Tender No-BMTC/CO/ME(P)/5/2020-21

Dated:04.11.2020

Request for Proposal (RFP)

for

Selection of Service Provider for Procurement, Operation and Maintenance of 300 Non AC Electric Buses on Gross Cost Contract (GCC) Model

by

Managing Director
Bangalore Metropolitan Transport Corporation
Central Office, Shanthinagar, Bangalore
Website : www.mybmtc.com

Volume 2 – Terms of Reference and Technical Specifications

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The issue of this RFP does not imply that the Authority is bound to select anBidder or to appoint the Selected Bidder, as the case may be, for the Consultancy and the Authority reserves the right to reject all or any of the Proposals without assigning any reasons whatsoever.

The Bidder shall bear all its costs associated with or relating to the preparation and submission of its Proposal including but not limited to preparation, copying, postage, delivery fees, expenses associated with any demonstrations or presentations which may be required by the Authority or any other costs incurred relating to its Proposal. All such costs and expenses will remain with the Bidder and the Authority shall not be liable in any manner whatsoever for the same or for any other costs or other expenses incurred by anBidder in preparation or submission of the Proposal, regardless of the conduct or outcome of the Selection Process.

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SECTION 1 : TERMS OF REFERENCE

PARTA :GENERALCONDITIONS

1. ROUTES AND DEPOTS

a) The Authority has undertaken key initiatives to establish an environmentally, socially and financially sustainable network of public transport for Bangalore, to encourage commuters to shift to public transport system/s. One of the tasks to achieve the above-mentioned program is to streamline the bus operations through private operators. For this the Authority has formulated a scheme that aims at operation of buses in Bangalore to specified performance standards, with specific focus on safety, by private entities selected through a competitive bidding process under a suitable contractual structure. Accordingly permits shall be granted to operate on identified routes.

The Service Provider shall be required to comply with the provisions of the Motor Vehicle Act, 1988 any amendments made thereof, rules and permit conditions made there under, and any other relevant statutes and directions of Hon'ble Courts issued from time to time. Details of information about number of buses under AC category are provided in table below:

Length of Bus	Aggregated Effective Kilometers / Year / Bus	Number of Buses
12m Non AC Buses	70,000 (200kms x 350 days)	300
Total		**300**

a) The routes indicated above are subject to change from time to time during the Period of the Contract. The decision for changing the route is at the discretion of the Authority and with prior notice to the Service Provider. The Authority shall notify the Service Provider of any change in routes fourteen (14) days in advance before the routes come into effect.

The Service Provider would be required to mobilize, finance, procure, develop necessary infrastructure, and operate the Stage Carriage Services in accordance with the specifications and standards set out in Master Service Agreement and under other applicable laws/ by laws governing such operationsc) A total of three depots i.e., Depot-08 (Yeshwanthpura), Depot-12(Kengeri), Depot-29 (K.R.Puram) would be identified by the authority for the exclusive 300 electric bus

2. TIME TABLE

The Service Provider agree that the Time Table shall be prepared and finalized by the Authority in consultation with the Service Provider at least 30 (thirty) days prior to the scheduled delivery of the first Lot of Buses. If the Time Table could not be finalised as above, then, either the Authority or the Service Provider may refer the points/ issues, which has caused non-finalisation of the Time Table, to the Steering Committee. The Steering Committee shall consider and decide on such points/ issues, within 7 (seven) days of its reference, such that the Time Table is finalised accordingly. The decision of the Steering Committee shall be final and binding on the Authority and the Service Provider in respect to the Time Table.

3. SERVICE LEVEL AGREEMENT FINES (SLA)

1. The Authority shall be entitled to levy SLA Fines in the event Service Provider are unable to delivery their respective scope as per the benchmarks identified in Service Provider Agreement.

2. The frequency of SLA Fines shall be the same period of the payment of invoices in accordance with Service Provider Agreement.

3. All Fines shall be calculated in monetary terms in accordance with the Service Level Agreement as provided in Service Provider Agreement.

4. Any Service Level Agreement Fines arising from the performance of the Service Provider shall be deducted from the Service Provider Fee at the time of scheduled payment in accordance with the Service Provider Agreement. The Service Level Agreement for the Service Provider shall become effective on and from the COD for the respective number of Buses on pro-rated basis, which are under the Project.

5. The SLA can be capped at 3% (Three percent) of the Total Project Cost during the Contract Period exclusive of applicable taxes. If the Service Provider does not improve the quality of service as and when instructed by the Authority, the SLA cap shall be increased next year by 5% (five percent) to ensure the Service Provider improve the quality of service as per the requirement of the Authority. The decision of date from when to increase the cap on the SLA shall be decided in the Steering Committee.

