

DIRECTORATE OF STATE TRANSPORT, HARYANA
2nd Floor, 30 Bays Building, Sector 17, Chandigarh-160017
Website: WWW:hartrans.gov.in

EOI/2/2017-18/SPA-1(Tech)

Notice Inviting Expression of Interest (EOI)

State Transport, Haryana Invites Expression of Interest (EoI) from Indian Bus Manufacturers for purchase of fully built-up Standard HVAC (Heating, Ventilation & Air-conditioning) Diesel Engine Buses meeting BS-IV emission norms having 3x2 Standard (without back reclining) seating configuration for operation on Inter-State Routes by Haryana Roadways with a view to provide comfortable bus services at a reasonable bus fare. Such buses are to be offered having comprehensive AMC valid for seven years or operation of 10.0 lac kms, whichever is earlier.

The last day of submission of EoI to the Director General, State Transport, Haryana, 2nd Floor, 30 Bays Building, Sector 17, Chandigarh-160017 is 27th February, 2018 till 17.00 hours. However, a pre-proposal meeting will be held on 24th January, 2018 at 3.00 P.M. for providing clarifications. Indicative technical specifications can be downloaded from this office official website: www.hartrans.gov.in.

Dated: 9.8.2017

Sd/-
Director General,
State Transport, Haryana.

TECHNICAL SPECIFICATIONS FOR HVAC STANDARD BUSES

1. SCOPE

1.1 The specification covers the design, manufacture, supply, testing & commissioning of diesel engine HVAC Standard buses for the operation on intercity plain routes from Chandigarh to various parts of Haryana and the neighbouring states. The bus design shall be energy efficient, environmental friendly, safe and secure for transportation of passengers besides the following main attributes amongst others:

- i) Passenger comfort & safety
- ii) Reliable and Durable Design
- iii) Ergonomically designed driver's work area
- iv) Ease of repair and maintenance
- v) Aesthetically designed interiors and exteriors
- vi) Ease of boarding and alighting for all passengers

1.2 The word Bus wherever it has been used in the specifications means the Diesel Engine Intercity HVAC Standard Bus. The bus shall meet all applicable Central Motor Vehicles Rules (CMVR) of India and Haryana Motor Vehicle Rules /Govt. Safety Norms, Emission & other norms applicable at the date of manufacture. In addition, it should also meet all the requirements of **Type III ACX Category** of bus of Bus Code AIS 052.

1.3 Where there is conflict between the requirement as per any applicable law in force and the requirement emanating from these specifications, whichever of these two is of superior/ higher standard shall prevail.

1.4 The Bidder shall furnish the technical details for assemblies/sub-assemblies / systems/components/equipment as per these Technical Specifications.

2. GENERAL DESIGN FEATURES

2.1 The full forward control Diesel Engine intercity bus shall have right hand drive & be fitted with engine at the front/rear of the bus. The bus shall be designed and manufactured in accordance with the Technical Specifications & "Code of Practice for Bus Body Design and Approval" as per prevailing version of AIS 052, (hereinafter referred to as Bus Code). The details of the relevant standards are to be indicated against each item. The bus shall be designed to carry sitting as well standee passengers. The bus design shall be suitable for daily average operation of 18 hours (maximum) on intercity service with peak loading of all passengers with full sitting capacity (Minimum 60 Nos. & seating layout of 3 x 2) @ 75 kg. Each (68 kg Passenger + 7 kg Luggage), average travelling speed of about 70 km per hour with starts/ stops after every 1 to 2

hours. To take care of the above load, the bus has to have adequate HP, Minimum 230 BHP to pull this load comfortably over a gradient of 10%, for which the Bidder has to produce a test report from the Type Approval agency. The bus should have a minimum engine power of 170 kW.

2.2 The bus design shall be eco-friendly, energy efficient, safe, and comfortable with exhaust emissions meeting the requirements of Bharat Stage IV. To ensure compliance to above, the type approval certificate from an approved test agency prescribed under CMVR will be necessary.

2.3 The bus must be of proven design suitably modified to the climatic & operational conditions, infrastructure and road conditions in northern India.

2.4 The bus design should be such as to meet all statutory requirements applicable for the state of Haryana in all respects. Further, the bus structure should meet the requirements of structural strength, stability, deflection, vibration, and roll over protection etc. amongst others for at least the following main loads:

- Static loads
- Dynamic loads
 - Single wheel bump loads
 - Double wheel bump loads
 - Braking and acceleration loads
 - Roll over

2.5 The bus body design should have got evaluated by the Contractors at their cost from ARAI, Pune, using Computer Aided Engineering (CAE) techniques for the above loads/ Performance requirements. The required values for the above loads/ conditions /Performance parameters are given in the following paragraph. Information on any other parameter as may be required by the test agency may be directly supplied by Bidder under intimation to the Purchaser.

2.6 The required Performance values/ data for above load conditions may be considered as follows:

Structural adequacy under Static and Dynamic Loading Conditions:

The design stresses will be computed with Gross Vehicle Weight (GVW) under the static and following Dynamic conditions. The stresses should be less than the yield stress for the material.

GVW = Un-laden mass of the vehicle + payload (number of passengers x weight of the passengers of 68 kg plus luggage 7 kg).

Static conditions: Stresses should be computed with GVW with the vehicle at

rest with any one wheel or dual set of wheels on a 150 mm bump or 150 mm pothole. Further, the bus shall not exhibit deflection or deformation that impairs the operation of the steering mechanism, doors, windows, passenger escape mechanism and service doors.

Dynamic conditions:

Stresses should be computed for the following combination of loads applied together.

Braking load (horizontal) : 0.6 g
Cornering load (transverse) : 0.6 g
Vertical load : 1.0 g

Bump load : Bump height as per Indian Road Congress - IRC 99/1988.

The following conditions should be considered for calculating the stresses:

Case 1 – single wheel on bump / pothole
Case 2 – diagonally opposite wheels on potholes
Case 3 – both wheels (front and rear) on bump / pothole

Fatigue strength: The bus is expected to be designed for operation of minimum 10,00,000 km.

The fatigue strength will be evaluated for the above specified life using a mix of 75% smooth road and 25% rough road as per the procedure given below. Typical profiles and statistical information of smooth and rough roads will be as per Clause B and E of Table C.3 of ISO 8608:1995 / IS 15592:2005.

