and low speed setting with an intermittent system. There shall be a combination switch to allow the

wipers to operate in a "mist" mode where the wipers shall make a minimum of 2 swipes, wait, and then recycle again. Electric wiper motors shall have metal style gears.

1. Windshield washer shall be provided. Reservoir capacity shall be a minimum of 5 gallons filled through filler neck located outside on the front of the coach. Spray shall be air operated pump, or approved equal, utilizing a wet wiper arm.
2. Wiper arms shall be Bosch (L.H. 3398100090, R.H. 3398100096), or approved equal, and be equipped with the largest wiper blade possible for windshield design.
3. Wiper motors and windshield reservoir shall be installed in an easily accessible location for ease in maintenance and inspection. Wiper motors shall be accessible from exterior of coach and properly sealed.
4. Wiper motors/alarms shall be adjusted to stay on windshield area, and shall not go past windshield rubber harness. The sweep shall be large enough to clear the windshield for vision of the right mirror.

2.02.14 **Operator's Side Window**

- A. Driver's side windows shall be of sliding type to allow adjustment of the left rear view mirror. The windows shall be split, sliding windows. The sliding portion shall move freely without rocking or binding.
- B. Windows shall be glazed with a minimum ¼ -inch tinted laminated safety glass. Glass shall be sun glazed at the top one-third to meet FVMSS standards.
- C. Driver's side window shall have a see-through pull down shade. The shade shall be a New-View Product, "Roll A Visor" or approved equal, all mesh design with a release cord which allows for the visor to return to the normal position.

2.02.15 **Coach Doors**

- A. The front entrance door shall be equal width, twin leaf inward opening glider door. The doors shall be equipped with framed glass (rubber glazed) with concealed inner frame. There shall be a sensitized leading edge rubber on door wings. The door wings shall be supplied powder coated in a black semi matte finish. Door shall have one piece glazing for the length of the door, to allow grab rail clearance for wheelchair ramp system. The door shall be full air-operated with Vapor Corporation, or approved equal, pneumatic door engine and controls with a shut-off valve. Door operating levels shall be splined to the shafts. The front entrance door opening width between wings shall be a minimum of forty-

six (46) inches and fifty-one (51) inches between drive tube centers. The front and rear exit doors shall have a minimum vertical open clearance of seventy-six (76) inches minimum. All doors shall be controlled from a five (5) position single lever door control valve with a handle operating in a horizontal plane. The door shall not be able to slam open or slam close under any condition.

- B. The rear door located on the right hand side just ahead of the rear wheels shall be equal width plug doors fitted flush with the exterior body. The doors shall have a framed glass (rubber glazed) with concealed inner frame. A recessed finger grip will be provided at the bottom of each door wing to ensure emergency "manual open" operation in the event of pneumatic failure. Operated by Vapor or approved equal, and a two (2) inch extruded rubber edge on each door section that overlaps by at least one half ($\frac{1}{2}$)inch. Two (2) inch extruded rubber edge on each door section must also utilize sensitive edge capability. The door opening shall be a minimum of forty-five (45) inches between drive tube centers and a clear opening of forty-one (41) inches. Door operating levers shall be splined to the shafts.
- C. The front entrance and rear door shall have Vapor, or approved equal, interlock control with the center and rear axle brakes as well as accelerator interlock to prevent movement of bus with the door in open position. Door system shall monitor speed of vehicle and not allow the doors to operate while in motion at or over three (3) MPH speed sensor.
- D. An adjustable pressure regulator to adjust air control to brake interlock shall also be provided. Interlock controls shall be above the door and readily accessible for servicing. Interlock controls may be located below the floor if they are readily accessible for servicing. Interlocks shall apply when doors begin to open.
- E. Interlock equipment shall be mounted together as one assembly with all swivel connections of copper or reinforced nylon (SAE J844 C) tubing. Interlock equipment and its location shall be approved. Door controls shall use proximity switches; no mechanical switches shall be used. Interlock bypass switch shall be installed in a secure, inconspicuous area for maintenance personnel to gain easy access to in the event that a system failure should occur.
- F. The rear and center axle brakes shall be interlocked so as to prevent the bus from moving when the wheelchair ramp system is being operated in a loading, unloading, or stowing cycle. Proposer shall supply complete information about interlock system operation at the time of bid. This

information must establish that the system used is the functional equivalent of that specified.

- G. Front kneeling feature shall be provided. It shall be operated in conjunction with front doors, and shall be sequenced with the rear and center axle inter-lock to assure that it is fully raised before the interlock is released. The kneeler shall not be operable until the front door opening is at a minimum of 5 degrees, and the wheelchair lift/ramps shall not operate until the door opening is at a minimum of 85 degrees open. The kneeler shall have the minimum capability to return to normal ride height when loaded to 150% of seated load capacity within 5 seconds when in the kneeled position at normal air pressure of 120psi. Control switch/switches shall be mounted on dash or to side of operator for ease of operation.
- H. Closing force shall be limited to avoid injury to a passenger caught in a closing door. All doors shall be equipped with sensitive edges. A maximum force of 25 pounds shall be required for a passenger to get free after having either door close upon them, even if the sensitive edge or safety device on the door is inoperative. The rear door shall be equipped with an alarm and a dash light if a person pushes the sensitive edge or puts object between edges when the doors are in the closed and locked position.
- I. In the event of an emergency, the door shall be able to be opened manually from inside the coach using a force of no more than 25 pounds after actuating an unlocking device at the door. A manually operated passenger emergency valve shall be installed in the door engine compartment, arranged so that when the valve is opened, door control system air is released allowing door to open manually.
- J. In closed position front entrance and rear exit doors shall fit snugly against bus body and bottom step to prevent drafts and intrusion of dust, water, ice, and snow.
- K. A front door control switch shall be externally located in a concealed location, to gain entry, with main battery power on only.
- L. A rear door master switch shall be located in right hand front dash compartment, operator's safety compartment, or front destination sign compartment. If single door master switch controls both doors, master switch may be located in the entry door compartment.
- M. The rear door shall have an easily accessible emergency opening device

located adjacent to the exit door, designed to operate the door regardless of all other controls. This device shall be identified, and instructions for its use shall be posted on or adjacent thereto. The operation of this device shall be interlocked so as to actuate the brakes to provide a smooth stop at a rate of deceleration equivalent to a stop within seventy-five (75) feet from a speed of twenty (20) MPH. The device shall be concealed by an easily breakable clear plastic panel and shall have a hammer or other device provided to gain access to the handle or lever, color to be red. Hammer to be attached to bus by metal chain. Front and rear door motors shall be accessible through a top hinged access door, with two quarter-turn spring latches controlled by hand operated knurled knobs.

- N. The rear exit door shall be designed to:
 - 1. Delay release of the brake interlock until after the doors are fully and completely closed;
 - 2. Prevent the doors from being unlocked by operator's door control while pressure is applied on the inside of the doors;
 - 3. Lock the doors closed mechanically, in case of electric power failure.

- O. There shall be a selector switch, located on the left driver's side panel to select touch bar or driver operation of the rear door.

2.02.16 **Destination Signs**

- A. Automatic electronic LED destination sign system such as the Twin Vision Silver Smart Series System or approved equal shall be furnished and installed in the coach by the manufacturer. This destination sign shall meet all ADA requirements.

- B. The destination sign system shall consist of:
 - 1. Front destination sign, Twin Vision Silver Smart Series System, 16 x 160.
 - 2. Side destination sign, mounted curb side; 8 x 96.
 - 3. Driver's control console and display.
 - 4. All cables and accessories.
 - 5. Shall be able to be integrated into the coach communication system and electronic system.

- C. The sign system shall have the capability to display a minimum of 4,000 single line 18-character messages. The system shall have the additional ability to sequentially display multi-line destination messages but with the route number portion remaining stable in a constant on mode at all times.

- D. All sign display characters shall be sized to enable a person with 20/20 vision to identify the destination displayed on the front sign from a distance of at least 150 feet and the side sign from a minimum of 50 feet in both bright sunlight and night time conditions.
- E. All signs shall have a minimum 2 minute shutdown delay, and display last reading after coach is turned off.
- F. Sign system shall have the capability of displaying special public relations messages alternately with the regular text and route messages.
- G. Signs shall be all LED, where the brightness of the LED automatically adjusts to the intensity of the outside light. Signs shall be designed to reduce glare during night-time use.
- H. The system shall incorporate a means of adjusting the length of time the messages are displayed. The interval shall be variable from 1 to 10 seconds in duration.
- I. Power to the sign system shall be controlled by the master coach run switch. The sign shall operate in all positions of this switch except off. The sign shall be internally protected against voltage transients and RF interference.
- J. Input power to the sign shall be fused externally to the sign with a 3AG fuse and holder (little fuses 150145 or approved equal). The fuse holder shall be readily accessible in the front sign compartment area. The sign manufacturer shall select the proper size fuse.
- K. Sign System Make-up
 - 1. Front Destination Sign. The front destination sign shall be capable of displaying a 15-character alpha text and a 3-digit alphanumeric route sign. The text character size shall be a minimum of 6.0 inches high. The front sign and compartment shall be designed to be dust free. Destination sign shall be completely accessible for maintenance. Front destination sign glass shall be electrically heated.
 - 2. Side Destination Sign(s). The side destination sign(s) shall be capable of displaying the same information as presented on the front sign, minimum 18 characters. The 3-digit route number portion shall be a minimum of 4.1 inches high. The text or route name information, 15 characters, shall be a minimum of 2.7 inches high. The height ratio difference between the route

number portion (3 characters) and route name (15 characters) shall be maintained. The route sign shall be capable of being programmed to display characters in either single or double row format.

3. Driver's Control Console. The control console shall be located within easy reach of an average size driver in a seated position and shall provide the controls and memory for display messages. The controls shall include a switch for selection of preprogrammed messages and a display to monitor the selection. The memory shall include preprogrammed messages and the capability for on-coach programming. The code selector switch shall be a push button switch. In addition to destinations, the code selector switch shall allow the driver to select public relations messages that shall be displayed alternately with the destination messages. The console shall also have the capability to preselect 2 different route messages.
4. Interconnection Cables. The system shall include all required signal interconnect cables. Signal connectors shall be polarized; cables shall have strain relief and contact shall be plated with a minimum of 50 micro-inches of gold.
5. Mobil Transfer Unit. The sign system shall be reprogrammable on the coach with the use of a card compatible with the Participating Agency's existing systems. One card shall be supplied. The card shall electronically reprogram up to 4,000 lines of information in a maximum of 3 minutes from boarding the coach to exiting the coach. The card shall be demonstrated to the Participating Agency for approval before delivery of the vehicles.
6. The manufacturer will install all signs with the appropriate dip switch settings as specified by sign manufacturer and/or the Participating Agency.

2.02.17 **Destination Signs – Readings**

A list of the Participating Agency's destination sign readings shall be supplied to the manufacturer to allow the signs to be pre-programmed with the correct readings. The manufacturer shall provide the current "dip switch" settings for all signs and provide instructions for setting/resetting the sign addresses.

2.02.18 **Mirrors**
A. **General**

Mirrors shall meet the requirement of FMVSS 111. The mountings of the exterior mirror shall be with 3/8-inch stud or bolts affixed to the coach structure. Mirror thickness shall be a minimum of 3/16-inch. Mirror

locations shall not create a safety hazard for passengers or a person standing on curb. The mirrors shall be fully electrically adjustable to give the driver a full view of the required area. Frame style shall be shock-absorbing type.

B. Exterior Mirrors

Coaches shall be equipped with two outside rear view mirrors, mounted on front corner posts and affixed to the coach structure. The mirrors shall be designed for the look and concept of the double decker vehicle. OEMs shall provide the styling for the Participating Agency's approval before production. However, some criteria shall be followed as listed.