4. STEERING COMMITTEE

A committee (**"Steering Committee"**) comprising of Managing Director of the Authority as Chairman of the Committee, CTM (Operations), CME, and Service Provider shall be constituted on or before the COD. The Managing Director of the Authority will be the Chairman of the Steering Committee and will chair all meetings held by it and in his absence, the nominated person by the Managing Director of the Authority will chair such meetings.

1. The Chairman of the Steering Committee shall have a second or a casting vote.

2. The Steering Committee shall meet last Monday of each quarter at a time and place as decided by the Managing Director of the Authority as may be called upon by any member thereof, with prior written request of at least 7 (seven) Business Days in such regard.

3. The minutes of the meetings of the Steering Committee shall be placed before the next meeting of the Steering Committee.

4. The Authority and the Service Provider shall comply with the directions and decisions of the Steering Committee from time to time.

5. DELIVERY TIMELINES

The expected Delivery Schedule for providing prototype and delivery of registered Non AC Electric buses as per following schedule from the Date of issuance of the Letter of Award as below:

Activity	Timeline
Release of Order	M
Prototype delivery of bus	M + 3 months
Delivery of 50% of tendered vehicles	M + 6 months
Completion of delivery of all 300 vehicles	M + 12 months

SECTION 2 : BUS SPECIFICATIONS

PART B : GENERAL DESIGN SPECIFICATIONS

1. The end-use requirement oriented specifications, with maximum make / model neutrality, for fully built electrically propelled Non air-conditioned (Non AC) buses for operations and maintenance of buses would furnish technical details for assemblies / sub-assemblies/ systems/ equipment's as per Terms of Reference Technical Specification of this Section in appropriate formats. The specifications cover end use based design, evaluation, fabrication & testing features of buses for the Authority's operations for transportation of passengers mainly in Bengaluru Metropolitan Area. The bus design should be energy efficient, environment friendly, safe, efficient and reliable besides meeting all statutory, legal and other requirements, as also those related to easy passenger accessibility including for persons with disabilities (PwDs), passenger comfort, driver's work place, internal and external aesthetics, ease of repair and maintenance etc.
2. The offered bus Specifications would comply with all applicable Central, State and local laws (including Acts, Rules & Regulations). These would include, but not be limited to, the provisions of Disability Act 1995 as amended till date as well as state and local accessibility, safety, noise and other requirements.
3. The electric bus should meet or exceed the Central Motor Vehicles Rules (CMVR) of India / Safety Norms, noise & other norms applicable at the time of supply. In the event of any conflict between requirements emanating from these specification and those as per any statutory/legal, etc in force, the superior/ higher requirements/Standards would prevail.
4. The bus body design would consider all other aspects / provisions to be made on proposed bus body facilitating ease of its mounting /erection on the acquired chassis without causing any damage / defect to chassis / its aggregates etc and further facilitating ease of repair and maintenance of all other fitments / aggregates provided on bus chassis, etc.
5. The bus should be designed to carry commuters in the urban/municipal areas mainly in the routes of the Authority with ease of boarding and alighting especially for ladies, senior citizens and Persons with Disabilities (PwDs). Buses would be provided with wheel chaired disabled persons friendly access and anchorage system
6. The Bus would be design for daily operation of 16 to 20 hours as per the time table issued by the Authority at the average journey speed of between 10 – 50 Kms per hour with frequent starts/stops, say, after every 200 to 1000 mtrs. The max attainable speed of the bus would be as per UBS-II/AIS-052.
7. The Bus design would be eco-friendly, energy efficient, safe, and comfortable meeting specified standards / norms (as amended up to date of supply).
9. The Bus must be of proven design suitably modified to climatic & operational conditions, infrastructure and road conditions as obtaining in urban/municipal areas of the Authority. The Bus design should meet all statutory requirements applicable for the city of Bengaluru in all respects. The bus should be compliant to UBS-II and bus body code specifications.
10. Bus/ bus-body design would be a proved design duly evaluated by agencies authorized as per CMVR using Finite Element Analysis for above loads/performance requirements for values for above loads/ conditions /performance parameters as given in subsequent paragraphs.
11. The bus, loaded to Gross Vehicle Weight (GVW), with crush load and under static conditions, would not exhibit deflection or deformation that impairs the operation of steering mechanism, doors, windows, passenger escape mechanisms and service doors, etc.

12. Manufacturer's certificate supported by testing and type approval agency's ARAI certificates along with the bus as also technical specifications/drawings required for inspection, performance assessment as above to be supplied along with the bus. Besides meeting the statutory requirements the bus would be designed with respect to its body and different aggregates/systems /sub systems to operate satisfactorily in urban transport service for at least 12 years .