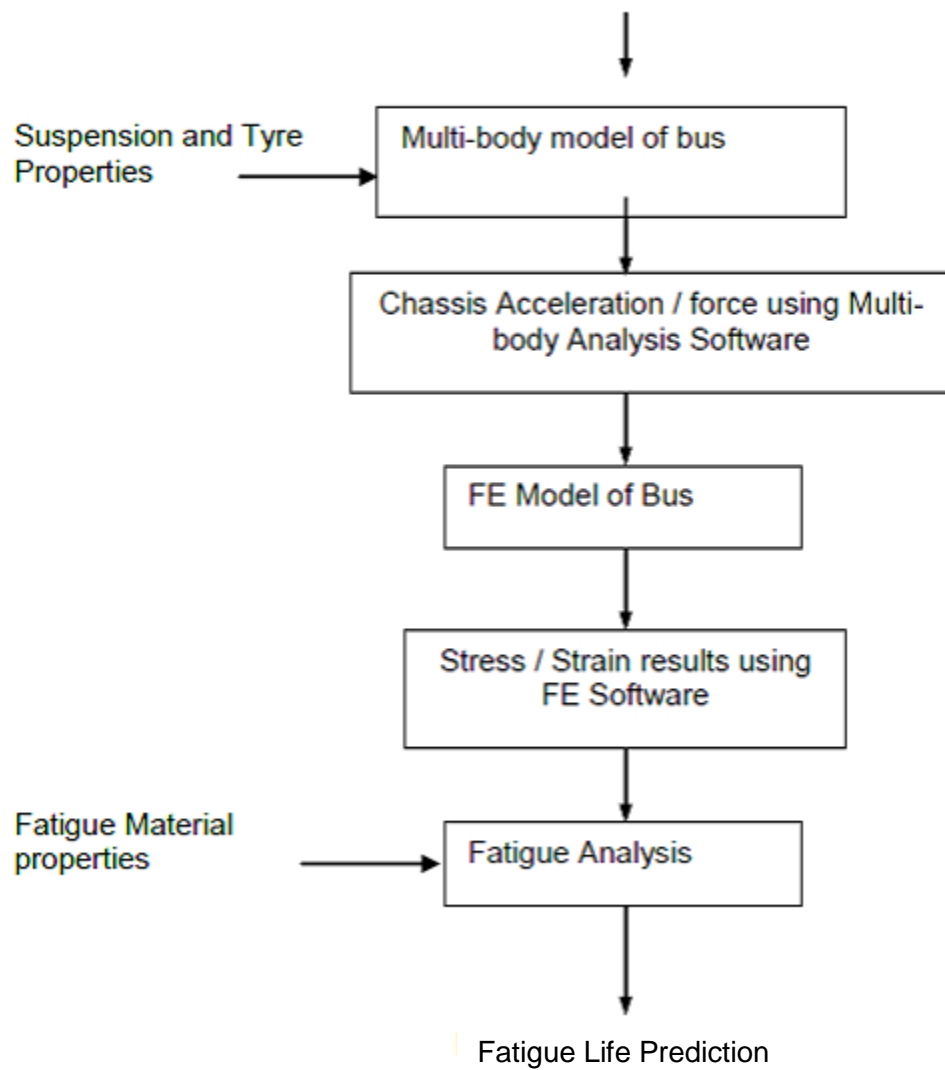
Modal: The lowest natural frequency in any mode shall not be less than 5 Hz.

Roll-over: It should meet the requirements of AIS 31 when tested according to the procedure specified.

2.7 Procedure for Fatigue Analysis of Bus

Suspension and tyres to be modeled as elastic member having stiffness and damping properties. The road profiles inputs mentioned above have to be used as input to the multi-body model of the bus to get chassis acceleration/force values. Acceleration/force data generated from multi-body analysis to be used as input for stress calculation using FEA. Results of FEA to be used for fatigue life calculations.

Flow Diagram
Road Profile Data



- 2.8 The complete bus manufacturer shall submit the structural design along with complete sectional drawings with dimensions and other technical specifications for inspection to the purchaser, along with FEA report from ARAI, Pune as per Para 2.4,2.5 and 2.6 for approval of built up structure before building the prototype bus. They will also furnish complete bus design and other technical specifications as required at the time of submitting the bus prototype for inspection cum approval. The bus design and the buses shall meet all the statutory requirements besides the one prescribed herein and type approval certificate/test report of compliance for the complete bus as per specifications laid herein/in CMVR including the Bus Code from the approved test agency will have to be produced. The bus shall be designed with respect to its body and different aggregates/systems /sub systems to operate in transit service for at least **8 years or 10,00,000 km whichever is later** .
- 2.9 Detailed drawings of bus structure along with complete dimensions (as approved in FE analysis by ARAI, Pune) , its components, seats, interior/ exterior fittings, electrical systems, wiring harness, photometric items and other accessories along with complete details of materials used, their specifications, manufacturing tolerances etc. shall be provided to the Purchaser by the Contractor.
- 2.10 General appearance, seating layout and structural details of roof, floor, sides, front & rear show, Cross section drawing of the bus and driver's cab shall be provided by the Bidder along with their bids.
- 2.11 Main dimensions of bus i.e., overall length, overall width, overall height, saloon height, pillar to pillar distance, seat pitch, number of seats (excluding seat for the driver & conductor) etc. shall be provided by the Bidder along with their bids.
- 2.12 The material used in the construction of buses shall be as per Bureau of Indian Standards (BIS)/ Automotive Industry Standards (AIS) specifications meeting/ surpassing the Performance & other requirements as given in the Bus Code. In absence of above specifications, Association of State Road Transport Undertakings (ASRTU) specifications could be followed. Wherever Indian standards are not available, internationally acceptable standards may be referred/indicated. Specifications standards wherever indicated in the Technical Specifications shall be conforming to the Specification Standards as amended up to date/ or latest. Wherever the specifications of any item have not been notified as International/ National Standard etc., the Bidder shall provide the actual specifications of that item along with the drawings of the items indicating all relevant details sent by the manufacturer to the testing agency. The drawings in such cases will be certified by the testing agency. The guaranteed life of the bus and its other aggregates be indicated item by item in the enclosed Proforma for Life of the main bus aggregates (Annexure-A). Periodical maintenance schedule for obtaining the said life be also indicated. The safety requirement shall be as per Bus code for the indicated Type III ACX bus.

2.13 BIS Standards are available from Bureau of Indian Standard, Manak Bhawan, 9-Bahadur Shah Zafar Marg, New Delhi-110002. Web site: <http://www.bis.org.in>. Similarly, AIS Standards are available from Automotive Research Association of India, Post Box No.832, Pune -411 004. Web site: <http://www.araiindia.com> . ASRTU Specifications are available from Association of State Road Transport Undertakings, 7/6, Sirifort Institutional Area, August Kranti Marg, New Delhi-110 049. Web site: <http://www.asrtu.org> , E-mail address: asrtu@de12.vsnl.net.in

- 2.14 **Fire Safety:** The bus shall be designed and manufactured with all applicable fire safety and exhaust emission regulations for buses including piping location, location of rubber hose, location of exhaust/catalytic converter location, prescribed upholstery material, fire retardant cables, connectors etc. These provisions shall include the use of fire retardant exhaust material, firewalls, and facilities for passenger evacuation (doors, windows and escape hatches) as per statutory requirements besides Bus Code. Flammability requirements shall comply with IS: 15061.
- 2.15 Suitable traps/openings with appropriate sealing shall be provided for repair and maintenance of various aggregate/systems/sub systems of the bus.
- 2.16 Any other provisions/fitments required for safe and efficient operation and or for fulfilling statutory requirements be provided in the offered bus.
- 2.17 The bus shall be so designed to maintain operational stability requirement as per Bus Code. Interior noise and pass by noise of the vehicle shall confirm to BIS: 12832:1989 or latest and BIS: 3028:1998, 10399: 1998 or latest respectively.
- 2.18 The Bidder shall ensure that the components/sub assemblies as are fitted in each bus comply with specifications as prescribed herein and duly approved by test agency and a certificate to that extent will be furnished by the bidder to the purchaser along with each bus.