1. Mirrors shall be Hadley (or approved equal), motorized and heated and shall be 24 volt.
 - a. When in heat mode, the heat switch shall illuminate showing that the circuit is on.
2. Curb side mirror assembly shall have a minimum size of 7 inches wide by 10 inches high, all convex. Convex shall be minimum of 6-degree angle and fully electrically adjustable and heated. Mirror shall be mounted to have a minimum of eighty (80) inches from the ground (tire level) to the bottom of the mirror head.
3. Left side mirror shall be a minimum of 7 inches wide by 10 inches high split mirror head with the top half being a flat mirror and bottom portion being convex with a minimum of 6-degree angle. The mirrors shall be operated independently with one switch. This mirror shall be mounted seventy (70) inches from the ground (tire level) to the top of mirror head.
4. Control switches shall be mounted on the left side of the driver's seat on side console.
5. Both mirrors shall be mounted on swivel arms to prevent damage from automatic coach washers. Mirror arms shall be long enough so that the right side mirror can be viewed within the shadow of the windshield wiper. Arm shall be vibration free, possible 2-point attachment.
6. All mirror arms shall be as vibration resistant as possible. They shall be made and mounted as solid to the coach as possible. Small tubular arms are unacceptable.

C. Right Side Exterior Mirror

The right side mirror shall be mounted according to OEM's style and configuration. However, they shall be approved by the Participating Agency before production. They shall also be mounted to provide a full range of vision from location in front of the right front wheel to beyond the rear of the coach. They shall not be mounted to doors and shall be mounted to have no vibration movement. They shall be convex. Spot mirror will be mounted on right exterior mirror to provide driver with a

view of the front of the bus and the bike rack assembly.

D. Left Side Exterior Mirror

The left side mirror shall be mounted on the outside left front corner of body so as to give the operator a view of traffic alongside and beyond the coach. It shall be structure mounted and have a stiff arm to prevent vibration. Location of mirror shall be in accordance with OEM style but approved by the Participating Agency prior to production.

E. Center Rearview Mirror

A convex, minimum 8-inch by 16-inch, interior rearview mirror shall be mounted ahead of and above the operator's position to provide a general view of the interior of the coach. This mirror shall have a center support capable of supporting the weight of the mirror, as designed by Metagal or approved equal.

F. Inside Mirrors

Mirrors shall be provided for the driver to observe passengers throughout the coach without leaving his/her seat and without shoulder movement. With a full standee load, including standees in the vestibule, he/she shall be able to observe passengers in the front and rear stepwells, anywhere in the aisle, and in the rear seats. Inside mirrors shall not be in the line of sight to the right outside mirror. Round 7" flat mirror or approved equal in right front corner. Rear stepwell mirrors shall be seeable with standing load.

2.02.19 General Interior

A. Interior Trim

Ceiling trim panels and sections between large side windows down to the bottom of the window openings shall be melamine, consoweld, or approved equal. Thickness shall be no less than .100 inches, and applied sectionally with trim strips covering panel joints. Color shall be determined before production. Ceiling panels shall be installed with no droop or buckling across width of the panels. All interior panels and moldings will be designed to withstand all levels of humidity with temperature variations from 0 degrees Fahrenheit to 200 degrees Fahrenheit, without failure. They shall also be designed to withstand regularly scheduled cleaning using industrial grade cleaners.

B. Side Wall Panels

Lower side wall trim panels shall be melamine, or approved equal applied sectionally with stainless steel or anodized aluminum trim strips covering panel joints. Horizontal trim molding shall cover the top of the side wall trim at the base of the side windows. Sidewall panels shall be firmly

attached to prevent panels from buckling, drumming or flexing and shall be secured without loose edges. The color and texture of the panels shall be determined before production.

C. Ceiling Panels

The ceiling panels shall be 1/10 transit grade melamine or approved equal with grey carpeting adhered to it.

D. Rear Bulkhead

The interior side of the rear bulkhead shall be contoured in such a way that it shall not have a tendency to collect trash. The panel, or sections thereof, shall be removable to service components located in the engine compartment. The main rear bulkhead shall be covered in seating material or grey carpeting and shall be determined at time of pre-production.

E. Operator's Platform Riser

The operator's platform riser shall be anodized aluminum or stainless steel. This shall also have openings to the underside of the dash compartment protected against the possibility of accumulation of debris behind the panels or around the operator's foot controls. The foot controls shall accommodate up to a size 14 shoe without interference for ease of operation.

F. Reading Lights and Stop Request Buttons

There shall be individual reading lights available at all passenger seat locations. These shall have all replaceable parts such as bulbs, lenses, and switches. They shall be equipped with LED style bulbs and lenses to defuse the light to a light that may be easily used for reading. There shall also be a stop request button, red in color, at each seated position as stated in Section 2.04.03 (D). These two systems may be incorporated into a single panel if desired. There shall be one master driver controlled 3-position on/off/test switch for all reading lights.

2.02.20 **Operator's Partition**

A. The driver's barrier, a full height partition, shall be shaped to essentially provide a barrier between the back of the driver and passenger compartment. The barrier shall form an aesthetic continuation of the dash and slope down just to the rear of the driver's seat location with no door installed.

B. Driver's side panel shall have a protective cap along the top to prevent damage from seat belt buckle.

- C. The barrier shall have a satin finish, with approved exterior skin. This skin shall be properly attached and finished to ensure no sharp edges are exposed, as well as provide a clean, professional look.
- D. The barrier shall wrap around the driver's area a minimum of six inches (6). This portion shall not obstruct the clear path for personal mobility aid device/wheelchair passengers during boarding and/or alighting. (This portion may be angled appropriately in order to maintain a clear path, without obstructing driver's seat travel.)
- E. The interior skin shall be comprised of fiberglass or aluminum, finished flat black.
- F. A driver's storage box shall be provided as an integral portion of the barrier. The box shall be located in the upper portion of the barrier, and shall have nominal dimensions of 24"w x 12"h x 12"d. This box shall be equipped with a lockable latch system.
- G. Exterior finish of this compartment, on the top and aft side, shall match the exterior finish of the barrier. Exterior finish on the outboard (window) and inboard (aisle) side shall closely match the covering of the street side front wheel house.
- H. On the inner skin of the barrier, a coat hook and registration holder shall be provided. The locations shall be approved by the Participating Agency at pre-production meetings.
- I. All proposers are required to provide sketches, photographs and/or drawings of the requested barrier with the Requests for Approved Equals for the Participating Agency's review.

2.02.21 Grab-Rails, Stanchions, and Modesty Panels

- A. Full grip stanchions and grab-rails shall be provided for the safety of the standees and for ingress and egress. Grab-rails and stanchions shall be 1¼ to 1½ inches in diameter and be made of textured, stainless steel that forms to the hand or utilizes a padded hand hold. Stanchions and grab-rails shall have at least 1½ inches of knuckle clearance.
- B. Passenger assists shall be convenient in location, shape and, size. Where practical, starting from the entrance door and moving anywhere in the coach, a vertical assist shall be provided either as the vertical portion of seat back assist or as a separate item so that a passenger may easily move from one assist to another using one hand or the other without losing support. Vertical stanchions in front of the longitudinal seats shall

not be positioned so as to interfere with passenger seating space.

- C. Grab-rails and stanchions shall be properly supported and held in place according to industry standards. Fittings and fasteners used shall be stainless steel.
- D. Stanchions and grab-rails shall be located as follows:
 - 1. Two (2) ceiling grab-rails, one on each side of coach aisle way even with aisle edge of seats. They shall extend from front to rear of coach, except for the gap at the rear door. Upper level of the first floor: there shall be no requirement for these on the upper level as the seating arrangement shall have handles incorporated for this purpose.
 - a. All stanchions and grab rails shall be one and one quarter (1¼) inch diameter, stainless steel. Fittings shall be stainless steel, or an approved equal corrosion resistant material. Stop request buttons shall be mounted on stanchions and one centrally located on the wall of each wheel chair position easily accessible to someone seated in a mobility device.
 - b. Grab rail ends shall terminate at ceiling connections or in elbows, and there shall be no exposed ends.
 - c. A diagram of proposed stanchion locations with proposed passenger seating diagram shall be provided. Number and location of stanchions shall be subject to approval by the Participating Agency. All stanchions and grab rails must comply with any ADA requirements where applicable.
 - d. If these cannot be installed due to lack of head clearance, then, at a minimum, each and every forward or rear facing passenger seat shall have hand holds at the top of the back rest on the aisle side.
 - 2. Stanchions on aisle side at all barriers, from ceiling to floor.
 - 3. Diagonal grab-rails on both sides of the front door.
 - 4. Stanchions and grab-rails at top of stepwells in stepwell area to aid in ingress and egress.
 - 5. Vertical stanchions shall be placed so as to aid in passenger safety during standing load operation.
 - 6. A horizontal passenger assist across the front of the coach to prevent injuries on the farebox or windshield in the event of a sudden stop and shall be able to allow passengers to lean against it for assistance and security while paying a fare. This is an ADA requirement.
 - 7. The vehicle stanchion behind the driver shall terminate at the lower edge of the aisle-facing seat or be dog-legged, so as not to

impede or interfere with wheelchair footrests as per ADA requirements.

8. Floor to ceiling, or approved design of, stanchion shall be provided at the rear of the lower level to assist passengers on and off of the Chesterfield (most rear) seating area without restricting passenger movement.

2.02.22 **Interior Ancillary Features**

A. Fire Extinguisher

1. Manufacturer shall furnish, and install, a 5-lb., dry chemical extinguisher Ansul No. A5 extinguisher with "FORAY" dry chemical and 20-inch hose assembly. It shall have U.S. DOT certification tag attached to extinguisher at time of acceptance. If fire extinguisher is mounted in a storage compartment, compartment shall be clearly labeled "fire extinguisher inside".
2. The fire extinguisher shall be located in easily accessible location. Mounting of the extinguisher shall be rigid and such as to prevent vibration, noise and accidental discharge. Fire extinguisher shall be mounted to allow easy and timely access by the driver. Location shall be approved by the Participating Agency.

- B. Manufacturer to supply #798, safety, reflective-triangle kit in each coach. The kits shall be mounted in an equipment box, in close proximity to the operator (position and box size to be approved by the Participating Agency before production).

2.02.23 **Interior Decor**

The interior decor plan shall be provided to the manufacturer prior to manufacture of coaches.

2.02.24 **Passenger Seats**

- A. Passenger seating shall be American Seating, recline design or approved equal. Upper level seating equipped with a storage net fastened on the rear back of the seat for patrons behind to store carry-ons, such as computers, purses, etc. All passenger seating shall be covered with a high standard fabric for vandal resistant and or damage hiding characteristics. The fabric shall be black E-Leather.
- B. All passenger seats shall be equipped with a hand-hold on the aisle side and shall be certified as having passed the testing requirements as specified in the FTA White Book regarding the purchase of Advanced Design Coaches and all test results and documentation shall be submitted to the Participating Agency at the time of delivery.

- C. All passenger seats shall have beverage holders attached to backside of seat back or approved area in near vicinity where applicable.
- D. Final seat configuration shall be discussed during pre-production. The basic design and layout shall be as follows:
 - 1. Seats shall be the cantilever style throughout both levels of coach, where applicable. Where cantilever cannot be installed, then pedestal style shall be substituted.
- E. Proposer shall provide a full technical description of seat arrangement proposed, including dimension for hip to knee room, spacing, and side view, and any alternate layout the Proposer may wish to include for consideration. Information must include price adjustments for alternate seating plans. Final seating plan shall be determined at pre-production.
- F. A minimum twenty (20) inch wide center aisle shall be maintained.
- G. All concealment areas behind and between the seats shall be closed out for security purposes to eliminate the ability for any placement of devices or objects.
- H. The upper rear portion of the seat back, seat back handhold, and upper rear surface of the modesty panels located immediately forward of transverse seats shall be padded and/or constructed of energy absorbing materials. During the 10g deceleration the HIC number shall not exceed 400 for passengers ranging in size from a six (6) year old child through a 95th-percentile male. The minimum radius of any part of the seat back, handhold, or modesty panel in the head or chest impact zone shall be a nominal ¼ inch.
- I. All materials, as applicable shall conform to the flammability and smoke emission standards in accordance with the DOT and FTA Recommended Fire Safety Practices for Transit Bus and Van Material Selections as contained in the Federal Register, Volume #58, #201 dated Wednesday, October 20, 1993 or as currently amended.
- J. **Seat Mounting**
No obstructions will be permitted which might narrow seating ability. Height of seat from floor will not exceed seventeen and one-half inches (17 ½) for transverse seats, nineteen inches (19) for settee and flip-up seats, and seats over wheel wells shall not exceed twenty inches (20). Deviation in seat height from floor will be permitted for proper seat alignment to belt rail. All seat subframes should be mounted without stress or strain, and in no case shall seats be installed so that any

passenger extremity can be caught. All fastenings shall be tamper-proof and neat in appearance. Recessed seat tracks for transverse seats shall be heavy-duty anodized aluminum; side wall seat rails shall be anodized aluminum.