13. Detailed schematic drawings of bus structure, seats, interior/ exterior fittings, electrical systems, wiring looms / harness, photometric items and other accessories along with complete details of materials used, their specification, manufacturing tolerances etc. would be provided by the bus manufacturer/ Bodybuilder. Additionally, details / drawings of mounting / fastening bus body to chassis1 to be provided along with the bid specifically bringing out whether bus body would be welded and integrated to chassis or fastened using fasteners along with applicable mechanism system /arrangement. Detailed Circuit diagrams for electrical be also provided by the bidder/bus manufacturer. Electric wiring in the bus (other than EPS) would be of multiplexing type. Additional details of wiring for electric propulsion system, inter-alia indicating location of battery packs, traction controller, cooling system, safety mechanisms, etc with appropriate colour code etc would be supplied with the bid.

14. Details of general appearance, seating layout and structural of roof, floor, sides, front & rear show and driver's cab, etc. would be supplied. Main dimensions of the fully built 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),entry/exit gates, wheel chair locations/fastening arrangement and the accessibility mechanism, etc., mounting arrangement for battery packs, drive motor/s, traction controller, etc would be supplied along with the schematic diagrams/printed literature of the bus.

15. Material used in construction of buses would be as per Bureau of Indian Standards (BIS)/ Automotive Industry Standards (AIS)/ specifications and/or other international specifications meeting/ surpassing 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. Specifications/ Standards followed would conform to Specification/Standards as amended /up dated/ or the latest published by the concerned agencies. Wherever no specifications of any item have been notified as International/ National Standards etc. actual specifications of that item used be mentioned. Guaranteed life of the bus and its other aggregates be indicated item by item. Periodical maintenance schedule for obtaining the said life of the bus be also indicated.

16. The bidder should ensure that the buses comply with the following but not limited to standards as below:

    a) Bureau of Indian Standards (BIS)
       ManankBhawan,
       9-Bahadur Shah Zafar Marg,
       New Delhi-110 002
       Web site: http://www.bis.org.in
    b) Automotive Research Association of India (AIS)
       Post Box No.832,
       Pune-411 004.
       Web site: http://www.araiindia.com.
    c) Association of State Road Transport Undertakings,
       Sector 12,
       Dwarka,
       NewDelhi.
       Web site: http://www.asrtu.org

17. Suitable traps/openings with appropriate sealing and covers would be provided for repair and maintenance of various aggregate/systems/sub systems / chassis / body/ their components, etc of the bus.

18. Any restriction in design, manufacture and mounting of bus body on chassis, as provided by chassis manufacture, as a part of detailed instructions for this purpose, be meticulously followed while mounting / joining / integrating bus body to bus chassis.

19. The bus would be so designed as to maintain operational stability requirement as per Bus Code. Interior noise and pass by noise of the vehicle would conform to BIS: 12832:1989 or latest and BIS: 3028:1998, 10399: 1998 or latest respectively and amendments thereof.

20. It would be ensured that the design, manufacture, certification(wherever called for) & installation of major bus sub-components and systems are compliant with all such sub- component vendors' requirements & recommendations within the frame work of any statutory, legal and or any other lawful/functional requirements. A certificate of compliance would be shown on demand. Components used in the vehicle would be of heavy-duty design.

21. Any other provisions/fitments required for safe and efficient operation and or for fulfilling statutory requirements be provided in the offered bus.

22. **Electric Propulsion system:**

    a) Electric propulsion system /Pure Electric Power Train would have adequate power/rating to obtain desired performance in respect of its adequacy of power, bus acceleration levels, specific power consumption, energy density, etc. Electric propulsion system to have adequate power not only to propel the bus at its GVW but also to operate efficiently all other auxiliary devices, and the air conditioning systems fitted to bus, simultaneously, etc. As the bus is required for operation in urban services, characterized by frequent stops and starts, electric propulsion system of adequate power for efficiently negotiating such frequent stops and starts and urban area gradients, achieve bus acceleration etc at full load, be considered for use. The power/battery rating, control mechanism, etc for obtaining above performance levels be indicated by the bidder in his bid along with other details called for in the annexure.

    b) Performance data / curves / charge - discharge cycle curves and other details of the electric propulsion system have to be supplied. A detailed set of calculations indicating adequacy of said electric propulsion system for proposed urban bus be provided along with all performance parameters of selected electric propulsion system.

    c) The electric propulsion system and its accessories would be easily replaceable. Electric propulsion system mounting would be such as to minimize transmission of vibrations, if any, besides sustaining its loading impact to bus structure. Electric propulsion system mounting, structural design & foundation etc would be so designed / positioned as to facilitate easy accessibility &replacement. Electric propulsion system design would be such that it would not be overheated during normal operating conditions of vehicle. An arrangement for audio-visual signal would be provided in the event of electric propulsion system and or any of its subsystems getting overheated excessively. The temperature at which signal operates would be indicated. Similar arrangement for other sub-system of electric propulsion system with their monitorable indicators be made on dashboard. The electric propulsion system would be equipped with electronic controller / management and on-board diagnostic system.