3.0 Engine:

- 3.1 Six Cylinder Turbo Charged inter-cooled Diesel fuelled engine with minimum rated power of 170 kW shall have power to obtain desired Performance in respect of its adequacy of power, acceleration levels, emission norms, specific fuel consumption etc The engine shall have adequate horsepower not only to propel the bus but also to operate efficiently the bus Air Conditioning System and all other auxiliary devices fitted to the bus, if any. The vehicle Performance should not be affected with running of the Air Conditioning System at full load. The engine shall be designed to operate for not less than 5, 00,000 km without major failure or significant deterioration.
- 3.2 Engine should be able to operate efficiently at ambient temperatures of approximately 0°C to 50°C, humidity level from 25% to 100%, generally operating in and around Haryana.
- 3.3 Performance data/curves and other details of the engine have to be enclosed with the tender documents. A detailed set of calculations indicating adequacy of the said Diesel engine for the intercity bus be provided along with all the Performance parameters of the selected engine. The engine has to meet all statutory requirements (copies of necessary certificates be enclosed). To ascertain whether there is sufficient tractive force

to pull over load of 20% during peak hours over 10% gradient; certificate from approved test agency will be specifically required.

- 3.4 The engine and its accessories shall be easily replaceable. The engine mounting shall be such as to minimize transmission of vibrations to the bus structure. The engine foundation & mounting shall be so located as to facilitate easy accessibility & replacement. Engine design shall be such that it shall not be overheated during normal operating conditions of vehicle. An arrangement for audio-visual signal shall be provided in the event of engine getting overheated excessively. The Bidder shall indicate the temperature at which the signal operates. Similar arrangement for other sub-system of engine with their monitorable indicators be made on the dashboard.
- 3.5 The engine electronic management system shall monitor operating conditions and provide instantaneous adjustments to optimize both engine and bus Performance. The bus should have suitable visual indication for the driver to recognize the mal-functioning of the Electronic Speed Limiting Device.
- 3.6 The engine compartment shall be insulated by incorporation of fire resistant material to avoid transmission of heat and noise to the passenger area.
- 3.7 The engine should be suitably designed to operate optimally under Northern India peak summer heat, cold and dust. Suitable lighting arrangement with separate switch shall be provided for the engine compartment.
- 3.8 For soundproofing & for protection against fire risk in engine compartment, no flammable material or material liable to soak fuel, lubricant or any combustible material shall be used in the engine compartment unless the material is clad by an impermeable fireproof sheet. A partition of heat-resistant material shall be fitted between the engine compartment & any other source of heat.
- 3.9 The bus shall have air intake location in a manner as to provide dust free, restriction free adequate quantity of air so as to avoid any operational problem of the engine. This should be located in a manner to eliminate ingress of water due to rain or washing.
- 3.10 The mounting of pipe/outlet for discharge of Exhaust gases and waste heat shall be as per CMVR. The entire exhaust system shall be adequately shielded to prevent heat damage to any bus component. The exhaust outlet shall be designed to minimize rain or water generated from high-pressure washing system from entering into the exhaust pipe.

4.0 Transmission System:

- 4.1 Minimum 6 forward speeds Synchronesh, preferably with an over-drive and one reverse with suitable ratios Gear box with manual / assisted operation shall be provided. The transmission also should have a retarder either electromagnetic or hydraulic.
- 4.2 Single Plate Dry friction type Clutch Plate, compatible with the system, shall be provided.

5.0 Suspension

The bus shall be fitted with air suspension at rear axle and Rubber ended webler suspension shall be provided on front axle with shock absorbers. The suspension system shall be fitted with minimum 4 shock absorbers at front & rear, suitable for trouble free operation and jerk free comfortable ride in existing road conditions of Northern India. The air suspension system should be suitably designed with anti roll bars and other accessories and should not lead to abnormal tire wear.

6.0 Steering:

Power assisted steering shall be provided.

7.0 Braking System:

- 7.1 The Anti-lock braking system (ABS) shall be full air type with fail-safe dual circuit having four-way protection valve, auto slack adjusters, etc. An air compressor, which minimizes oil carry over shall be fitted. The braking system shall be fitted with air dryer and oil/ water separator system. The buses shall also be provided with hand operated pneumatic flick valve type parking brakes at rear wheels. The air pressure line shall be treated for corrosion resistance.
- 7.2 In the event of failure of the engine and or loss of air in the system, adequate provision be made for obtaining effectiveness of service brake system and or for deactivating the spring actuated brakes.

8.0 Wheels and tyres:

- 8.1 The bus shall be fitted with 7 tyres of size 295/80R22.5 – 16 PR Radial Tubeless tyres.
- 8.2 Splash aprons of minimum 6.50mm thickness composed of rubberized fabric shall be installed behind of wheels as needed to reduce road splash and protect under floor components. The splash aprons shall extend downward to within 100mm of the road surface at static conditions. Apron widths shall be no less than tyre widths .Splash aprons shall be bolted to the bus under structure.

Splash aprons and their attachments shall be inherently weaker than the structure to which they are attached. The flexible portions of the splash aprons shall not be included in the road clearance measurements. Other splash aprons shall be installed where necessary to protect bus equipment.