- K. The seats, under all conditions of occupancy, shall be of a design to minimize dirt catching projections.
- L. Rear seats shall be spaced out evenly, and hinged to provide easy access to engine compartment.
- M. Under seat area will be properly dressed to facilitate cleaning; projections or ledges are not permitted. Space in back of, between, and at the ends of seats shall be such as to prevent the accumulation of rubbish or other debris.

2.02.25 Accessible Seating

- A. On all buses, the first two (2) sets of passenger seats to the rear of the left and/or right forward wheel chair positions (dependent on seating layout) shall be of a folding type, such as that manufactured to accommodate most Personal Mobility Aid Devices (PMAD)/mobility device or four passenger longitudinal fold-up, barrier type. The seats shall be American Seating or approved equal and shall be upholstered in same design, color, and material as other passenger seating. The folding mechanism of the seat frame shall be easily activated and positioned by PMAD/mobility device passenger to accommodate a PMAD/wheelchair in a secure manner for traveling.
- B. The folding seat may be longitudinal. Transporting position for PMAD/wheelchairs shall be forward facing. The folding seating shall be mounted to bus wall and also to bus floor, with an inch square stainless steel tubular leg on aisle end. Such legs shall be securely mounted to bus floor. Folding seat(s) shall have a positive locking mechanism to maintain seat in upright and normal positions until released by an individual.
- C. The area designated for PMAD/mobility device passengers shall be located a sufficient distance from longitudinal seats, wheel housing, stanchions, or other obstructions to permit easy access and necessary room for maneuvering by PMAD/mobility device passengers to and from PMAD/wheelchair tie-downs.

2.02.26 Operator Seat/Compartment

- A. Operator's Seat
 - 1. The operator's seat shall be a Recaro Ergo Metro with headrest,

high back, dual air lumbar, air operated side bolsters, air operated fore and aft slide. Driver's seat to come equipped with a 2 point 78" seat belt that pulls from left to right, and built-in maxi alarm indicating that the maxi brake has not been applied when driver takes pressure off the seat, regardless of master switch position; seat belt alarm may be acceptable. Photo electric eye is not acceptable. Seat shall be upholstered in black vinyl with an upgraded Silicon seat cushion.

2. The seat shall be fully adjustable fore and aft with minimum nine (9) inch travel. Seat shall be provided without arm rests.

B. Compartment and Instrument Panel

1. The intent of this section is to require the manufacturer to supply state of the art ergonomics engineering to the coach operator's environment so as to maximize driver comfort and ease of operation for extended periods of time.
2. All switches and controls necessary for the operation of the coach, including Door Master, 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, J287, Driver Hand Control Reach. Controls shall be located so the boarding passengers may not easily tamper with control settings. A complete drawing/layout of the driver's compartment shall be included with proposals.
3. The instrument panel shall be illuminated and located directly in front of operator's seat for easy reading. Speedometer shall have prominent markings in Miles per Hour (MPH).
4. Instrument Panel shall include the following;
 - a. Voltmeter
 - b. Coolant temp gauge
 - c. Fuel gauge
 - d. Two (2) air gauges (150 psi) (Engler, VDO, Forster, or approved equal), to monitor Primary and Secondary air pressure.
 - e. Speedometer/odometer driven by the transmission electronics.
 - f. Telltale lights to indicate door unlocked (emergency door unlatched if door is required), stop lights on, headlight high beam on, auxiliary heater)
 - g. Transmission and engine microprocessors (amber indicators for check engine or transmission, red for shutdown modes)
 - h. Low air pressure warning audio and visual

- i. Air-conditioning malfunction
 - j. Directional signal action
 - k. Indicator light warning failure of 12 Volt system, if battery equalizer fails
 - l. On-Board Diagnostics
5. The bus shall be equipped with an on-board diagnostic system that will indicate conditions that require immediate action by the operator to avoid an unsafe condition or prevent further damage to the bus. This diagnostic system shall have visual and audible indicators. The diagnostic indicator lamp panel shall be located in clear sight of the operator but need not be immediately in front of the driver. 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. The audible alarm shall be tamper resistant and shall have an outlet level between 80 and 83 dBA when measured at the location of the operator's ear. Wherever possible, sensors shall be of the closed circuit type, so that failure of the circuit and/or sensor shall activate the malfunction indicator.
6. Malfunction and other indicators listed in the following table shall be supplied on all buses and protected from direct light to assist in the viewing of the indicator lights with a visor or approved. Space shall be provided on the panel for future additions of no less than three (3) indicators as the capability of on-board diagnostic systems improves.

VISUAL INDICATOR	AUDIBLE ALARM	CONDITION OR MALFUNCTION
ABS	None	ABS System Malfunction
A/C STOP	None	Compressor stopped due to high/low pressure or loss of refrigerant
CHECK ENGINE	None	Engine Electronic Control Unit detects a malfunction
CHECK TRANSMISSION	None	Transmission Electronic Control Unit detects a malfunction
FIRE	Bell	Over-temperature condition in engine compartment
GENERATOR STOP	None	Loss of generator output
HOT ENGINE	Buzzer	Excessive engine coolant temperature
LOW AIR	Buzzer	Insufficient air pressure in either primary or secondary reservoirs
LOW OIL	Buzzer	Insufficient engine oil pressure

7. Engine shutdown with spring-loaded overrule toggle switch or

push-button (momentary-on) shall be provided for the following engine and transmission conditions:

- a. Low Oil Pressure (Engine)
 - b. High Coolant Temperature
 - c. Low Coolant level (Shutdown shall not occur until after thirty (30) seconds duration)
 - d. High Transmission Oil Temperature
8. A front control switch panel shall be located in a panel directly to the left of operator and shall be designed for simplification of electrical controls and shall be inclined for easy access to control switches. Top surface of control panel shall have main, control or master switch with four positions;
- a. "ENGINE STOP"- All systems "OFF", **EXCEPT** power available for interior, stop, turn and hazard lights, silent alarm, horn and Farebox
 - b. "DAY RUN" - All systems and engine "ON", **EXCEPT** headlights, park, tail and marker lights
 - c. "NIGHT PARK" - All systems "OFF", **EXCEPT** those listed in Engine Stop and power to radio and marker lights
 - d. "NIGHT RUN" - All systems and engine "ON"
 - e. Or approved equal system
9. A separate switch shall control operator's heater and defroster motor. Engine starter switch shall be push button type. Normal control of all electrical units, except stop lamps, turn signals, hazard flashers, horn, and destination signs, shall be obtained through positioning of main control switch. Toggle type switches for alternate control of interior and sign lighting, passenger buzzer, and any special equipment shall be installed.
10. Both front and rear control panels shall be hinged from the top and shall be equipped with door gas props. A side hinged panel shall be permissible with gas filled props only.
11. Starting motor switch is to be wired so that engine cannot be started when bus is in gear. Delco Starter or approved equal must have over crank protection built in to the starter housing.
12. An operators "911" (covert alarm) switch shall be installed at a location approved by the Participating Agency; this switch will activate the covert alarm on the Trapeze AVL system. It will also activate the emergency message on the Twin Vision destination sign. Switch will be shielded type with inset button – Trapeze supplied. An operators "alarm event/power indicator" switch will be installed; this switch will mark an alarm event on the Seon digital video recording equipment. It also indicates recording and power status – Seon supplied.

C. **Marking of Controls**

All operating controls, light switches, and controls for auxiliary equipment shall be clearly and permanently marked and identified by means of metal or oil resistant plastic identification plates. The plates or stamping shall spell out, in American English, with lettering filled with contrasting color paint, the words of the system or function. All switches shall be rotated or flipped in the same direction for the On and/or Off positions.

2.02.27 Bike Racks

There shall be an option for a bike rack system to be provided with each coach. The mounting hardware shall be mounted on/in/around the front bumper before shipment and the rack shipped to the property inside each coach. This system shall consist of the following:

- A. Bike Rack system shall be the Sportworks, DL3 Trilogy or approved equal that does not impede the headlights or turn signals in either the stowed position or lowered position.
- B. Shall be stainless steel and plastic construction.
- C. Shall have guards for protection of bike to ground as well as wash rack damage. Shall have instruction decal as per the Participating Agency's design.
- D. Bike rack shall not have to be removed for towing of the vehicle.

SECTION 2.03 WHEELCHAIR RAMP

2.03.01 General Specifications

- A. The wheelchair ramps shall meet all the requirements of this specification and any other specifications of a coach manufacturer that may be outlined herein or included herein by reference. The wheelchair ramps shall comply with all ADA requirements. There shall be a ramp located at the front or entrance door.
- B. The ramps shall be capable of operation with or without the coach-kneeling system activated; however the coach shall not be capable of kneeling once a ramp is deployed.
- C. The ramps shall be capable of stopping and reversing direction at any point during operation. The ramp operational pressure should be as low as possible to prevent injury to a person if contact is made.

- D. General layout and basic operation to follow and details to be discussed at pre-production.
 1. The ramp shall have operational switches on the right side of dash for operator to use and shall not be enabled until front door is open.
 2. There shall be a manual operation that is easily used and takes less than 25 lbs. of force or pressure to operate.
 3. Center and rear axle brake interlock shall be activated whenever the ramp is deployed or deploying.
- E. Ferrous materials shall be coated or plated, or consist of an anti-corrosive nature.
- F. All ramp, door, and securement requirements shall meet or exceed ADA specifications.

2.03.02 Ramp and Associated Units

- A. Accommodations
Space and body structural design shall be provided at the front door of the coach to accommodate a wheelchair ramp. The ramp should be rated at a minimum of 750 lbs. total capacity. If rated higher, the data shall be provided.
- B. Loading System
When the coach is equipped with the loading system, the normal door width, door operation or other specified dimensions shall not be compromised. When the system is not in use, the passageway shall appear normal and no portion of the entrance area shall move when the doors open. The controls shall be simple to operate with no complex phasing operations required and the loading operations shall be under the surveillance and complete control of the driver. The coach shall be prevented from moving during the loading or unloading cycle by a throttle and brake interlock system. The incorporation of the wheelchair system shall not present a hazard, nor inconvenience any passenger. The wheelchair platform area shall be no less than 32 inches clear width. The wheelchair platform shall be a minimum of 55 inches in length.
- C. The device shall not retract or fold when a passenger is on the platform. A passenger on the platform shall be able to easily obtain support during the entire loading or unloading operation by grasping the passenger assist rails located on the doors or other assists provided for this purpose. The passenger assists shall allow a minimum of 32 inches of boarding clearance on the ramp. The platform shall be designed to protect the device from damage and persons on the sidewalk from injury during

deployment of the ramp. The surface of the ramp shall be covered with a replaceable or renewable nonskid material and shall be so designed to prevent the wheelchair from rolling off the sides during loading or unloading. The edges of the ramp shall be painted yellow on both inner and outer edges.

- D. Deployment or storage of the lift or ramp shall require no more than 5 ½ seconds. The device shall function without failure or adjustment for 500 cycles or 10,000 miles in all weather conditions on the design operating profile when activated once during the idle phase. A manual override system shall permit unloading a wheelchair and storing the device in the event of a primary power failure. The manual override system shall be as simplistic as possible, such as a grab strap.

- E. Power Source
The power source, hydraulic and/or electric shall be an independent system not associated with the power steering pump and controls.