d) Electric propulsion system compartment/s would be insulated to avoid transmission of heat and noise to saloon area. This firewall would preclude or retard propagation of an electric propulsion system compartment fire into passenger compartment. Only necessary openings would be allowed in the firewall, and these would be fireproofed. Wiring may pass through only if connectors or other means are provided to prevent or retard fire propagation through the firewall. Electric propulsion system access panels in the firewall would be fabricated of fireproof material and secured with fireproof fasteners. These panels, their fasteners, and the firewall would be constructed and reinforced to minimize warping of panels during a fire that will compromise integrity of the firewall. Bus manufacturer would provide relevant details to the Authority.

e) The electric propulsion system would be suitably designed to operate optimally under Bengaluru's climatic conditions.

f) Electric propulsion system noise and chemical, electro-magnetic emission levels, if any, must conform to the national / international and or any other Indian Standards, adopting the most superior one.

g) Specific power consumption of electric propulsion system in terms of kms per KW hour at Standard operating conditions (Indian urban operating cycle) would be indicated along with guaranteed energy consumption level (kilometers per kilowatt hour i.e. km per kwh) under GVW and the standard urban operational conditions / cycle.

h) For sound-proofing & for protection against fire risk in electric propulsion system compartment/s, no flammable material or material liable to soak chemical fumes, or any combustible material would be used in electric propulsion system compartment/s unless the material is clad by an impermeable fireproof sheet. A partition of heat– resistant material would be fitted between the electric propulsion system compartment/s & any other source of heat.

i) The fire safety measures as outlined by the Karnataka Fire Department for safety and security shall be set up near the charging infrastructure in the depots

j) The vehicles would have high voltage / high current lines designed /protected / laid out in a manner as to provide adequate safeguards against any and all operational problems and safety hazards arising out of / caused by these items.

k) Details of make / model etc. of various items of electric propulsion system and its subsystems would be provided as part of bid.

23. **Battery Cooling system:**

Cooling system would efficiently dissipate heat from the electric propulsion system and its sub-systems. Replacement/ maintenance of battery cooling system and its items be also easily carried out. Details of battery cooling system specifications, cooling capacity, cooling medium, repair and maintenance procedures etc. would be supplied.

24. **Traction Controller System:**

a) An efficient traction controller and or any other appropriate mechanism / device to efficiently regulate speed-power relationship for the electric propulsion system be provided for facilitating smooth, effective and jerk free drive of the bus. All operational controls/buttons/switches etc. be conveniently located within easy reach of the driver. The traction Controller System and the controls/operational sub systems be easily accessible for repairs and also be easily replaceable. Complete system details need to be supplied with the bus.

b) Traction Controller System be fitted with a mechanism which makes it possible to operate reversing mechanism only when vehicle is stationary.

c) Details of make / model etc. of various items of traction Controller System would be provided as part of bid.

25. **Suspension:**

The bus would be fitted with air suspension system at front and air-suspension at rear axles at the discretion of the Authority. The suspension system would be fitted with shock absorbers, suitable for trouble free operation and jerk free comfortable ride in existing road conditions of Bangalore.

26. **Steering System:**

As per UBS-II/ AIS_052.

27. **Braking system:**

a) The braking system would be full pneumatic type with fail-safe dual circuit having four- way protection valve, auto slack adjuster, disc type brakes in front and drum type at rear, with non-asbestos brake lining having temperature and wear characteristics suitable for harsh urban operations. Brake squeal would be absent under normal conditions of operation. An air compressor/dryer, which minimizes oil carry over, would be fitted. Braking system would be fitted with air dryer and oil/ water separator system. Buses would also be provided with hand operated pneumatic flick valve type parking brakes at rear wheels. Air pressure line would be treated for corrosion resistance or as per manufacturers design.

b) In the event of failure of EPS and or loss of air in system, adequate provision be made for obtaining effectiveness of service brake system and or for deactivating the spring actuated brakes or as per manufacturers design.

c) Regenerative Braking system of appropriate design / specification be provided or as per manufacturers design/ CMVR/ UBS-II/ AIS-052.

28. **Wheels and Tyres:**

a) The bus would be fitted with steel radial tubeless tyres of optimal size and design conforming to AIS-044 Part I with wheel rims of corresponding size conforming to AIS/ BIS: 10694 (part 3)-1991 or latest. The bus would be supplied with 7 sets of tyres (two on front and four on rear wheels) fitted on the bus plus one set as spare Stepney.

b) Details of type, specifications, capacity, make, model etc. of tyres/wheel rims would be provided as part of the bid.

c) Suitable guards be provided near wheels to prevent damage/ for obtaining safety from stones hurled from tyres or as per manufacturers design/ CMVR/ UBS-II/ AIS-052.