9. Heating, Ventilation and Air conditioning (HVAC) climate control system:

- 9.1 The HVAC system shall be provided for heating as well as cooling of the interior whole compartment of the Bus as per the environmental conditions of the Northern India for Intercity operation.
- 9.2 The Bidder shall design the composite heating and air conditioning system with Spheros / Denso / Thermoking make and of capacity to suit the operating/environmental conditions given at Para 2.3 & 3.2, and pay load as given in Para 2.1. The time required for obtaining nominal temperature of 20°C in the saloon under above operating and loading conditions shall be provided by the Bidder besides tonnage, total power consumption of AC System for 16 h of operation maintaining saloon temperature of 23°C under continuous operation of vehicle with doors closed and load etc. Bidder to consider the maximum numbers of passengers with 3x2 seating lay out as per bus code. (Minimum 60 seating excluding driver & conductor and standees). The minimum capacity of the refrigerating system required is 47KW/40,000 kcal/14.0Tr. There should be adequate heating capacity for comfort of passengers during winter season. The air compressor drive should be designed with double 'B' type, cogged, 'V' shaped fan belts to ensure reliable operation.
- 9.3 Air Conditioning system must be so designed to work in compatibility with other vehicle systems and not in isolation. The Air-conditioning system shall have large heavy-duty transit compressor and high capacity alternator. A properly sized alternator/ charging system shall be selected to support the Air-conditioning system and to improve reliability & efficiency of the system. The system shall be designed to meet any future regulations on refrigerant etc.
- 9.4 The bus shall be provided with aesthetically roof mounted Air-conditioning system (i.e. evaporator and condenser unit) of the above makes driven by main engine. Proper care shall be taken for insulating the system for optimum efficiency. Proper AC ducting shall be installed inside saloon for uniform distribution of air-conditioned flow. Air conditioning system shall be CFC free. Life of the Air conditioning system and its aggregates should be given in Annexure-A. Periodical maintenance schedule for obtaining the said life be also indicated.
- 9.5 Automatic Electronic temperature control arrangement shall be provided for AC system.
- 9.6 In case of AC failure, proper air ventilation in the form of two units of Roof

mounted Hatches with fan will be provided.

- 9.7 The Bidder shall provide the details of design, specifications, mountings, circuit diagrams etc. for HVAC system along with their bids.
- 9.8 A high output two speed demister shall also be fitted in the driver's cabin to draw fresh air from roof. The Bidder shall provide the detailed specifications of demister.
- 9.9 The whole bus body shall be fully thermally insulated with flame retardant Polyurethane or glass wool of minimum 40 kg/m^3 density as per bus code. The Bidder shall provide specifications/BIS standards for the aforesaid insulating material.
- 9.10 A suitable & proper AC ducting shall be provided in the Hat Rack base as per recommendations for the AC unit for effective and smooth air flow to cover the entire saloon area with proper insulation and jointing to the condenser and evaporator units to minimize/ eliminate chances of any leakage.
- 9.11 The Heating, Ventilation and Air conditioning (HVAC) climate control system shall maintain inside temperature of the bus within a range of 18°C to 30°C while controlling the relative humidity to a value of 60% or less.
- 9.12 The air conditioning portion of HVAC system shall be capable of reducing the passenger compartment temperature from 43°C to 32°C in less than 20 minutes after engine start-up. The air shall be composed of not less than 20% outside air. Airflow should be evenly distributed throughout the bus with air velocity not exceeding 0.5 m/s on any passenger.
- 9.13 One foldable ladder at rear with suitable landing platform on the roof shall be provided for the maintenance of the bus air conditioning system.

10. Hat Rack:

The hat racks with the provision of louvers & AC ducting shall be provided on strong brackets in the saloon running along both side of the bus. The hat racks shall be of the color matching to the interior decor of the bus. The design shall be so constructed as to avoid sharp corners and edges. An indicative photograph of a hat rack attached with the specification to assist in designing the hat rack.

11. Louvers for Individual AC Control:

The suitable approved louvers shall be provided below the ducts for air draught on the passenger seat both for window side and aisle. About 30% of the air is to be bled through permanently open vents which throw air in the

gangway and in the front & rear of the ducts. The ducts should be insulated with fire retardant Polyurethane on the outer surfaces throughout the entire length of the duct.

12. Fuel Tank:

Diesel tank of minimum capacity of 240 liters shall be provided. A suitable Flap shall be provided for fuel filling point with proper spring loaded clip type/ magnetic lock arrangement in the skirt panel.

13 Under frame & Structure:

13.1 The super structure shall be fabricated using CRCA hot galvanized steel tubing (ERW– Rectangular / Square Sections) conforming to BIS 4923-1985 or latest, of grade Yst –220. The Channel conforming to IS: 808-1989 & IS: 2062 or formed sections conforming to IS: 1079 shall be used as cross bearer. The formed U/C-Section made out of CRCA sheet conforming to relevant BIS standard shall be used for floor longitude.

13.2 A comprehensive multi-stage anti-rust treatment by way of Hot Phosphating/ Galvanizing shall be provided to bus flooring, sides, roof, understructure, as per BIS 3618 Class-A2/ relevant BIS for Galvanizing of MS Structural Members for resistance corrosion or deterioration from atmospheric conditions so as to enable them & frame to last for at least **8 years or 10,00,000 km whichever is later**. The samples of all materials & connections shall withstand a two weeks (336 hours) Salt Spray test in accordance with ASTM procedure B117 with no structural detrimental effect to normally visible surface & no weight loss over 1%.

13.3 The entire surface of bus under floor and sides exposed to ground shall be covered with appropriate corrosion prevention & flame retardant paint coating for protection against harmful effects of water, mud etc and to retard flames, if any. The wheel housings shall be constructed to contain tyre bursts during operation and be flame retardant in case of tyre fire.

13.4 MIG welding shall be used for steel structural member's fabrication.

13.5 After anti corrosive treatment, structural members shall be coated with red oxide/ Zinc Chromate primer & Epoxy Primer.

13.6 Under floor to sidewalls shall be sealed to prevent dust ingress.

14 Paneling

14.1 The bus exterior side panels shall be fitted with stretched GPSP steel sheet upto waist level. The interior paneling will be of ABS of minimum 2 mm thickness.

Rear & skirt paneling shall be of aluminium. Panels shall not have any waviness & shall be so mounted as to present smart aesthetic exteriors. The roof paneling of GP sheet shall have formed water channel over the cant rail. The Bidder shall be required to indicate the details of the above said paneling including thickness/ sizes of panels, fittings, rivet pitch etc.

- 14.2 All side skirt panels below stretch panel line must be no longer than 1500 mm and be of such design that the panel can be replaced easily with a pre-painted panel within a very short period of time.
- 14.3 Anti-drumming compound shall be applied on inner side (enclosed surfaces) of entire paneling.
- 14.4 Roof structure shall be thermally insulated with flame retardant Polyurethane or glass wool of minimum 40 kg/m³ density covered suitably with BWP plywood - IS marked. The Bidder shall provide specifications/ BIS standards for the aforesaid insulating material.
- 14.5 TIG welding for fabrication of aluminium components shall be used.
- 14.6 Interior panels shall be attached so that there are no exposed unfinished or rough edges or rough surfaces. Panels & fasteners shall not be easily removable by passengers.

15. Paints:

All the structural members of the bus shall be treated for corrosion prevention internally as well as externally and painted wherever required. The Polyurethane (PU) metallic painting conforming to BIS: 13213-1991 or latest standards as applicable shall be used for exteriors painting of the bus. Color shade shall match to the shades as per BIS: 5-1978 or latest. Details of paints used, surface treatment & preparation, corrosion prevention treatment, base primer coating, number of paint coats to be applied etc shall be provided by the Bidder.

16. Color schemes:

Exterior, interior color schemes and logo/ graphics to be painted will be intimated to the successful Bidder before the completion of paneling of the proto type bus.