- F. Wheelchair Accommodations
There shall be two (2) wheelchair securement positions as close to the Ramp assembly as possible and shall be outfitted with a stowable securement system, American Seating ARM with "Y" belt, a four point securement system including QJStraint securement loops, or approved equal. When secured, the wheelchairs shall be forward facing. Seating shall be replaced or modified to provide the necessary parking space and stowed tie down equipment. OEM shall provide details at time of pre-production to see what options are or may be available. The exit signal shall be a maximum of 4 feet above the floor in this area. Maneuvering room inside the coach shall accommodate easy travel for a passenger in a wheelchair from the loading device through the coach to the designated parking area. No portion of the wheelchair or its occupant shall protrude into the normal aisle of the coach when parked in the designated parking space(s). The coach floor surface in the parking area shall be covered with a replaceable or renewable nonskid material such as specified flooring material. No width dimension shall be less than 48 inches. Areas requiring 90-degree turns of wheelchairs should have a clearance arc of a minimum 42 inches. In the parking area, where 180-degree turns are expected, minimum space should be clear in a 68-inch diameter circle. Approximately 18 inches of vertical clearance above the floor surface shall be provided on the outside of turning areas for wheelchair foot rest clearance. The basic design and layout is to have chairs enter the #2 or second door and exit the front door. The proposer shall provide a plan including layout drawings for entry, maneuvering, parking and exiting of wheelchair passengers for the Participating Agency's review and

approval.

- G. Restraint/Securement Systems - Contractor shall furnish the American Seating ARM with "Y" belt securement, or approved equal.
- H. Wheelchair Securement Device
The wheelchair securement system shall be a four-point securement type. The rear straps shall be inertial/self-retracting. The front straps shall have a retractor release button and a tensioning knob. All straps shall have a seat belt type attachment (Y-belt). No J-hook or S-hooks shall be accepted on the wheelchair securement end straps. Straps shall be mounted with appropriate hand clearance to operate tensioning knobs and retractor release buttons as necessary. The system shall allow unobstructed access of the wheelchair into the securement area. Straps shall not slide into the aisle when not in use.
- I. Passenger Restraint Seat Belts
The passenger restraint shall be a seat belt/shoulder harness with an inertial/self-retracting belt design. The straps shall be of sufficient length to secure the passenger in the wheelchair when the wheelchair is mid-way between the front and rear wheelchair securement straps. The straps shall be equipped with a device that prevents them from sliding into the aisle when not in use.
- J. When platform is in its closed state, the passenger assist shall be available for use and safety.

2.03.03 **Physical Parameters**

- A. The ramp and controls shall operate within temperature ranges required for the transit coach.
- B. Platform capacity (design load) shall be 750 pounds minimum.
- C. A complete operating cycle for passenger loading or unloading shall be capable of being accomplished in 30 seconds of motion time.

2.03.04 **Safety Requirements**

- A. Wheelchair ramp control interlock shall be integrated with coach brakes and accelerator to prevent coach movement during operation. Interlock circuits shall be furnished by the coach manufacturer.
- B. Wheelchair controls shall be interlocked with door controls to provide a door "open" enable circuit and to prevent door closure until the ramp has returned to the (stowed) position. An electrical circuit shall be provided

to the coach when the ramp is not fully stowed. This circuit shall be utilized to maintain the coach door and accelerator/brake interlock circuits. Also the controls shall be wired so that it shall not operate unless the transmission is in neutral and interlock and parking brake engaged.

- C. Side barriers shall protrude a minimum of 1 inch above the step tread surface and shall be painted "yellow".
- D. Safety barrier to prevent the wheelchair from rolling off the sides of the platform shall not retract in the event of system failure.
- E. A manual system shall be capable of deploying (lowering) and stowing (raising) the wheelchair ramp. This manual method shall be capable of being operated by the driver as stated in 2.03.01 D 2.
- F. There shall be a minimum of a two inch circular light on the outside of the front door on the side of the coach. This light shall have a wheelchair symbol incorporated in the lens and be of an amber color. It shall flash when coach is knelt as well as when ramp is in operation.

2.03.05 Construction, Materials and Components

- A. The ramp assembly shall be a complete unit containing hydraulic components and lines and all electrical components and wiring. Hydraulic and electrical input shall be terminated in a location as specified by the coach manufacturer.
- B. Ramp, in stowed position, shall be covered with coach flooring material or material that is consistent with the entire coach interior. The ramp shall have yellow nosing and yellow at the leading edge, both of which you will see in stowed position. In the deployed position, the ramp shall have a non-skid surface and also have yellow on leading edge as well as sides to mark edges.
- C. Approach ramp of the platform shall be covered with replaceable or renewable non-skid material.
- D. Platform surface shall be even and straight.
- E. Mounting provisions shall have a minimum horizontal adjustment capability of ½ inch.
- F. The ramp shall be capable of adjusting to match the coach floor height.
- G. Basic lift or ramp structure: The basic frame structure shall have a safety

factor of a minimum three times the design load when material ultimate strength values are utilized.

- H. Moving load-carrying members: The mechanical linkage moving parts shall have a safety factor of a minimum six times the design load when material ultimate strength values are utilized.
- I. The ramp shall withstand, without permanent deformation, a static load of a minimum three times the operating design load. This load shall be equally distributed over the ramp surface.

2.03.06 Hydraulic Controls and Components

- A. A hydraulic pump assembly shall be utilized to provide a minimum of 4 gallons per minute at 1750 psi.
- B. Noise levels shall not exceed 75 dB, near the pump or ramp mechanism, during any phase of operation, deployment or stowing.
- C. All hydraulic components and controls shall be industrially rated, and the rating shall exceed maximum system pressure.
- D. All electrically operated hydraulic components shall operate on nominal 12 or 24 + 10% VDC electrical system.

2.03.07 Electrical Components

- A. Circuit design shall allow safe operation of the wheelchair system at all times.
- B. The physical configuration of the electrical control design shall be relay or solid state, operating from the coach battery power system. The control components shall be capable of operating for the service life of the coach.
- C. Indicator lights or lighted switches shall be incorporated into the controls, and shall identify the following function:
 - 1. W/C Stop Request
 - a. This shall be accomplished by way of the yellow square push style button attached to sidewalls and/or bottom of the flip-up seat in the w/c securement area.
 - 2. Ramp Deployed
- D. Electrical controls shall be capable of handling loads in each circuit.

2.03.08 Control Logic

- A. Logic shall be of the command feedback (action/position) type. Loss of

electrical power shall not permit an unsafe condition to exist when power is restored.

- B. All functions shall be controlled with a momentary type switch, which shall be maintained in the "on" position by the driver and shall be spring-loaded to the "off" position.

SECTION 2.04 ELECTRICAL, ELECTRICAL COMPONENTS, AND WIRING

2.04.01 Wiring

- A. A Multiplex electrical system consisting of but not limited to: bus mounting card cage with power supply, processor and network card(s) and a mix of input and output cards, block input/output module(s), or approved, located throughout the bus typically two in the side console, and one in the dash and exit door compartments, to have configuration capacity of thirty two (32) point blocks. The engine, transmission and climate control systems are to be controlled by their own dedicated control system, but all other systems are controlled by the Multiplex system. This includes all lights, doors, engine starting and fast idle controls, lifting and kneeling, retarder and climate control interfaces, etc. Each switch or other input device and each light, valve or other output device is to be wired to the closest input or output card or block. Each input or output point is to have a status LED.
- B. The control logic is to be software based. The documentation for the logic shall consist of ladder logic with each device identified by name and logical address. Comments describing the program are to be included where necessary before each rung of the ladder. This documentation in conjunction with the status LED's are for ease of rapidly troubleshooting the bus.
- C. The system shall be capable of being displayed, modified and diagnosed via a personal computer, utilizing user friendly, menu driven software program. This program shall also be used for troubleshooting by providing real-time information on the status of each input and output, and can be used to force inputs and outputs on or off. It shall also be used to modify timer values.
- D. The system and all wiring provided shall be completely modular for expansion. All input/output modular blocks, if required, and other system components shall be easily removable and changeable, including the dash area. All wiring to the system shall be via removable terminal blocks so a defective unit can be changed without having to disturb any wiring.

- E. The Proposer is to furnish the Multiplex diagnostic programs and any software/firmware required to diagnose, operate and maintain the electronic systems on the buses. The Proposer shall provide all required registration(s)/license(s) and ongoing support for each software package as required. Local training for this system shall also be provided as part of vehicle orientation for the maintenance staff.
- F. All wiring shall be vinyl insulated or both vinyl and fabric insulated and permanently color coded for ease of identification. The engine compartment wiring insulation (except wiring for lights) shall be cross link or cross grain polyethylene, or approved equal. The engine compartment wiring shall be permanently numbered and permanently color coded. The interior light wiring shall be two layer cross link or cross grain polyethylene insulation or aircraft type high voltage wire. The battery cable shall be 4/0 gauge, with minimum of 0.075 inch wall plastic insulation or cross linked polyethylene or approved equal. Cable may be 3/0 gauge for 24 volt applications.
- G. The main wiring harness shall be loom covered and concealed within "C" shaped channels of mainframe or bus body for protection from the elements. All harnesses and wiring shall be securely retained by rubber covered clips or solid nylon straps. The wiring shall terminate at appropriate junction terminals set in Bakelite or molded plastic material. All wiring end connectors shall be of the soldered or machine crimped insulated type. Wiring cables larger than No. 10 will be equipped with soldered or machine-crimped terminals. All circuits shall be protected by manual, reset-type circuit breakers, except the speedometer, backup lights, and engine compartment lights which may use a line fuse. Automatic reset circuit breakers may be used for starter solenoid, headlamps, and dashboard area lights.
- H. Multiple plug and receptacle-type connectors shall be provided to permit rapid disconnect of multiple circuits for engine, closure door wiring, and directional signal switch. Screw terminals for power leads shall be permitted for directional signal switches.
- I. All wiring harnesses shall be designed for this bus and contain only wiring for units thereon, plus sufficient extras for future use. There shall be different colors for every system with a minimum of five (5) color coded wires shall be installed in the wiring harness that runs from the rear compartments to front operator console. Universal type wiring harnesses will not be accepted.
- J. Proposer shall provide an operator's electrical panel terminal block which

shall be accessible from an internal/external access door. External door shall be hinged at top, with door prop up and secured with 5/16" square key locks.

- K. Multiple plug connectors outside the interior of the bus must be totally weather-proof (i.e., water, dust, moisture) type. EXAMPLE: Body harness to DDEC III controls. There shall also be installed a jump start connection, (Red Connector), in engine compartment, battery compartment or switch box, with easy accessibility; location shall be approved by the Participating Agency prior to build.
- L. Fare collection system shall be supplied by and installed at the Participating Agency's designated facility. There shall be power and ground run to the farebox pedestal through a shielded cable. It shall be a twelve (12) volt, 15 amp protected supply and have battery ground as well a chassis ground. It shall be protected with its own circuit breaker. The cable end shall have the proper connector used on GFI fare collection systems. 12 volt power supply shall be disconnected when main battery switch is off.

There shall be power and ground run to the right side dash area (for the GO-TO Smartcard reader) through a shielded cable. It shall be a twenty-four (24) volt, 15 amp protected supply and have battery ground. It shall be protected with its own circuit breaker. No cable end is necessary. 24 volt power supply shall be disconnected when main battery switch is off.

2.04.02 Junction Boxes

All relays, controllers, flashers, automatic circuit breakers and other electrical components shall be mounted in vibration free and easily accessible junction boxes. If the boxes are mounted externally to the coach, they shall be sealed to prevent moisture from normal sources from entering the boxes and to prevent any fires that may occur inside the boxes from propagating outside the boxes.

2.04.03 Components

- A. Alternator
 - 1. A belt driven with constant self-tensioner alternator is required for the system on the coach. The alternator shall be a Delco Remy 50 DN, 24-volt, 270 ampere (maximum rated output alternator which produces 208 amperes at 500 R.P.M.) at a minimum or approved equal.
 - 2. A fast idle device shall be installed to increase engine speed and

alternator output with a minimum engine RPM of 900.