29. **Axles:**

a) Solid beam front axle & grease type front bearings & seals of reliable & proven design of adequate capacity to take care of maximum Gross Vehicle Weight (GVW) & crush loading expected during life span of the bus of minimum 10 years or 8, 00,000 Kms. whichever is later or as per manufacturers design.

b) The bus would be driven by a single heavy-duty rear axle of proven design, adequate capacity to take care of maximum GVW & crush loading expected during life span of bus of minimum 10 years or 8, 00,000 Kms. whichever is later. Transfer of gear noise to bus interior would be minimized. Lubricant drain plug would be magnetic type, external hex head. If a planetary gear design is employed, oil level in the planetary gears would be easily checked through plug or sight gauge or as per manufacturers design.

c) The drive shaft, if any, would be guarded to prevent it striking floor of the bus or the ground in the event of a tube or universal joint failure.

d) Or as per manufacturers design/ CMVR/ UBS-II/ AIS-052

30. Details of type, specifications, capacity, make, model etc. of Front& Rear Axles would be provided at in the bid.

31. **Battery Packs:**

a) Electrically propelled vehicles must meet and satisfy all requirements of "code of practice for Electric Propulsion system vehicles", safety and other requirements as per AIS 052 and as per any other applicable standard and procedures; regulatory requirements as per CMVR / KMVR and any other applicable regulations for operation in the State of Karnataka.

b) Battery packs of requisite capacity would be appropriately mounted on to the bus keeping in mind convenience of battery maintenance /charging / replacement etc., safety of system and its maintainability, operation in the BMTC routes.

c) Capacity of the battery packs would be adequate for over 200 kms of bus running with single charge.

d) Battery packs and other components of Electrically propelled vehicles should conform to applicable AIS / BIS standards or International Specs / standards in absence of AIS /BIS specs. Battery packs and other components / units of Electric Propulsion system be tested and certified to conform to said standards. Detailed drawing indicating location and mounting details of Battery packs /and other sub-systems of Electric Propulsion system be provided along with the bid

e) Make, model, capacity, etc. of each Battery packs and the number of such Battery packs fitted, be submitted along with the bid. Similar details be also submitted for traction controller and other subsystems of the Electric Propulsion system or as per manufacturers design

f) All requirements of AIS / BIS / CMVR/GMVR etc. for Battery packs, Electric Propulsion system / sub-systems and components, etc. be fully met and test certificate for the same be provided.

g) The e-waste generated and the disposal of batteries is to be carried out as per the provisions of Karnataka State Pollution Control Board**.**

32. **Under frame & Structure:**

a) The under frame and super structure would be suitably designed as per manufacturer design, homologation certificate to be obtained.

b) A comprehensive multi-stage anti-rust treatment would be provided to bus flooring, sides, roof, under-structure, axle suspension components etc. for resistance to corrosion or deterioration from atmospheric conditions & road salts so as to enable them & the bus frame to last for at least 12 years.

c) Samples of all materials & connections would 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%. Details of treatment provided with relevant specification details be indicated along with suitable calculations to reflect that the corrosion prevention treatment meets the requirements of minimum 12 years life in Bangalore's operational environment. Details of the system followed for corrosion prevention of internal surfaces of structural tubing would be supplied. A certificate of testing from an authorized government test lab has to be submitted.

d) Front and rear structure design would be energy absorption type to reduce impact stresses into under frame/side structures/ other areas of the vehicle. Damaged area of the vehicle would be easily repairable and or replaceable in the event of any major damage at normally available workshop facilities and without any need for specialized tools / fixtures and equipment's.

e) Entire surface of bus under floor and sides exposed to ground would 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. Wheel housings would be constructed to contain tyre bursts during operation and be flame retardant in case of tyre fire.

f) Sufficient clearance & air circulation would be provided around the tyres, wheels & brakes to preclude over-heating when the bus is operating

g) MIG welding would be used for steel structural member's fabrication.

h) All structural members would be MIG welded besides suitable gussets/ brackets of adequate size & thickness be provided on floor, side, front, rear & roof structure to ensure structure rigidity &integrity.Material, shape size and specs of such gussets / brackets would be provided by the bus supplier in their supplied drawings.

i) After anti corrosive treatment, structural members would be coated with red oxide/ Zinc Chromate primer & superior quality black paint.

j) During structural assembly operations, a number of holes are drilled and or weldments made after the corrosion prevention treatment of components/structural items/members causing loss of such treatment and exposing these items to corrosion. Manufacturer would take sufficient care to carry out corrosion prevention of items so exposed to effectively prevent corrosion.

k) Under floor to sidewalls would be sealed to prevent dust ingress.

33. **Panelling:**

Bus exterior side panels as per manufacturer design, homologation certificate to be obtained.