17. Entrance-Cum-Exit Door

- 17.1 Single Entrance-cum-exit door in the centre of the bus (Conductor side) shall be provided with improved jack-knife collapsible In-Swing Door electro-pneumatically controlled. The entrance cum exit door shall be electro-

pneumatically controlled by the driver with internal and external emergency open controls. In the event of an emergency, it shall be possible to open the door manually from inside the bus by using a force no more than about 10 kg after actuating and unlocking device at the door. Door, door hinges and locks shall comply with safety requirements as per Indian/ International standards (to be specified by Bidder). The closing and opening time of the door should be in the range of 4 seconds. A pilot lamp on the driver's dashboard shall be provided to warn that the door is 'Open' or 'not fully closed'. The control shall be labeled on a panel to the right side of the driver.

17.2 Entrance-cum-Exit Door operation shall be controlled with the help of one push buttons (press once open, press again closed)

17.3 All the handles shall match to the décor of its fitment location or shall be chrome plated.

18. Windows

The windows shall be in single piece fixed glass type design. The dark green tinted toughened glass shall be of 5.0 mm thick. The window glasses shall be pasted aesthetically. The size and shape of the glasses shall enable the passengers to have maximum outside view. The transparency of tinted glass should be 30%.

19. Floor Material

The floor shall be fitted with fire retardant marine grade board of 15 mm thickness conforming to BIS 710-1976 or latest and BIS 5509-2000 or latest. The said floor shall be covered with anti-skid type silicon grain material of minimum 2 mm thickness meeting Indian standards (to be specified by the Bidder). The anti-skid type silicon grain material shall have features for non accumulation of dust. Same floor level shall be maintained between the saloon and driver's cab gangway.

20. Escape hatch:

In addition to emergency exits, two type approved escape hatches cum emergency exit to ensure fresh air inside the vehicle in case of AC failure to be provided.

21. Seats:

Minimum 60 passenger seats (excluding Driver & Conductor) of fixed back type with the provision for safety belts as per the requirement of CMVR/Bus Code shall be fitted in 3 x 2 seating layout. The seats shall be provided with seat & back covers made out with matching cloth. Every back rest shall be

provided with the head cover of matching cloth. Seats having all the recommended features of type III ACX bus as per Bus Code, excluding folding table for food tray shall be provided. Pushpak Brand 3 x 2 standard type approved seats of Harita Seating System are to be provided. Any other brand shall be used with prior consent of the Transport Department.

23. Driver's work area :

23.1 A hinged flap driver door of not less than 1600 mm height and 650 mm wide, with maximum space for window using the material like rubber glazing & glass, shall be provided for entry and exit to driver's work area.

23.2 **Driver partition** - The driver half partition should be covered with ABS. The Partition glass shall be so tinted to minimize the glare & reflection in the windscreen directly in front of the barrier from interior light during night operation.

24. Dashboard Instrumentation and Control System

24.1 The bus shall have ergonomically designed molded type dash board and instrument panels made out of FRP material. The Bidder shall provide detailed fabrication drawings along with materials used, their specifications and the process followed in fabrication of dashboard and instrument panel. The Bidder shall also provide details on repair and maintenance of the same along with the material required. One set of dashboard and instrument panel shall be supplied as spare with each lot of 50 completed buses or part thereof.

24.2 The bus shall have dash board with full instrumentation panel containing meters and gauges to indicate important parameters like air pressure, coolant temperature, battery charging current, fuel level, side indicators, head lights, hand brakes, engine oil pressure etc. In addition warning lights for low engine oil pressure, high cooling system temperature & low coolant level, low air pressure and battery weak shall be provided at the driver's dash board showing tell tales. The arrangement for the dash board controls and instrumentation shall be as per the bus code.

25. Rear-view Mirrors- Interior and Exterior:

Electrically operated Rear-view mirrors shall be provided on both sides of the bus to enable driver to have clear side/rear views. One interior rear-view mirror shall also be fitted for viewing the drivers cabin. The provision for viewing the entry cum exit door area through third mirror or any other satisfactory arrangement shall also be made.

26. Sun Visor:

Adjustable sun visors shall be provided for the windshield & the driver's side window. Visors shall be shaped to minimize light leakage between the visors & windshield. Visors adjustment shall be made easily by hand with positive locking & releasing devices and shall not be subject to damage by over-tightening. Sun visor construction & material shall be strong enough to resist breakage during adjustment.

27. Destination Boards:

27.1 Alphanumeric Dual Display Technology amber colored LED based electronic route display system of high intensity illumination with automatic brightness control along with audible and display system in English and Hindi shall be installed at the front. There shall be display of destination with options in Hindi & English. The display system be accommodated within the minimum size specified in the Bus Code. The display should be fixed type. The pitch of the LED shall be optimized to cover the maximum possible area along the length for displaying maximum number of letters. The display area of 180 mm x 205 mm should be available. The display shall be clearly visible in all weathers at a distance of 50 m.

27.2 The system shall have a programming for minimum 200 numbers of destinations. Further the system shall also have a programming for minimum 5 nos. of bus stops on each route. The system shall be GPS compatible. Further a provision shall be made at a suitable location for the fitment of GPS box so that a suitable GPS receiver could be installed in future. The operation of the system by the drivers shall be made on the dashboard or near to it. There shall be single point near dashboard for changing programme. The details of the memory, circuit, wiring, diagram, power consumption etc. shall be provided by the Bidder. The bidder shall impart detailed training to the officials / drivers with respect to programming, operation/ maintenance etc. of display system. The system shall be of rugged construction, vibration proof, water proof and shall be able to operate efficiently at ambient temperatures of approximately 0° to 50° C, humidity level 25% to 100%.

27.3 The minimum letter size for the route nos. shall be 200 mm.

27.4 General Requirements

- i. The system be designed such that data can be fed onboard using add on devices like pen drive etc.
- ii. The system hardware should be able to withstand the fluctuations in all weathers, battery power, noise and vehicle vibrations, etc.
- iii. All the items / sub-systems be leak proof and shall have water / dust ingress protection as per IP Protection No. 55/65 or latest standards.
- iv. Mounting on the system should be robust and vibration absorbing type.

- v. The system hardware should be durable and vandal-proof from inside as well as outside the bus (proper protection with locking system be provided).
- vi. Excellent visibility from all sides during day, twilight and night in all weathers.
- vii. Ability to withstand acceleration upto 10 g.
- viii. Ability to withstand variation in natural frequencies in the range of 5 Hz to 50 Hz.
- ix. The system should have PC interface facility.
- x. Operatable on 24 Volt DC power obtained from vehicle battery. The system shall have adequate measures to ensure appropriate quality of power supply even during battery output fluctuations.
- xi. All components, circuitry, cards, microprocessors, switches/keys should have ISI marks or be of internationally reputed makes/brands.
- xii. All components shall carry ISI mark as far as possible.
- xiii. The system should have easy maintainability / reparability.
- xiv. It should be damage proof on account of power fluctuation and should continue to operate smoothly even during such fluctuations.
- xv. Any other precaution / measures required for smooth and efficient trouble-free functioning of the system year after year be incorporated.
- xvi. The Bidder shall provide the above system as upgradeable as and when required in future.