3. Charging system shall have overcharge protection through the coach electronic system rather than a fuse.

B. Horn

1. Minimum dual heavy-duty 12-volt or 24-volt horns shall be furnished and installed so as to be protected from wheel wash. Horns shall have loudest available pitch.
2. Horn shall be activated by a button located in the center of the steering wheel. It shall be installed to keep transfer punch debris from falling into or collecting under the button, making horn inoperative.
3. The horn shall be two tone (1 horn high, 1 low) and easily distinguishable from a standard automobile or truck and have a pitch that is in compliance with FMVSS.

C. Starter

1. The starter shall be minimum 24-volt and capable of turning the engine over under all climate conditions encountered in Minnesota.
2. The starter shall be designed to work with a solenoid. The solenoid switch shall be interlocked so that:
 - a. Engine can be started in neutral position of the transmission control only, in accordance with FMVSS 102.
 - b. Starter shall not operate when engine is running.
 - c. Other major electrical loads are disconnected while cranking.

D. Passenger Stop Signal

1. The passenger's stop signal shall be a single tone solenoid type chime that is audible both to the driver and passenger and a "Stop Requested" sign. The chime shall only sound once until reset by opening and closing the doors. The chime "tone" shall be set to the highest level.
2. The stop requested signs shall be electronic LED signs with Amber or red lettering as will be discussed at pre-production meetings. These signs shall illuminate "Stop Requested" when the passenger chime is activated and remain on until entrance/exit door is opened. These signs shall be capable of incorporation into our AVL electronic system.
3. The signal shall be activated by passengers utilizing electric switch system. Switches shall be located at each and every passenger seat as well as on or around lower deck front stanchions for standee and some seated passengers to reach. Each and every

switch/button shall be red in color. The exact location of added switches shall be discussed at pre-production meetings.

4. Stop request shall have an indicator light on dash that is in dissimilar color to distinguish from other lights. Chime shall have a disable switch on side panel, and shall have a reset switch to reset the chime system.
5. Coaches shall also have stop requested signs and an audible chime on the upper deck in addition to the lower deck as stated in number 2 above.
6. In the wheel chair securement area, a touch pad mounted on either the bottom of a flip seat, or in reach of a person sitting in a wheel chair shall be supplied for each wheel chair position.
 - a. This touch pad shall have the standard W/C symbol embossed in the pad.
 - b. There shall be a separate light on the dash, (different color) indicating WIC stop request.
 - c. The passenger stop request chime will chime twice when a W/C pad switch is touched.

E. P.A. System

A complete P.A. system, compatible with the Participating Agency's APTS system, shall be installed consisting of one amplifier minimum 12-volt, negative ground installed in the driver's compartment in such a manner so as to not interfere with drivers when they adjust the driver's seat or operate the emergency brake or other switches or items in the compartment. The system shall include, but not limited to the following:

1. REI System.
2. No less than eight (8), ceiling mounted, 6 inch, interior speakers and one exterior speaker shall be supplied. The interior speakers shall have a minimum of four per level and the exterior speaker shall be mounted above or by front door.
3. Operation of the P.A. system shall be controlled by a gooseneck microphone mounted for easy use by the driver during operation of the bus. P.A. system shall also be equipped with an external access port for hand held microphone.
4. PA system shall function with the master switch in the "Run," "Park", or "Night Run" positions.
5. PA system amplifier shall be compatible with and shall be able to be hooked up to an AVL Electronics System.

F. Complete Transitmaster VI/IVLU system with:

1. Data radio with GPS & WIFI mounted to slide out trays located within forward staircase compartment.
2. Three (3) antennas (data radio, WIFI, GPS)

3. MDT located on dash, right of driver.
4. Driver's speaker and covert switch-integrated to twin vision emergency alarm switch.
5. Automatic passenger counter.
6. To include loaded voice file on the VI/IVLU and interior led signage will be integrated into upper and lower deck front header panels behind glass screens for hearing impaired.
7. Serial cable from VI/IVLU and 24v ignition power (to stay live 40 minutes after coach ignition is turned off) to front entrance dash for go-to reader - include rail to mount go-to reader

2.04.04 Batteries and Battery Compartment

- A. The batteries and starter cable shall be properly bracketed and sized to carry maximum loads that may be encountered.
 1. Terminals shall be crimped and soldered to the cables.
- B. OEM shall furnish two (2), 8D style, 12-volt batteries.
 1. Battery specification shall be:
 - a. 8D-C E/O
 - b. CCA 1400 for 30 Sec. @ 0 degrees F.
 - c. CA 1750 for 30 Sec. @ 32 degrees F.
 2. Each battery shall have a minimum of 1400 ampere hour rating.
- C. A battery equalizer shall be installed to provide proper charging voltage to both batteries and still maintain each battery independently. Equalizer shall be protected by a circuit breaker or other approved electrical type equipment to disconnect power in case of failure. Equalizers shall be mounted in a location away from the heat of the engine, preferably in a compartment that is cooled by the bus air conditioning system.
- D. Batteries shall be mounted in a slide out, stainless steel tray or approved equal, for ease of maintenance. The tray and batteries shall be mounted in a manner consistent with protecting the batteries from accidental grounding or shorting. Batteries shall also be secured to the tray with Nylon block or approved equal.

2.04.05 Battery Disconnect Switch

A master battery switch shall be provided near the batteries in the battery compartment, mounted to prevent corrosion, for complete disconnecting from all coach electrical systems, with exception to equipment that must remain energized. The equipment mentioned shall be spelled out and agreed upon at pre-production. The master switch shall be capable of carrying and interrupting the total circuit load.

Opening the master switch with the power plant operating shall not damage any component of the electrical system but shall shut the engine down. Fusible link shall be installed between batteries and alternator main power supply cable. Master battery switch shall be accessible during an emergency through an access door located in the battery compartment door which shall be clearly labeled, "Master Battery Switch Disconnect". Switch location shall be approved by the Participating Agency prior to installation.

2.04.06

Interior Lighting

A.

Passenger Lighting

1. LED lighting, as designed by Pretoria, latest design, or approved equal, shall be installed in the cove area on both sides and along the total length of the coach on both levels. Light fixtures shall be front lighted. Lighting fixture shall not compromise the minimum interior headroom.
2. Lighting lenses shall be made of polycarbonate material and be sealed to prevent the entrance of dust and insects but shall be easily opened for cleaning and service of the LED's.
 - a. The lenses shall be of the small rib design to help disperse light evenly.
 - b. The lenses shall have a blue tint.
3. The power for these LED lights shall be programmable through the PLC system.
4. Interior lights shall not be controlled through the run switch and shall be operative without the engine running at one-half, three-quarters, or full position.
5. In night position, first and second lamps on both street side and curbside, lower level shall operate only when front door is in the open position.
6. One (1) driver's compartment light lamp shall be mounted above steering wheel to illuminate entire driver's area. Switch shall be rheostatically controlled by a Colehersee part #7488-03 switch or approved equal and situated with other interior lighting switches on driver's side control console. Driver's light shall have full range of dimming from light "out" to "bright".

B.

Stepwell and Curb Lights

1. All stepwell/door threshold areas shall be illuminated to a minimum of 5 foot-candles. Ground surface for a distance of 3 feet from bottom step edge outward in all directions shall be illuminated to a minimum level of 2 foot-candles light source.
2. The stepwell lights shall be activated only when the doors are in an open position.

3. Stepwell lights shall be shielded to prevent light from directly shining into passenger or driver's eyes.
4. Light fixtures shall be LED and 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.
5. Stepwell lights shall be protected from damage caused by passenger kicking the lenses or fixtures and shall not be a hazard to passengers.
6. All lights shall be of LED style.

2.04.07 Exterior Lighting

- A. All exterior lights shall be L.E.D. and shall meet State and Federal Department of Transportation requirements.
- B. Headlamps required shall be equipped with high and low beam controlled from foot switch on floor that is sealed and protected from moisture; the foot switch shall be located to the left approximately 6 inches behind the left turn signal switch. Sealed beam units shall have a low beam life rating of 600 hours minimum.
- C. An exterior white LED light shall be provided at each door to illuminate the outside area when the door is open (2 ft. candle illumination minimum).
- D. Directional Lighting
 1. Directional signals shall meet all federal, state and local motor vehicle standards. Directional signals shall be operated by foot control switches to the left of the steering column. Also furnished shall be two (2) amber directional lights on each side of coach with metal protective shields, located one (1) above rear duals, and one (1) above front axle, light assembly shall be DELPHI #911062 with Vulcan Guard #2456692 or approved equal.
 2. A hazard-warning switch shall be provided to simultaneously flash the directional lights at the front, rear, sides, and dash indicators of the coach. The hazard-warning switch shall overrule the manual directional switch. When the 4-ways and/or turn signals are operating there shall be an audible alarm indicating the signals are on; the audible tones shall be different in sound between the turn signals and 4-ways. These hazard lights shall not be operated by any means other than the switch.
 3. The hazard-warning switch shall be located on the driver's control panel. The indicator lamps on the dash shall flash when hazard signals are flashing. The switch shall be easily recognizable. If toggle type, switch shall be at least one-half inch longer than

other switches, and shall be mounted as far forward as possible. Hazard switch location shall be approved by the Participating Agency prior to installation.

4. Front Directional Signals shall be minimum 4 inches amber. Rear Directional Signals shall be a minimum of 4 inches amber. Stop/tail lights shall be 4 inches red. Directional signals and stop/tail lights shall be LED based on industry standards.

E. Clearance and Marker Lights

1. Marker Lights - A minimum of four (4) LED marker lights shall be installed, one on each upper corner of the body. The two (2) front fixtures shall have amber colored lenses and the rear fixtures shall have red colored lenses.
2. Identification Lights - A minimum of three (3) LED light fixtures shall be mounted on approximately 6-inch centers, near the top of the roof and centered on the body centerline, on the front of the coach with amber lenses and on the rear of the coach with red lenses.
3. All lens colors shall comply with all federal, state, and local regulations. All lenses shall have smooth outside surfaces to prevent collection of dirt and/or other accumulation.

- F. Reflectors at the front, rear, and on each side of the vehicle shall be provided, with amber front and red rear.

G. Stop, Tail and License Plate Light and Holder

1. In addition to directional signals, rear lamps shall consist of red combination stop/tail lights. The rear tail lights shall be LED style and shall be mounted with nutserts for ease of removal.
2. A third LED Cyclops brake light shall be mounted to the rear of the coach on the engine access door and shall be centered. Its location shall not interfere with the advertising panels. Location shall be approved by the Participating Agency.

H. Back Up Lights/Signal

Two (2) LED back-up lights shall be provided. An approved audible back-up alarm shall be initiated whenever coach is in reverse gear Alarm model and specification shall be approved by the Participating Agency.

- I. All exterior marker/clearance and identification lights shall be recessed or metal shielded to protect from tree limb damage.

- J. All exterior lights shall be able to be tested by pushing both turn signal switches down at the same time. This activates all exterior lights in test

mode for operators to check on walk around. This shall be on timers so as to go to normal operation after a two (2) minute time period or if the vehicle is put into gear.

- K. There shall be a wheel chair symbol light mounted at front door opening and shall be lit upon activation or deployment of the front door ramp, or approved equal, as stated in 2.03.04 F.

2.04.08 Fire Protection, Detection, and Suppression

A. Fire Protection

The passenger and engine compartments shall be separated by a bulkhead(s) which shall be an incorporation of fireproof materials in its construction and 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.

1. Any passageways for the climate control system air shall be separated from the engine compartment by fireproof material. Piping through the bulkhead shall have copper, brass, or fireproof fittings sealed at the firewall with copper or steel piping on the forward side.
2. 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/or bulkhead connectors shall be sealed with fireproof material at the firewall.
3. Engine access panels in the firewall shall be fabricated of fireproof material and secured with fireproof fasteners. These panels, their 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.