34. **Paints:**

a) All structural members of the bus would be treated for corrosion prevention internally as well as externally and painted wherever required. Polyurethane (PU) painting base spray paint of standard companies like Sherwin williams, reberlo or debeeror or equivalent conforming latest/ international Standards as applicable would be used for exteriors painting of bus including interiors wherever required. The colour shade would match to the shades as per BIS: 5-1978 or latest. Details of paints used, surface treatment & preparation, corrosion prevention treatment, base primer coatings, number of paint coats to be applied etc. would be supplied.

b) All exterior surfaces would be smooth & free of wrinkles & dents. Exterior surface to be painted would be properly prepared as required by paint system supplier, prior to application of paint to ensure a proper bond between the basic surface and succession coat of original paint for stipulated service life of the bus. Paint would be applied smoothly and evenly with the finished surface free of dirt and following other imperfections:

i. Blisters or bubbles appearing in the topcoat film.
ii. Chips, scratches, or gouges of the surface finish.
iii. Cracks in the paint film.
iv. Craters where paint failed to cover due to surface contamination.
v. Overspray.
vi. Peeling.
vii. Runs or sags from excessive flow and failure to adhere uniformly to the surface.
viii. Chemical stains and water spots.

35. **Colour Schemes:**

Exterior, interior colour schemes and logo/ graphics would be painted as directed by the Authority. Information, on seats, for reservation for persons with disabilities, ladies, senior citizens would be marked as per the details provided by the Authority.

36. **Service Doors:**

a) Two service doors (passenger entrance / exit) In-swing/ out-swing pneumatic door with clear glass window as per requirement of AIS-052 at LH side in front of front axle one and other between front and rear axle. Door mechanism should be robust type to avoid any rattling with good aesthetic look with proper rubber sealing to avoid ingress of water and dust.

b) The Successful Bidder will be required to provide options with regards to position of the such door(s) on the near side. While the intention is to provide doors as per provision already stated, the Authority will finalize the positions of the kerb side door(s) in consultation with the Successful Bidder after assessment of all the options. The cost of any modifications that may be part of the final solution agreed will be to the bidders account.

c) The partition between Kerb side doors and other features of the door would be provided as forming part of the approved solution or as per AIS-052.

d) The Operation of entrance and exit doors would be electro-pneumatically controlled by driver with internal and external emergency operational controls. In an event of an emergency, it would be possible to open doors manually from inside the bus by using a force no more than about 10

Kg. after actuating and unlocking device at each door. Unlocking devices would be clearly marked as an emergency device & would require two distinct actions to actuate.

e) Doors, operating mechanisms, door hinges and locks would comply with safety requirements as per Indian/ International Standards (to be specified and supplied by the bus manufacturer). Overall dimensions and construction of entrance and exit doors would be identical so that doors and door operating mechanisms are interchangeable. While closing and opening time of doors should be in the range of 4 seconds each. There would be maximum opening area in longitudinal & vertical directions in fully open condition. Door operating mechanisms, brackets etc would be maintenance free and designed with lifetime durability of minimum 12 years.

f) A pilot lamp on the driver's dashboard would be provided to warn that the door is 'Open' or "Closed" or "Not Fully Closed" or as per AIS-052.

g) The Entrance and Exit doors would be provided with suitable support in form of grab handles for boarding/ alighting passengers on door flaps. Electronic / other suitable sensors would be installed at all entrance and exit doors to retract door automatically if any obstruction to door occurs during door closing. It must be effective until door is fully closed.

h) A red "Door Closing" sign would be installed above exit doors. The sign will blink when doors are closing or as per AIS-052.

i) A suitable device to prevent doors from opening as long as bus is in motion would be provided.

j) Service Doors' operation would be controlled with help of separate push buttons and one switch for each door mounted over the 400 mm partition between the doors. One red master button to close all entrance and exit doors at same time would also be provided or as per AIS-052.

k) All button and switches would be labeled on a panel as per manufacturers design.

l) Heavy-duty prominent nosing of bright yellow colour would be used to protect edge at entrance/exit.

m) Access door would be provided with heavy-duty sealing to avoid ingress of dust into passenger compartment. Upper & lower section of both front & rear doors would be glassed for not less than 45% of the respective door opening area of each section. Glazing material & glass in doors would be same as in side windows.

n) Details of above service doors including electro-pneumatically controlled door closing system with complete circuit diagram would be supplied Photo-cell controlled opening / closing functions of doors and a "sensitive edge" made for safe entry exit be fitted or as per AIS-052.

o) Doors would be fitted with heavy-duty hinges as per bus code.

p) Doors would be fitted with heavy-duty locks with &/ without lock & key depending upon their use. Striker plate would be fitted at the closing end of locks.

q) All handles would match to décor of its fitment location or would be chrome plated.

r) Doors would open or close completely in about 4 seconds from the time of control actuation and would be subject to closing force requirements and adjustment requirements. Front door would remain in commanded state position even if power is removed or lost. Operation of & power to, passenger door would be completely controlled by driver. A control or valve in driver's compartment would shut off power to, and/or dump the power from, front door mechanism to permit manual operation of front door with bus shut down.