28. Towing device:

Heavy-duty ring type towing devices shall be provided in the front bumper area with load transfer to bus structural members. The capacity of each the towing device shall be 1.2 times (minimum) the kerb weight of the bus.

29. Wind screen – Front and Rear:

Front wind screen in the bus shall be in two piece (48"x48") design, with curve at sides, PVB film laminated clear glass of minimum thickness of 5.5 mm. Rear wind screen shall be tinted toughened glass of thickness of 5 mm. A grab handle on the outside of the windshield centre at waist level shall be provided to facilitate manual cleaning of the windscreens.

30. Wind screen wipers

Electrically operated windscreen wiper system having two wiper arms with blades shall be provided. The wiper motor shall be heavy-duty steel body for minimum of two-speed operations. The wiper arm shall rest horizontally when not in use. The sweep angle shall be sufficiently wide for clear view during rainy days. The windscreen wiping system shall be 24V, having variable speed, with fitment of time delay relay. The windshield washer system shall deposit washing fluid on the windshield & when used with the wipers, shall evenly &

completely wet the entire wiped area. The windshield washer system shall have a minimum 2.5 litres tank & shall be so located for easy refilling and two Nozzles at suitable location for proper spray of fluid. Reservoir pumps, lines & fittings shall be corrosion resistant & reservoir itself shall be translucent for easy determination of fluid level.

31. Battery, Alternator & Self-starter:

- 31.1 The battery system shall be 24V of minimum 180 Ah capacity low maintenance type lead acid batteries. The batteries shall be well secured to a hinged/ pivoted or slide out type carrier for ease of access for repair & maintenance, replacement and suitably ventilated for escape of fumes but insulated against ingress of dust and moisture. The battery box shall be mounted near to the engine compartment and shall be well secured, easily accessible & ventilated.
- 32.2 Battery terminals with positive locking system (e.g. angle type terminal with provision for double bolting) duly protected against all possible short circuit risk shall be provided.
- 33.3 Each battery cable shall be covered with flame retardant corrugated flexible pipe and shall be properly encased & clamped.
- 34.4 A heavy duty double pole battery with copper contacts cut off switch shall be provided near the driver seat on side paneling at appropriate level for disconnecting the power supply from the battery except for safety devices such as wire suppression system & other systems as specified. All the four connection points of the battery cut off shall be properly connected - Two points of battery cut off switch shall be connected with the battery and two points shall be connected with self-starter. The battery Cut-off switch with the power plant operating, shall not damage any components of the electrical system in off position. The battery Cut-off switch shall be capable of carrying & interrupting the total circuit load.
- 34.5 The bus shall have 24 Volt D.C with double pole wiring for all its electrical equipment to avoid sparking in buses. A separate system/ mechanism shall be provided for the discharge of electro static charge induced during the operation of vehicle. An extra precaution like double electrical insulation, which shall be waterproof confirming to the Indian Standards, shall be taken to avoid spark in the bus.
- 34.6 Minimum 80 Amp alternator of 24V DC with consistent output to take care of idling periods of intercity operation shall be provided and so located as to minimize ingress of oil or rain water into it.
- 34.7 A pre-engaged type 24V DC Self-starter of adequate capacity with relay shall be

fitted in the bus and so located as to minimize ingress of oil or rain water into it.

35. Electrical equipment and wiring:

- 35.1 The cross section of the battery cable shall not be less than 70 mm . Wiring shall be grouped, numbered & color coded.
- 35.2 The wiring looms/ harness for vehicle system of the bus shall be properly routed, encased/ concealed type so mounted to eliminate chances of any spark. The Bidder shall be required to provide the details of the above wiring loom including circuit diagram, lay out of controls etc. at the time of prototype. Wiring support shall be protective & non-conducted at areas of wire contact & shall not be damaged by heat, water, solvents or chafing.
- 35.3 All electrical fittings and lights shall be fully wired up, running in flame retardant black color PVC sleeves or conduit or casing of adequate size as per applicable Indian standards (to be specified by the Bidder) and installed in a manner to facilitate easy inspection/ rectification/ replacement etc as & when required without disturbing internal finish/ décor of the bus. Whenever any wire or cable or PVC sleeve carrying cable etc passes through holes in the sheet metals/ structural member, suitable rubber grommets/ Bakelite inserts shall be provided in these holes to avoid direct contact between cables and sheet metal causing damage to the insulation coating.
- 35.4 The Bidder shall furnish the details of the above cables and battery cables.
- 35.5 Design of the electrical, electronic & data communication systems shall be modular so that each major component, apparatus panel or wiring bundle is easily separable with standard hand tools or by means of connectors. Each module except the main body wiring harness shall be removable & replaceable. Power Plant wiring shall be an independent wiring module. Replacement of engine compartment wiring module shall not require pulling wires through any bulkhead or removing any terminals from the wires.
- 35.6 The electrical system & its electronic components shall be capable of operating in the area of the vehicle in which they will be installed. Electrical & electronic equipment shall not be located in an environment that will reduce the Performance or shorten the life of the component or electrical system. No vehicle component shall generate or be affected by electro-magnetic interference or radio frequency interference (EMI/ RFI) that can disturb the Performance of electrical / electronic equipment. The bus shall conform to AIS-004.
- 35.7 The Bidder shall provide the recommendations regarding methods to prevent damage from voltage spikes generated from welding, jumps start shorts etc. at

the time of prototype.

- 35.8 All electrical & electronics hardware shall be accessible & replaceable easily. It shall be mounted on an insulating panel to facilitate replacement. The mounting of the hardware shall not be used to provide the sole source ground and all hardware shall be isolated from potential EMI/ RFI.
- 35.9 All electrical/ electronic hardware mounted in the interior of the bus shall be inaccessible to passengers & hidden from view unless intended to be viewed.
- 35.10 All electrical/ electronic hardware mounted on the exterior of the vehicle i.e. in an exposed environment shall be mounted in a sealed enclosure.
- 35.11 All electrical/ electronic hardware & its mountings shall comply with the shock & vibration requirements.
- 35.12 The Bidder shall provide an analysis of the estimated electrical load for each system at the time of prototype. Alternator over voltage output protection shall be provided.
- 35.13 All branch circuits except battery to starting motor & battery to generator/ alternator circuits shall be protected by circuit breakers or fuses sized to the requirements of the load. Electronic Circuit protection for the cranking motor shall be provided to prevent engaging of the motor for no more than 30 seconds at a time to prevent overheating. Circuit breakers or fuses shall be sized to a minimum of 15% larger than the total circuit load current. The current rating for the wire used for each circuit must exceed the size of the circuit protection being used.
- 35.14 To the extent practicable, wiring shall not be located in environmentally exposed locations under the vehicle. Wiring & electrical equipment necessarily location under the vehicle shall be insulated from water, heat, corrosion & mechanical damage. Where feasible front to rear electrical harnesses should be installed above the window line of the vehicle.
- 35.15 All electrical motors shall be easily accessible for servicing.
- 35.16 Two separate additional out-lets are to be provided with appropriate relays & fuses in wiring harness for fitment of electrical auxiliary devices/ systems to be added later on in the buses, if required.
- 35.17 One AC (Alternating Current) out-let of 220V is also to be provided at suitable location for charging of electrical/electronic equipment like Mobile Phone, etc.
- 35.18 If any electronic components have an internal clock, it shall provide its own

battery back up to monitor time when battery power is disconnected.