B. Fire Detection

An adequate number of fire detection sensors, as determined by manufacturer's engineering design for total system coverage, shall be located in the engine compartment to monitor the major heat sources and fuel storage areas. The system shall detect fires in critical areas, shall activate fast-acting extinguishers which release fire suppression agent to those critical areas, and shall activate the fire alarm bell and fire warning light in the driver's compartment.

1. The system shall also monitor heat levels within the field of view (range) of the sensors and shall activate an overheat alarm to warn the driver of an overheat situation.
2. The system shall return to normal setting and deactivate the overheat alarms when the temperature returns to normal.

3. The system shall have supervision monitoring to indicate operational status of the sensors, harness, and extinguishers.
4. Each extinguisher shall have a pressure gauge which is able to be seen without dismantling of panels or covers.

C. Fire Suppression

The engine compartment, battery compartment and fuel compartment areas shall be equipped with an automatic fire extinguishment system. An Amerex model V-25 ABC Agent Modular Vehicle Fire Suppression System or approved equal shall be the system. The purpose of the suppression system is to ensure bus and passenger safety and survivability in the event of a fire.

1. Sensors shall activate the extinguishers immediately upon fire detection.
2. Automatic engine shutdown shall take place ten (10) seconds after fire detection.
3. The automatic extinguishment system shall use high speed valves, attached to DOT certified bottles.
4. Installation of fire suppression systems into the buses shall be completed prior to delivery of the buses to the Participating Agency. All work shall be performed by certified technicians in fire suppression installation, as determined by the manufacturer.
5. The automatic detection and actuation system shall provide 24-hour fire detection of the engine compartment.
6. The system shall be designed to operate at 12 or 24 VDC and shall not exceed a current draw of more than 0.1 amps.
7. The entire fire suppression system shall be Factory Mutual Research Corporation approved, and the system manufacturer shall provide a \$5 million insurance policy (per vehicle, per incident) to the Participating Agency in the event of system failure and fire damage occurs.

2.04.09 Two-way Voice Radio

Two-way Radio Equipment

EF Johnson 53SL ES Mobile Radio 700/800Mhz VHF/UHF

A 'clean' 12v supply will be provided in the drivers LHS panel. See Section 18.40 for details.

1. Install the "shot glass" type PCTEL MLPV800 low profile vertical 806-960Mhz antenna on roof and run the antenna cable to the radio.
2. Install and mount 2way radio on left hand panel in the area of the left thigh.

3. Wire 12v ign power with 2amp fuse to the radio accessory pigtail with connector.
4. Wire 12v battery power to the radio power cable with connector.
5. Wire a ground to the radio ground cable with connector.
6. Install 2way radio microphone clip.

The radio and communication system shall include several systems and shall be integrated as per the Participating Agency's overall plan.

2.04.10 Digital Video Cameras and CCTV

There shall be two separate systems installed on the vehicles. One shall be a video recorder unit and the other being an operator CCN. Each system shall operate independently and have independent controls. They shall also have separate cameras and view both internal as well as external.

A. Operator CCTV

1. Operator compartment shall have a color monitor installed for viewing and shall be reachable by the operator as seated in driver's seat. At least four camera positions both internal as well as external shall also be installed.
2. There shall be a minimum of three cameras:
 - a. One mounted in rear of coach to view outside and behind the coach. This camera shall also be input into the Seon system for recording purposes.
 - b. One to be mounted in front interior of coach on the upper deck to view upper deck interior passenger compartment.
 - c. One each to be mounted in, around, or above both forward and rear stairways so as to view the staircase and passengers utilizing the stairway.
3. All cameras shall be a concealed miniature and fully adjustable.
4. Monitor screen shall be flat and have an automatic brightness sensor in operation.
5. If software is needed and/or available to trouble shoot and make repairs to the system, it shall be supplied.

B. Digital Video Camera and Recorder

Shall be a Seon DXHD or approved equal with the following provisions:

1. Install a 10 camera Seon DXHD surveillance system to slide out trays located within forward staircase compartment, including:
2. 12 volt ignition power with inline fuse. 12 volt battery power with an in-line fuse.

3. WiFi Smartlink wireless bridge with antenna mounted to roof to allow connection to the VMax Commander. – Seon Provided
4. System signal hook-up to RH Turn, LH Turn, Engine Brake Signal, Hazards, Service Brake Signal.
5. An operators “alarm event/power indicator” switch will be installed; this switch will mark an alarm event on the Seon digital video recording equipment. It also indicates recording and power status – Seon supplied.
6. Install the GPS antenna in front destination sign area or area with view of sky – Seon Supplied

Cameras to be located as follows:

1. Lower Deck Camera 1 (Infrared) shall have a focal length suitable to cover the front of the bus including the front door and steps, fare collection area, operators area and a facial view of boarding passengers.
2. Lower Deck Front Camera 2 (Audio) shall have a focal length suitable to cover the front area of the bus, including passenger seats from the front of the bus to the first rear exit door of the bus.
3. Lower Deck Mid Area Camera 3 (Audio) shall have a focal length suitable to cover the first rear door and steps, center aisle and seats on each side of the rear door and aisle.
4. Upper Deck Front Camera 4 (Audio) shall have a focal length suitable to cover the front area of the bus, including passenger seats from the front of the bus to the rear exit stairway of the bus.
5. Upper Deck Rear Camera 5 (Audio) shall have a focal length suitable to cover the rear area of the bus, to include the rear Stairway entrance and steps, and passenger seats within the rear section of the bus.
6. Upper Deck Front Stairway Camera 6 (Audio) shall have a focal length suitable to cover the complete stairway from entry at the upper deck to exit on the lower deck.
7. Upper Deck Rear Stairway Camera Seven (Audio) shall have a focal

length suitable to cover the complete stairway from entry at the upper deck to exit on the lower deck.

8. Exterior Passenger Side Camera 8 (Infrared) shall have a focal length suitable to cover the complete exterior of the bus from the front facing rear.
9. Exterior Drivers Side Camera 9 (Infrared) shall have a focal length suitable to cover the complete exterior of the bus from the front facing rear.
10. Front Roadway HD Camera 13 (HD) shall have a focal length suitable to cover the road way and bike rake area at the front of the bus. This shall be a high definition camera.
11. Leave a minimum 3 inch clearance between Seon DVR and Cradle Point WiFi router box located within forward staircase compartment.
12. Shall have software supplied for laptop to interface with camera system. This software shall make it possible to have on board viewing, downloading, and system control using a laptop computer.

2.04.11 Passenger WiFi Router

Install a CradlePoint AER 2100 with Two (2) MC400 modems for the Verizon Wireless Network to slide out trays located within forward staircase compartment and power using 12 volt Ign.

SECTION 2.05 MECHANICAL

2.05.01 Power Plant Compartment

- A. The power plant compartment shall be completely sealed to prevent smoke or fumes from entering the bus interior. The power plant bulkhead shall be insulated to minimize heat transference to the interior and shall have the ability to maintain a maximum 20" degree Fahrenheit differential between the power plant bulkhead and the interior of the bus, additionally noise transfer to the bus interior shall not be above 83 +2 db.
- B. The compartment shall be lighted by a minimum of five (5) LED'S producing a minimum of twenty one (21) foot candle power. An additional twenty one (21) foot candle power LED shall illuminate the

rear electrical junction box. LED'S shall be enclosed by a clear high temperature resistant lens.

- C. Small, spring-loaded access doors shall be provided to check and add engine oil and radiator coolant without necessity of opening a large compartment door.
- D. Compartment doors shall be sturdily constructed, well fitted, and reinforced, where necessary, of material and finish harmonizing with other exterior features of the bus.
- E. An oil pressure gauge, coolant temperature gauge, engine "RUN" switch, starter cutout switch, starter switch, lamp switch and throttle control are required in the engine compartment. Throttle control shall be automatically switched to the rear compartment position when the engine compartment switch is placed in the "rear start" position. All engine compartment switches and wiring must be environmentally sealed to keep dust and moisture out.
- F. Coolant temperature gauge shall be moisture resistant and shock-proof.
- G. Doors hinged at top shall be provided with heavy-duty, gas filled lifts equipped with positive means of locking the doors in the open position.
- H. Engine, hydraulic (except power steering), fuel, and oil lines shall be Aeroquip FC 300 Teflon with wire braid and reusable fittings or approved equal.
- I. Electric fuel priming pump with check valve is required in engine compartment. The control switch shall be located on remote control panel in engine compartment.

2.05.02 Engine

- A. The engine shall be equipped with an electronic control module, T-drive configuration, diesel engine established for the use in a transit coach application. The engine chosen shall provide optimum performance. The engine shall provide adequate horsepower and torque to enable the coach to meet the minimum acceleration; top speed and road grade requirements specified. The propulsion system shall have a design life of at least 14 years or 700,000 miles including periodic major overhauls. The engine shall meet all current and applicable Federal and State engine exhaust emission standards.
- B. The engine shall be not less than 8.5-liter, four-cycle unit, complete with

starter, alternator, and air compressor. It shall not have a capacity less than 330 BHP and shall be configured like a Cummins M-11 (ISL for hybrid application) or approved equal. Engine oil pans shall be equipped with a quick drain, style drain plug.

- C. Engine shall be equipped with a positive engine shut down device.
- D. An engine fast idle device shall be electronically operated and controlled by a switch mounted on the dash accessible to the operator only when the shift lever is in the neutral position and shall not be overruled by the accelerator interlock. Fast idle device shall have a setting of 950 RPM.
- E. Two (2) oil filters, full flow shall be required if recommended by engine manufacturer. Filters shall be readily accessible and serviceable. Engine shall be equipped with engine oil dipstick with non-running calibration settings.
- F. Brass hexagon head plugs with standard piped threads for vacuum and pressure gauge connections shall be installed in, or as near as possible to the air intake and exhaust manifolds.
- G. The engine speed shall be set to limit maximum coach speed to 70 mph.
- H. The engine shall be equipped with tachometer adapter or marking for use of an electronic tachometer. Road speed shall be read through engine electronic system.

2.05.03 Engine Maintenance and Service

- A. 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 power plant. Quick connectors shall be utilized on all lines, wherever feasible and possible, for ease when removing power plant. The power plant shall be removable as one complete unit. The muffler, exhaust system, air cleaner, air compressor, starter, alternator, radiator, all accessories and any other component requiring service or replacement shall be easily removable and independent of the engine and transmission removal. An engine oil pressure gauge and coolant temperature gauge shall be provided in the engine compartment. All gauges shall be equipped with maximum indicator pointers. These gauges shall be easily read during service and mounted in an area where they shall not be damaged during minor or major repairs.
- B. All radiator filler caps shall be hinged to the filler neck and closed with

spring pressure or positive locks. The engine oil fill shall be located inside the engine compartment. All fluid fill locations shall be permanently labeled to help ensure correct fluid is added; and all fills shall be easily accessible with standard funnels and pour spouts. All lubricant sumps shall be fitted with magnetic type, hex head, and drain plugs of a standard size.

- C. Engine and transmission shall be equipped with sufficient heavy-duty fuel and oil filters for efficient operation and protection 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. Fuel lines from tank to the filter shall have a shut off valve. The fuel filter shall be a DAVCO Model 382 Fuel Pro or approved equal filter with water separation, fuel processing filter assembly. Fuel and oil lines within the engine compartment shall be rigidly supported and shall be composed of steel tubing where practical except in locations where flexible lines are specifically required. Flexible fluid lines shall be kept to a minimum and shall be as short as practical. They shall be routed or shielded so that failure of a line shall not allow fuel or oil to spray or drain on any component operable above the auto-ignition temperature of the fluid. Flexible lines shall be Teflon or approved equal hose with braided stainless steel jackets except in applications where premium hoses are required, and shall have standard SAE or JIC brass or steel, reusable, swivel end fittings. Hoses shall be individually supported and shall not touch one another or any part of the coach.
- D. Engine driven accessories shall be unit mounted for quick removal and repair. Critical points in the hydraulic system shall be fitted with service ports so that portable diagnostic equipment may be connected to monitor system operations. All lines shall be compatible with the hydraulic fluid and maximum pressures of the system. Flexible lines shall be minimized in quantity and length. Non-interchangeable lines, both those with the same fittings as those on other piping systems of the coach, 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. Hydraulic lines shall be marked, at a minimum at each end, and preferably every 3 feet as to job function "pressure or return."
- E. A Morris control or approved equal hand throttle shall be mounted in the engine compartment for diagnostic purposes, and also shall be equipped

with a plug for the engine/transmission electronics for diagnostics.