37. **Guard / Guard rails:**

Suitable guard would be provided in areas such as service doors entrance/exit area where seated passengers are likely to be thrown into as a result of heavy braking, Guard height would be minimum 800mm from bus floor, and guard would extend inward from the wall at least 100mm more than the centre line of the seating position of the passengers who are prone to this risk.

38. **Windows:**

a) Windows would of large size for panoramic view. They would be in single piece window glasses. Toughened glass wherever used in bus body would be 4.8 mm to 5.3 mm thick aesthetically installed. Size and shape of the glasses would enable even the standees to have maximum outside view without kneeling. General requirements of windows would be as per the provisions of bus code (AIS 052/153).

b) Windows would have provision of suitable sealing to avoid ingress of dust and water and would have proper/ efficient drainage system /UBS II.

c) Details of window design; fitment etc would be supplied by the bidder along with the bid.

39. **Emergency Exit:**

Emergency exits would be provided in bus as per the provisions of Bus Code – AIS 052/CMVR. Possibility of using passenger entry/exit gate on near side for said purpose would be explored by manufacturer and confirmed. Details of Emergency exits including their numbers, locations, sizes, markings etc. would be supplied.

40. **Escape hatch cum emergency exit :**

At least one escape hatch cum emergency exit would be provided in roof as per AIS-052 bus code. A number of additional hatches may also be provided for facilitating ventilation I bus in the unlikely event of air-conditioner failure.

41. **Steps:**

No steps

42. **Floor:**

a) Bus floor design would be as per manufacturer design and homologation certificate to be obtained.

b) Internal saloon height would be 1900 mm minimum.

c) Floor design would allow easy cleaning including that of sweeping & drainage of water.

43. **Gangways:**

Gangway-from entry/exit gate walls through the entire bus length, would have clear space of

minimum 600 mm for passenger movement and would be generally as per the provisions of the Bus Code AIS 052/153/ UBS II and meet statutory requirements.

44. **Handrails and Handholds**

a) Handrails and Handholds would be provided as per provision of bus code (AIS 052) / UBS II. The surface of handrails & handholds would be colour contrasting and slip- resistant.

b) All handrails would be as per manufacturer design and homologation certificate to be obtained.

45. **Stanchions**

a) Vertical stanchions would be so positioned to facilitate access to seats for those standing. Stanchions would be as per manufacturer design and homologation certificate to be obtained.

b) Stanchion pipes and the handrails would be painted in cannery yellow colour while the joining brackets be painted in grey colour generally matching with inner paneling or as per manufacturers design.

c) A suitable device, such as high visibility bell pushes, for convenience of passengers to request for stopping bus be provided at appropriate locations.

46. **Passenger Seats:**

a) Passenger seats would be front facing, comfortable, durable & maintenance free of high back seats meeting performance requirements of AIS023 and other requirements as per the Bus Code (AIS 052). The high back seats would be fitted as per manufacturers design and certification to be obtained.

b) Similarly, 'High Back seat backrest would be appropriately fitted. Suitable integral type seat hand grab rails would be provided one on top of backrest & one at the back of backrest for seated passengers.

c) Seat pitch would be maintained as per AIS 052.

d) Details of seat design, material, specifications, pitch and other relevant data and the seating layout would be supplied by the manufacturer for approval of the Authority.

e) Details of seating lay out, accommodating maximum number of seats in 2x2 layouts meeting requirements of the bus code would be supplied. Seating capacity would be as per UBS-II including space for one wheelchair with provision for seat belt, wheelchair anchorage etc. Standee capacity of bus worked out as per system given in bus code (AIS 052) / CMVR would be indicated by manufacturer. Seating and standee capacity of bus would be as per AIS 052/CMVR.

f) Construction/ fitting of the seat would be such as to be easily replaceable and repairable.

49) Seat Belts and its Anchorages:

Seat belts would be provided for the seats as per the provisions of CMVR & Bus Code (AIS 052). Any seats provided at rear end of bus, seats in centre (facing the gangway) would necessarily be provided with seat belts. Seat belts and its anchorages would conform to the requirements of AIS 005 and AIS 015

50) Driver's Work Area:

a) Driver's work area and door be as per manufacturer design and homologation certificate to be obtained.

b) Driver's visibility in front of the bus, seated on driver seat, be as per bus code (AIS 052) / CMVR

c) Driver's seat would meet the requirements of AIS 023.

d) A barrier of bulkhead between driver and front passenger seat would be provided. The barrier would minimize glare & reflection in windscreen directly in front of barrier from interior light during night time operation.