- 35.19 All electronic component suppliers shall ensure that their equipment is self-protecting in the event of shorts in the cabling and also in over voltage and reverse polarity conditions. If an electronic component is required to interface with other components it shall not require external pull up and/ or pull down resistors.

36. Lights and lighting system:

- 36.1 Interior lighting shall be made with minimum 5 nos. of sunken type LED light assembly fitted with 24V and mounted in center for uniform lighting in two separate circuits to provide adequate lighting and meet the bus requirements specified in Bus Code. In order to avoid glare to the driver while in motion, illumination of the area at least upto the driver partition shall be shut off while in motion by an appropriate separate switching.
- 36.2 Headlamps including fitment of head leveling device, if needed, with relay and side light etc shall be suitably styled into front-end construction.
- 36.3 2 Nos. Night lamps of Blue Color shall be provided in the saloon.
- 36.4 Lights provided for illuminating exit/entrance door area, the lights shall illuminate the outside area up to at least one meter when door is opened. The lights for exit/entrance door areas shall be flushed as far as possible to avoid tripping of passengers. Further a suitable step well light of sunken type shall be provided on the side wall in the step well area.
- 36.5 A reverse buzzer shall be installed at the rear of the bus to sound intermittently when reverse gear is engaged.
- 36.6 The bus will be fitted with CCTV camera based bus surveillance system having minimum 3 CCTV Cameras and one mobile DVR having capacity to record input from 3 CCTV Cameras for minimum 30 days.

37. Manufacturer's nameplate

Manufacturer's nameplate may be fixed as per the following locations:

- One inside at front left of the bus
- One outside at rear right of the bus

38. Pollution under control (PUC) Certificate Holder

A suitable holder with clear acrylic sheet cover shall be provided in driver cab near driver seat at appropriate level for fixing of PUC certificate.

39. Boots at Side:

The maximum nos. of side luggage boots shall be provided on the near & off side of the vehicle for maximum space for luggage & tools etc.

40. Boot for spare Stepney

A separate boot for spare wheel Stepney shall be provided preferably on the near side of the bus.

41. Bus dimensions

Main dimensions of the bus body shall be as follows:

S.No.	Description	Dimensions
1	Overall length	Minimum 11600 mm.
2	Overall width	2600 mm with minus tolerance of 30mm
3	Seating Capacity	Bidder to provide the maximum number with 3x2 seating lay out. calculations as per bus code.(Minimum 58 seating excluding driver & conductor)

42. Tool kit

The Bidder shall provide a suitable tool kit and other mandatory items as per CMVR 138 (4)/ other applicable rules comprising of common tools and other essential items required. The complete list of tools in the tool kit to be supplied with every bus shall be provided to the Purchaser. The Bidder shall provide one Hydraulic Jack per bus of a capacity of at least 8 Ton as per design of the bus.

43. Tools, Gauges and Testing Instruments

The Bidders shall be required to furnish list of tools, gauges and testing instruments for inspection, repair and maintenance of the buses along with a complete list of spare parts recommended for: normal wear and tear; and emergency requirements for any breakdowns, damages etc.

44. Operation and Maintenance Manual :

At least 5 hard bound copies of maintenance manual containing essential technical information required for satisfactory operation, inspection and maintenance shall be supplied by the Bidders.

One set of Colored wall charts shall also be provided of the following units showing assy. details:

- Chassis lubrication and brake system.
- One set of Colored wall charts of the following units for every fifty buses showing assy. details.
- Engine
- Gear box
- Rear axle
- Front axle
- Clutch
- HVAC system

45. General requirements :

- 45.1 The Purchaser reserves its right to alter, modify, change the specifications as per requirement to suit the latest provisions of CMVR/ any other Notifications, safety aspects, emission aspects besides any practical/ operational difficulties etc. faced by the Purchaser. The Vehicle Manufacturer shall ensure that all the alterations, changes or modifications in the specifications, if necessary, as mentioned above shall be carried out in the buses built by them as per the advice of the Purchaser without attributing any additional cost.
- 45.2 While registering every bus, Contractor & transport authority shall jointly examine the bus prior to registration. The registration of such a vehicle be done only after signing the report jointly by all concerned along with the transport authority.
- 45.3 For electrical installations, flameproof cables shall be used, especially positive terminals shall be locked firmly with all cables & pipes with proper looming to take care of vibrations, fire retardant material shall be used for seats, roof & sidewalls.
- 45.4 Details of structural members, their material specifications & dimensions i.e. cab & saloon flooring, cross bearers, various angles, floor longitude, main body pillars, dummy/stump pillars, cant rail, vent rail, waist rail, skirt rail, wheel arch section, sole bar, seat rail, roof sticks & roof longitudes, diagonal bracing, stretch & body panel stiffeners, gussets etc. shall be provided by the vehicle manufacturers along with their bids.

- 45.5 Similarly, details of aluminium sheets/sections & their alloys/specifications, aluminium sheet, rub rail, decorative moldings, wire cover, wearing strips, footsteps edging, various panel beadings, window frames and its sections, finishers, water gutter channel, roof grab rail brackets shall be provided by the vehicle manufacturers along with their bids.
- 45.6 All edges shall be rounded off and shall not cause injury to bus occupants.
- 45.7 Complete bus shall be rattling free.
- 45.8 All the rivets and bolts holes shall be jig drilled as far as possible. Rivet heads neatly formed and each bolt/rivet shall be tightened after full mating of the surfaces to be fastened.
- 45.9 Continuous type piano type hinges and tower bolts of stainless steel shall be used as per relevant Indian standards.
- 45.10 Similarly Aluminium extruded sections wherever not painted shall be anodized.
- 45.11 All flaps wherever provided should have heavy-duty support to keep it open for ease of maintenance.
- 45.12 All miscellaneous M.S pipes shall be cold phosphated with the coating of 2.16 to 2.70 g/m² or by any other pre-treatment process conforming to Indian standards (to be specified by the bidder). The samples of all materials & connections shall withstand a two weeks (336 hours) Salt Spray test in accordance with ASTM procedure B117 with no structural detrimental effect to normally visible surfaces & no weight loss of over 1%.’
- 45.13 Anodized decorative aluminium moldings/ beadings etc shall be used.
- 45.14 All M.S pipes used in the bus shall be ERW conforming to BIS 3601:1984 or latest, of grade WT – 160.
- 45.15 All rubber items used in bus body shall be made of Ethylene Propylene Dien Monomer (EPDM) rubber of black color conforming to the Indian Standards to be specified by the Bidder and AIS 085.
- 45.16 EPDM rub rail of aesthetic profile shall be fitted in anodized extruded aluminium channel between stretch panel and skirt rail longitudinally at the widest portion of the bus.
- 45.17 Every trap/-opening flap shall be secured in a manner that the vibrations can't dislodge it. Lifting devices must not protrude above the flap.
- 45.18 All structures, body, and panel-bending mode frequencies, including

vertical, lateral, and torsional modes, shall be sufficiently removed from all primary excitation frequencies to minimize audible, visible, or sensible resonant vibrations during normal service.