2.05.04 **Exhaust**

- A. The exhaust muffler, or Diesel Particulate Filter (DPF), shall be heavy-plate type designed with proper acoustical qualities, and tailored to the engine requirements and installation. In cases where a DPF is required, the DPF compartment shall be of sufficient insulation and air flow to prevent overheat of the compartment even in a failure mode.

- B. The tail pipe plenum shall be completely sealed and insulated to prevent fumes or smoke from entering the coach interior and to prevent excessive heat from causing a burn or fire hazard. The exhaust shall be emitted from a location on the upper left-hand corner of the coach, or approved equal. If exhausting out the top of the coach, the exhaust stack shall be positioned at a minimum of 45-degree angle, not to allow rainwater to enter.

- C. The exhaust and tail pipes shall be so designed to provide sufficient clearance from the running gear under all operating conditions. Exhaust system parts shall not foul the axle or any part of the coach when the coach body is raised on the jacking pads. The tailpipe shall extend slightly beyond the edge of the body to prevent exhaust from being trapped under body and prevent discoloration of body panels.

- D. Electrical wiring shall not be routed close to any exhaust component to prevent wiring damage with the exception of the exhaust monitoring system in which case it shall be protected from heat damage.

2.05.05 **Cooling System**

- A. Temperature of the main engine and operating fluids on the coach shall be controlled by a cooling system. The cooling system shall be sized to maintain fluids at safe, continuous operating temperatures during the most severe operation with the coach loaded to GVWR and with ambient temperatures from minus twenty degrees up to one hundred ten degrees Fahrenheit. 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.

- B. Radiator shall be of durable corrosion-resistant construction with bolted-on removable tanks, or approved equal. The radiator shall be of sufficient size to properly cool the engine, transmission, brake retarder and related components used in heavy service.

- C. Piping leading to and from the radiator shall be stainless steel or brass

tubing and use of rubber hoses shall not be accepted. Necessary hoses in the coolant system including heating system shall be premium, silicone rubber type that is impervious to all coach fluids. All hoses shall be secured with premium, stainless steel, worm, inside sleeve, wide band type clamps with a hex drive head approved for silicone grade hose.

- D. Radiator fan shall be thermostatically controlled (electric drive preferred) so it will only operate above the minimum engine operating temperature and shall maintain engine temperature but not exceeding the engine manufacturer's recommendations. Fan speed shall be regulated to minimize fan noise. Proper airflow over the radiator shall also be provided. The radiator shall be protected from road dust and dirt.
- E. A correctly sized, stainless steel or corrosion-resistant coolant surge tank shall be provided to store and restore expelled coolant. A sight glass shall be provided on the surge tank to facilitate checking proper coolant level.
- F. The coolant in the coaches shall be protected from freezing with ethylene glycol extended life anti-freeze installed to protect the coolant to minus forty degrees Fahrenheit. Anti-freeze shall meet engine manufacturer specifications.
- G. Water filter shall be provided on each engine.
- H. Engine thermostats shall be easily accessible for replacement. Valves shall permit complete shutoff of both lines for the heating and defroster units. All low points in the cooling system shall be equipped with drain cocks or plugs. Air vent valves shall be fitted at high points in the cooling system unless it can be demonstrated that the system is self-purging.
- I. Adequate access shall be provided for inspection and filling of the cooling system from outside vehicle without removing any other equipment. A sight glass to determine satisfactory engine coolant level shall be provided and shall be accessible by opening one of the engine compartment access doors.
- J. A spring-loaded, push-button type valve, or approved equal, to safely release pressure or vacuum in the cooling system shall be provided with both it and the water filler no more than 60 inches above the ground and both shall be accessible through the same access door.
- K. The water pump shall have a sufficient discharge capacity to maintain proper engine temperature. The water hose connection shall have a substantial bead and surface shall be cleaned and prepared to provide

bead leak-proof clamping of hose.

- L. A Proheat X45 with circulation pump or approved equal auxiliary coolant heater shall be provided. This heater shall include electronic control and shall monitor itself so as to not create damage to the vehicle, engine, or coolant.

2.05.02 Fuel System

A. General

1. The fuel system shall consist of the fuel tank, filler provisions, fuel pump, filters, and lines to deliver the fuel to the engine and all auxiliary equipment so the fuel shall function under all loading and operating conditions described in this Specification.
2. When delivered, the engine shall be tuned, utilizing the latest style fuel injectors and No. 2 ultra-low sulfur fuel, to give optimum performance, (unless otherwise instructed).
3. Engine shall be certified and warranted to operate with Bio-Diesel Fuel. The mix that shall be approved shall be at a minimum of B-5 with a Maximum of B-20.

B. Fuel Tank

1. The fuel tank(s) shall be securely mounted to the coach to prevent movement during coach maneuvers, but shall be easily removed for cleaning or replacement. The tank shall have an inspection plate or removable filler neck to enhance cleaning and inspection. The tank shall be baffled internally to prevent fuel sloshing regardless of fuel level.
2. The fuel system shall comply with the specific requirements of FMVSS 301.
3. The fuel tank(s) shall have a minimum usable capacity of at least 130 US gallons.
4. The mild steel fuel tank(s) shall be made of sufficiently heavy gauge material internally to prevent baffled surging. The tank shall be internally braced and externally supported in such a manner as to eliminate the possibility of developing vibration fatigue cracks. All openings shall have adequate stiffeners so that a flat surface is presented to the attaching plates.
5. The tank shall either be located between chassis frame members or protected by a steel barrier to provide protection in the event of a side body impact. Fuel tank filler access shall be located on right side of coach.
6. Fuel gauge shall be mounted in driver dash area and the sending unit shall have an access panel to gain access without removing tank.

C. Filler Provision

1. The tank filler pipe shall be so designed as to permit a minimum filling rate of 40 gallons per minute filling to the "full" point with no back splash when fuel fill nozzle shuts off.
2. The fuel filler shall be located on the curbside.
3. The tank filler shall consist of a standard filler neck, level control valve, a whistle, and a pressure release valve.

D. Fuel Filter

A fuel processor filter system shall be installed on all coaches. A DAVCO Fuel Pro #382 See-Chek System or approved equal system with necessary check valve for preventing drain back shall be provided.

E. Noise and Emission Standards

1. Motor coaches shall conform to the air-pollution control standards of the Environment Protection Agency of the Federal Government and all other federal, state and local air-pollution requirements as established for the year of vehicle manufacture. Engines shall be certified in No. 2 ultra-low sulfur diesel fuel oil.
2. Gases, solids and sound levels originating in, produced by and emitted from the propulsion engine and/or auxiliaries shall not be greater than such effects permitted by federal, state or local government regulations.
3. Emissions from the exhaust pipe shall meet all Federal and State Requirements. Engine shall be certified to meet all State and Federal requirements as established for the year of vehicle manufacture.
4. When the vehicle has idled for 3 minutes and then accelerates to 80% of rated speed under load, the opacity of the exhaust shall not exceed #2 on the Ringlemann Scale thereafter.
5. Exhaust gas shall be discharged at the upper left rear of coach, or approved equal. No public hazard or discomfort shall result from the exhaust location.
6. The coach-generated exterior noise at curb idle shall not exceed 83dbA.
7. The interior noise at any location one (1) foot from interior window and walls and four (4) feet from the floor shall not exceed 83dbA + 2dba during any vehicle operating condition.

2.05.07 Performance Criteria

The Manufacturer shall furnish the following performance graphs with proposals:

- A. Engine Speed vs. Road Speed
- B. Torque vs. Engine Speed
- C. Horsepower vs. Engine Speed
- D. Fuel Consumption vs. Engine Speed
- E. Vehicle Speed vs. Time (both loaded and unloaded)
- F. Vehicle Speed vs. Grade (both loaded and unloaded)
- G. Oil Consumption vs. Engine Speed

2.05.08 Vehicle Emission Standards

Manufacturer shall meet all federal, state and local EPA vehicle emission standards in effect at the time of delivery of vehicles to the Participating Agency. Delivery is defined as physical delivery of vehicles to the F.O.B. point as described in this document.

SECTION 2.06 TRANSMISSION AND DRIVE SHAFT

2.06.01 Transmission

- A. Transmission shall be properly mated with the engine furnished. Controls and internal parts shall be adequately designed and adjusted to provide smooth power shift accelerations without damage, and to prevent output torque when the selector level is in neutral position.
- B. Transmission shall be electronically controlled, equipped with a retarder and shall be fully automatic power shift, hydraulic drive, heavy-duty type of adequate strength and capacity. It shall have no less than five speeds forward, one reverse and equipped with a lock-up clutch. The transmission shall be equipped with starter interlock to prevent starting of the engine unless transmission is in neutral. Retarder shall be controlled by a minimum 1/3-1/3-1/3; 1/3 application of retarder on engine throttle, 1/3 application on first stage of brake application, and final 1/3 application of retarder on 2nd stage application of brake. Retarder shall have an indicator light in the engine compartment control box, indicating either retarder is "engaged". A retarder "on/off" switch shall be installed in a front electrical excess panel. There shall be indicator lights on the dash indicating that the retarder is "on" or "off". Transmission shall be equipped with a running calibration dipstick to

allow the fluid level to be checked while the engine is running. The retarder shall not control the maximum road speed. The retarder shall not engage when maximum speed is reached.

- C. Transmission shall be controlled by a key shift pad that shall indicate the selected gear and also provide electronic readings of fluid level and failure codes. The shift switch shall meet the requirements of FMVSS 102. The transmission control shall be designed to protect the transmission from any possible damage as a result of improper use of controls. The transmission shall be equipped or wired so that it cannot be shifted from forward to reverse or vice versa while the coach is in motion.
- D. Transmission shall be equipped with manufacturer's recommended fluid filter system.
- E. Adequate transmission fluid cooling shall be provided for heavy load operation. An auxiliary cooling system shall be provided.
- F. A conveniently located filler and dipstick tube for checking and filling the transmission shall be provided. The transmission oil filter and dipstick shall be located so that it shall not be a burn hazard and be accessible with the rear engine compartment door open.
- G. Transmission shall be an Allison B500R, six speeds, or approved equal.

2.06.02 Drive Shaft

- A. Drive shaft shall be heavy-duty type with lubrication fittings provided for the universal and slip joints.
- B. There shall be suitable protective guards around the drive shaft. Heat shield shall be provided if necessary.
- C. All timing marks that are necessary for the correct alignment shall be installed.
- D. No wiring or tubing shall be within striking distance of driveline unless protected by adequate shielding.

2.06.03 Drive Shaft Access

There shall be a secured access panel in floor to gain access to the drive shaft from coach interior.

- A. This cover shall be attached in a way to not be loose or create a tripping

hazard.

- B. Cover shall have a seal that shall keep water, dust, dirt, mud, and or smoke from entering the passenger compartment.
- C. Cover shall include as integral part, the flooring material that has been chosen for this coach.

SECTION 2.07 AXLES, STEERING, and GENERAL CHASSIS

2.07.01 Axles

All axle assemblies shall be of the heavy-duty type designed to carry loads imposed upon it by conditions encountered in normal service as designed by M.A.N. or approved equal. Gross axle weight rating shall meet the coach gross vehicle weight rating and the expected loads. Gross axle weight ratings shall meet all local, State and Federal Regulations. It shall also possess a full warranty for a minimum of five years, or approved equal.

- A. Front Axle
 - 1. Shall be a beam-type axle, or approved equal, with a minimum permissible load carrying capacity of not less than 15,500 pounds and shall be specifically used for coaches.
 - 2. Shall have all rotating or friction points equipped with replaceable bushings or inserts and lubrication fittings.
 - 3. The front axle shall be a beam-type axle, or approved equal.
 - 4. Both front and rear drive axles shall have the axle manufacturer's maximum load rating for the gross loads that the coach manufacturer designed them to carry. The gross load shall include seated plus standee load.
 - 5. Shall be equipped with Oil Bath Bearings, or approved equal.
 - 6. Shall be equipped with disc style brakes.
 - 7. Shall be the steering axle and equipped with necessary components to include, but not limited to, steering stops, tie rods, steering box, etc.
- B. Drive Axle
 - 1. Shall have a gear ratio that shall be suited for a freeway speed of 70 MPH and yet have enough torque to pull from a stop to meet the minimum criteria of performance.
 - 2. Shall have a differential assembly that can be removed and serviced without removal of the entire axle.
 - 3. Shall be equipped with disc style brakes, or approved equal.

4. Shall have spring brakes incorporated in the brake chamber for emergency as well as parking brake use.
 5. Shall have removable axle tubes without the removal of the entire axle, or approved equal.
 6. Shall have a magnetic drain plug located at the bottom of the differential chamber.
 7. Wheel ends to be lubricated with differential fluid and shall have hub piloted wheels, not Budd type.
- C. Tag Axle
1. Tag axle shall be of the "I" beam and non-steer type, or approved equal.
 2. Shall be equipped with oil bath bearings, or approved equal.

2.07.02 Steering

- A. Life expectancy of all steering components shall exceed 1,000,000 miles. No element of the steering system should fail before suspension system components when one of the tires strikes a severe road hazard.
- B. Power steering shall be supplied. The force at perimeter of steering wheel applied by the driver shall not exceed 10 lbs. with the vehicle moving at 1 foot per second. Loss of power steering shall not result in loss of steering control.
- C. Wheel geometry and steering arrangement shall be such as to ensure easy steering and to promote equal tire wear. Mounting shall be such as to make the wheel free from road shocks and vibration. The steering wheel shall be black plastic molded over metal with a diameter between 18 and 20 inches dependent upon the effort needed to turn the wheel. Steering wheel angle shall be adjustable with tilt type with a telescoping steering column. Steering shall be equal turns left and right.
- D. Steering gear, rotating shaft universal joints and splines shall be protected from wheel spray. Steering shaft, yoke and clamping shall be so designed as to assure positive clamping of the yoke on the shaft. All steering shaft crosses shall have needle bearings. All parts shall be easily removable for replacement or repair.
- E. Caster angle shall be selected to provide a tendency for the return of the front wheels to the straight position with minimal assistance for the driver. A power steering fluid reservoir that is easily accessible for checking and filling fluid level without removing any equipment shall be provided. Reservoir shall be permanently labeled and accessible with

engine access door open.

1. Shall steer the coach to a 45 degree angle.
2. Shall have an air suspension system just as the two other axles, however, shall be capable of reducing the down force if needed for drive wheel traction.
3. Shall utilize tie rods, steering arms, linkage, and steering boxes as approved by FMVSS standards.
4. Shall be a hydraulic assist system.

2.07.03 General Chassis

The general suspension system shall incorporate, but not be limited to the following:

- A. Air suspension on all three axles.
- B. A minimum and maximum ride height as designed by OEM Engineering.
- C. Shall comply with all applicable FMVSS laws and guidelines.
- D. Shall have serviceable bushings in all lateral and radius rods.
- E. Shall have serviceable stabilizer bar bushings, if applicable.
- F. Shall have air style leveling valves to maintain proper vehicle height.
- G. Shall have shocks on both sides of all axles for a quality ride and comfort.
- H. Kneeling system for front kneel only. This shall only apply if the wheel chair ramp inclination meets with ADA laws from street level to coach floor level.

2.07.04 Wheels and Tires

- A. Wheels
 1. All wheels shall be machined and balanced. The vehicle shall be equipped with single front, dual drive, and single tag.
 2. Wheels shall be Alcoa Hub-Mounted 9.00 X 22.5 machine finished aluminum with durabrite coating. Wheel stud nuts shall be minimum grade 8 and tightened per wheel manufacturer's specifications. No lock rings shall be permitted.
 3. All wheels on the coach shall be of the same size and type, interchangeable between front and rear.
- B. Tires
 1. Steer and tag tires shall be Michelin, 315/80R 22.5 (XZA-2 or

approved equal). Drive tires shall be Michelin, 315/80R 22.5 (XDN-2 or approved equal).

2. The manufacturer shall furnish nine (9) wheels for each three-axle coach.
3. Load on any tire at GVWR shall not exceed tire supplier's rating. Tires shall be interchangeable on the coach.

2.07.05 Brakes

- A. The braking system shall be air operated, of the balanced type, and shall be designed to ensure safe braking performances under normal and emergency conditions. The total braking effort shall be distributed between all wheels in such a ratio as to ensure maximum tire mileage, and equal rate of wear in front and rear brake blocks. The braking system shall meet all current federal, state and local safety standards.
- B. Service brakes shall be the disc-type or approved equal.
- C. Brakes shall be self-adjusting. The friction material shall be of heavy-duty design to give maximum life.
- D. Routing of brake lines shall be such as to minimize the likely incidence of corrosion from chemicals or susceptible to road hazards.
- E. The coach shall be equipped with dual low air pressure warning lights and buzzers to indicate loss of air pressure within the front and rear brake systems.
- F. Force to activate brake pedal control shall be essentially a linear function of the coach deceleration rate and shall not exceed 50 lbs. at 0.7 inches above heel point of the pedal to achieve maximum emergency braking.
- G. Each coach shall be equipped with a (PP 1) parking brake valve and emergency brake overrule valve (SR2) that are independent of the service brakes and are located to the left of the driver's seat (or approved equal). The parking brake, when applied with the coach running, shall illuminate an indicator light on the instrument panel. The (SR) system shall have its own reservoir and be capable of releasing the parking brake a minimum of two times without engine running.
- H. The brake chamber shall have a water drain hole at the bottom in the non-pressure side, if designed with chambers. Diaphragms shall be neoprene. Angle of mounting shall be such that the water shall not tend to run into the brake actuating rod aperture. Brake chamber mounting studs shall be double-nutted. A brass elbow shall be furnished on each

brake chamber.

2.07.06

Air System

A. Air Compressor

1. Air compressor shall be a reciprocating type with full ball bearing crankshaft, 15 ½ CFM minimum or approved equal.
2. The engine driven air compressor shall be sized to charge the air system from 40 psi to the governor cut-off pressure in less than three minutes while not exceeding the engine's rated speed. Air compressor shall have Discharge Line Muffler (Ping Tank) with one way check valve on discharge side of the muffler, and shall be equipped with a drain cock and safety valve. The drain shall be plumbed to exterior of coach, or approved equal.

B. Air Compressor Governor

An air compressor governor shall be provided to automatically control air pressure in the system between maximum and minimum pressures. It shall have a cut-out pressure of 120 psi and a cut-in pressure of 85-90 psi.

C. Check Valves

Check valves shall be provided to isolate the front and rear section of the dual brake system assuring an adequate air supply for braking in the event that one of the systems fails. If the system utilizes a different means of achieving this safety feature, the information of operation shall be supplied by the proposer.

D. Air Reservoir

1. A minimum of six (6) air reservoirs shall be supplied and shall be mounted to the main frame rail. Total combined capacity of all air reservoirs shall be a minimum of 7140 cubic inches. All tanks shall meet or exceed SAE J10b Standards and be equipped with clean out plugs.
2. One reservoir shall be dedicated to the maxi-brake release, and isolated by check valves, or approved equal.
3. Air tank for air suspensions shall have valve or valves to regulate and protect air system.
4. All air tanks shall be equipped with quality type drain cocks, flush mounted or pet cock drain valve mounted in a protected and accessible location, to ensure complete drainage of tanks. If tanks located in non-accessible location, they shall be equipped with remote mount drain systems as noted above.

E. Air Dryer

1. The air supply system shall be equipped with an air dryer to

remove and collect moisture and contaminants from the air before delivery to the supply reservoir. The air dryer shall be equipped with a replaceable cartridge and a 24-volt heater (Bendix AD-9 with Puragard oil separator or approved equal).

2. An integral, self-cleaning filter element shall be furnished to trap carbon particles and other contaminants that could harm brake system components.
3. A thermostatically controlled heater shall be included to prevent freezing of accumulated moisture during low temperature operation.
4. The air dryer shall purge itself upon compressor cycle.
5. Air Dryer shall be mounted on left side of each coach or approved equal.
6. The air dryer shall be installed to manufacturer's specifications using the proper size copper tubing and recommended length between the air compressor and the air dryer providing the proper amount of time to cool the air prior to the dryer.

F. Air Lines

1. Air lines, except necessary flexible lines, shall conform to the installation and material requirements of SAE Standard J844-Type 1 for copper tubing (all copper tubing shall be seamless) with standard, brass, flared or ball sleeve fittings, or SAE Standard J844-Type 3B for nylon tubing if not subject to temperatures over two hundred (200) degrees F. Accessory and other non-critical lines may use Type 3A tubing.
2. Nylon tubing shall be installed in accordance with the following color-coding standards:

RED	Indicates front brakes
GREEN	Indicates rear brakes and supply
BROWN	Indicates parking and emergency
BLUE	Indicates suspension leveling system
BLACK	Indicates accessories
3. Copper and stainless tubing shall be color-coded by heat shrink sleeves at the ends to meet the color-coding requirements.
4. Line supports shall prevent movement, flexing, tension, strain and vibration. Looms shall support copper lines to prevent them from touching each other or any other coach component. To the extent practicable and before installation, the lines shall be pre-bent on a fixture that prevents tube flattening or excessive local strain. Copper lines shall be bent only once at any point including pre-binding and installation. Rigid lines shall be supported at a maximum of 5-foot intervals. Nylon lines may be routed and shall be continuously supported.

5. 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.
6. Provisions shall be made for air supply connections at the front and rear of coach.

SECTION 2.08 CLIMATE CONTROL SYSTEM

2.08.01 General

The coach climate control system shall be designed to provide passenger comfort by heating, cooling, dehumidifying and filtering the air that shall be force circulated within the coach. The system shall be a Thermo King Intelligair IV or approved equal. A fully integrated control system will be provided to ensure upper and lower deck heating output is regulated by an independent signal from A/C control panel. Driver's demister/AC and upper/lower deck air-conditioning controls will be located on the driver's side console. It shall be designed to maintain coach interior temperature to a minimum of 70 degrees F (heating mode) with a relative humidity of 50% or less at all locations in the coach, cooling to be able to maintain 68 degrees F, and function under all operating and climate conditions. System shall not require special tools to gain access, however shall be computer based as to adjustments, settings, and trouble shooting. The Contractor shall certify that the coach heat requirements for the climate control system can and will be maintained.

1. Overhead air-con ducts will provide 26kW of blown air heat from the air-conditioning unit re-heat function to both upper and lower decks.
2. Warm blown air will also be provided via a combined demister and air-conditioning unit (located in the cross front panel) to the drivers cab area forward of the operators position blowing into the foot well area and onto the drivers torso area. (See also Section 14.3) Unit will be 100% recirculating with washable filters fitted.
3. Passenger floor heater for both upper and lower decks with switch to control operation located on driver dash.
4. Threshold heater will be installed at both the front and rear passenger doors.
5. A combined demister and air-conditioning unit will be located behind cross-front panel with warm air ducted in a plenum chamber across bottom of windshield. Outlet nozzles will direct the warm air onto windshield. An inline valve beneath the rear riser floor trap will

isolate demister water circuit. Demist air will be 100% re-circulatory with a grille in front dash panel. Must be able to effectively defrost windshield in a cold weather northern climate.

6. Controls for this unit will be located on the driver's side console with rheostat control over heating level, blower speed (variable) and a switch for air conditioning function. A damper controlled by a 3rd rheostat will provide air flow to be directed to windshield, drivers upper and drivers lower vents.

Note: Air delivery pipes to the plenum chamber and drivers compartment to be insulated to increase cab cooling performance.