45.19 Exterior protrusions if any shall conform to the provisions of relevant CMVR/ AIS/ Bus Code. The exterior rear-view mirrors and required lights and reflectors are exempted from the protrusion requirement. Grills, doors, bumpers and other features on the sides and rear of the bus shall be designed to minimize the ability of unauthorized riders to secure toeholds or handholds. The exterior body features shall be shaped to allow complete & easy cleaning by automatic bus washers without snagging washer brushes or retaining water & dirt.

45.20 Hydraulic Grease Nipples shall be provided for ease of proper lubrication & maintenance.

45.21 The front panels, bumpers and grill should be designed such that there are no pointed or sharp protrusions to minimize injuries to vulnerable road users in case of impact.

45.22 All MS Solid rivets used shall conform to BIS: 2155-1962 (or latest)

45.23 Only High Tensile (HT) steel self-locking type Nuts, conforming to Property Class-8 of BIS: 7002-1972 (or latest) & BIS: 1367 (Part-8) (or latest) shall be used in the complete bus body.

45.24 All the steel Hexagonal head bolts used shall be Cold Rolled, high tensile type conforming to property Class-8.8 of BIS Specification No.IS:1364-1975 (Part-I) & IS: 1367-1975 (Part-2 & 3) (or latest). The nuts shall conform to IS: 1364 (Part-3) & IS: 1367 (Part-2 & 6).

45.25 Wood Screws, Machine Screws, Self-Tapping Screws shall conform to relevant Indian standards. All bolts, Machine Screws, Wood Screws, Plain Washers, and MS Solid Rivets etc. shall be galvanized before assembly.

45.26 The bus will be fitted with entertainment system consisting of FM radio cum MP3 player/ DVD player with speakers at suitable locations in the coach.

45.27 **Maintainability:**

The fabrication of bus shall be manufactured in such a manner that facilitates easy access for repair & maintenance, removal, replacement of various bus components/ assemblies/ sub-assemblies/systems by providing suitable traps/ flaps etc. Also removal and re-fitment of engine, transmission, radiator etc. shall be easy for repair & maintenance purpose. Radiator coolant/water filling and fuel filling shall be easily accessible with suitable closures with locking arrangement/-holding arrangement. Also an access door shall be provided for

attending to air cleaner assemblies mounted in the vehicle.

46. Inspection and Testing:

The bus shall be inspected at various stages of fabrication by the Purchaser's representative at the manufacturer's works. The inspection shall comprise of ensuring that all materials, components, items, accessories and assemblies used in the fabrication of buses confirm to contractual specifications. Wherever required to ensure this, laboratory test shall be carried out. The inspection shall be undertaken at the component fabrication stage, chemical pre-treatment stage, fabrication of assembly, sub assembly stage, structure, paneling and equipping stage and Pre-dispatch inspection. The Final Inspection of buses shall be carried out at Gurugram/Panchkula. After the bus is finally inspected, it shall be subjected to test run and trials as required by the Purchaser. The bus shall be taken over by the Purchaser after satisfactory final inspection, testing and trials.

47. Quality Assurance :

- 47.1 The Bidder shall use materials including fasteners conforming to relevant Indian standards and shall get the same pretested before use, meeting requirements of all the specified parameters to ensure quality of the material specified. However, random sample of materials shall be picked up and duly sealed by the representative of Purchaser in the presence of the Bidder, out of the purchased lot at the works of the manufacturer or out of the bus under fabrication/ completed bus and will be sent for testing the quality of components at CIRT,Pune/ARAI/BIS approved testing laboratories having testing facilities for testing all the parameters of the specifications of the materials/ items. In the event of failure of samples in lab tests the testing shall be conducted in the same way again from the fresh lot. The Bidder shall replace the failed materials by those duly passed in lab tests.
- 47.2 In the event of failure of material/ items in laboratory test, failure of material/ items (removed from the completed bus) in laboratory test, acceptance decision about the bus be taken by the Purchaser after obtaining compensation/ recoveries of liquidated damages from the supplier as per the system decided by the Purchaser.
- 47.3 Wherever, the failure of material on one parameter or more than one parameter, the recoveries for the complete lot of materials used in the bus shall be made from the Bidder plus 20% damages thereof.
- 47.4 The bidder shall provide the bill of material along with quantum used in a bus for each of the item/ component/ sub-component and raw material used in the manufacturing of the bus to decide the lot for sample testing etc.

47.5 The Bidder shall be responsible to inform about any change in name of manufacture of item/ material to be used in bus body fabrication to the Purchaser. Also Bidder shall stop using any item/ material from a lot in case, a sample from the said lot fails in the lab test during testing.

ANNEXURE-'A'

LIFE OF MAIN BUS AGGREGATES

Sr. No	Items	Aggregate life before reconditioning		Life for each reconditioning		Ex factory price in Rs per unit	Cost of Reconditioning in Rs per unit per reconditioning	No. of Re-conditions available
		in km	in h	In km	in h			
1.	Engine							
2.	Fuel Injection Pump							
3.	Injectors							
4.	Fuel Filter							
5.	Oil filter							
6.	Air filter							
7.	Radiator Assembly							
8.	Water Pump							
9.	Gear box							
10.	Clutch							
11.	Front axle							
12.	Rear axle							
13.	Steering							
14.	Front							
(a)	Leaf							
(b)	Shock Absorber							
(c)	Rear Air							
15.	Battery							
16.	Alternator							
17.	Self-starter							
18.	Fuel Tank							
19.	Oil & water separator							
20.	Wind screen wiping system							
21	HVAC System							
i	Compressor							
ii	Evaporator							
iii	Condenser							
iv	Demister							
v	AC Blowers							
vi	Heating							
vii	Pneumatic							
22	Any others							

The guaranteed life of the bus: -----Years- -----km

Date : _____ Name & Signature of Authorized Signatory _____
On behalf of the Bidder

Place : _____ Address : _____