e) Dashboard Instrumentation and Control System

f) Bus would have ergonomically designed moulded type dash board and instrument panels made out of FRP material. Details of materials used their specifications etc of dashboard and instrument panel would be provided by the manufacturer or as per AIS-052.

g) Bus would have dash board with full instrumentation panel containing meters and gauges to indicate important parameters like air pressure, coolant temperature, bus subsystems operating current, propulsion system battery packs charge level, side indicators, head lights, hand brakes engagement, cooling fluid temperature, level etc. In addition warning lights for low electric charge, high cooling system temperature & low coolant level, low pressure and high temperature of any other subsystem, low battery charge level, if any, low air pressure and bus system operating power supply weak would be provided at the driver's dash board. All the dashboard controls and instrumentation system would be as per the bus code.

h) On board electronic diagnostics system along with CAN and integrated into the OBITS for communication to the Authorities backend would be provided as per UBS II. The CAN parameters would be as mentioned in UBS II specifications and mutually agreed with the Authority.

51) Rear-view Mirrors- Interior and Exterior:

Rear-view mirrors would be provided on both sides of bus to enable driver to have clear side/rear views. One interior rear-view mirror would also be fitted for viewing saloon area by driver. Installation and performance requirements of rear-view mirrors would conform to AIS 001 and AIS 002. Exterior rear-view mirrors would also enable the driver to view object near bumper area.

52) Sun Visor:

a) Adjustable sun visors would be provided for windshield & driver's side window. Visors would be shaped to minimize light leakage between visors & windshield. Adjustment of visors would be made easily by hand with positive locking & releasing devices and would not be subject to damage by over-tightening. Sun visor construction & material would be strong enough to resist breakage during adjustment. Visors may be transparent but would not allow a visible light transmittance in excess of 10%. Visors where deployed would be effective in driver's field of view at angles more than 5^{o} above horizontal.

b) An electric horn conforming to BIS: 1884-1993 or latest and installation requirements conforming to AIS 014 would be fitted in bus and further conforming to the provisions of CMVR.

53) ITS Equipment (OBITS)

a) The Service Provider shall procure buses as defined by the Authority which shall also include various but not limited to ITS System as defined by UBS II, AIS 140 Specifications and any amendments issued thereof. Some of the equipments and their quantities are listed below:

i. Intelligent Transport Management System (ITMS)

a.	Passenger Display Boards	4
b.	Speaker	4
c.	Amplifier	1
d.	SCU / OBU	1
e.	DDU	1
f.	CCTV System	2 Internal Cameras, 1 Internal front facing camera 1 External Reverse Camera with Cover 1 MDVR for storage up to 07days)

g. Panic Button System integrated into the SCU / OBU or as per UBS-II/ AIS-140

b) The equipment of the OBITS shall be integrated to each other and the Bus CAN for transmitting all the bus data, vehicle tracking data and the any other data as required by the Authority. The Cost of such integration would be the responsibility of the Service Provider.

c) The Authority shall provide all the route information for along with Passenger Information System to the Service Provider to upload into the OBITS.

d) All OBITS equipment listed our should be ARAI/ICAT certified or any GoI approved agency at the time of delivery of the buses.

The Service Provider shall provide the complete OBITS system as specified herein above in the Buses. The Service Provider shall also ensure to supply equipment compatible with existing ITS System of Authority so as to enable smooth integration. Service Provider is responsible for regular maintenance OBITS equipment installed by it during the Contract Period. The Service Provider and Authority agree to share interfacing protocols and Active Programming Interface with each other for smooth integration of OBIITS equipment provided by Service Provider with Authority's ITMS System. The service provider shall share all data generated by OBITS with the authority

a) The Authority can mount any equipment in the Buses provided by the Service Provider at its own cost and the Service Provider shall be responsible for the safety and security of such equipment during the Contract Period.

54) Stop Requests:

a) A suitable device for the convenience of passengers to request for stopping bus be provided at appropriate locations

b) Bumpers:

i. Bus would be provided with front and rear bumpers of Steel or impact resistant polymer or combination of both meeting requirement of an energy absorbing system. The bumper would be easily repairable/ replaceable. Bumpers would conform to the requirements of CMVR, AIS (069), and Bus Code/any other international Standards (to be specified by the manufacturer). The Successful bidder would supply details of above bumpers along with drawings including thickness of bumpers, section, profile etc. or as per manufacturers design

ii. Bus manufacturer would provide details of materials used, their specifications and process followed for their repair and maintenance along with material required.

55) Towing device:

Heavy-duty ring type towing devices would be provided in front and rear bumper area with load transfer to bus structural members. Capacity of each towing device would be 1.2 times (minimum) the kerb weight of the bus. The manufacturer would supply a copy of the test certificate of the towing devices.

56) Wind Screens:

Front and rear wind screen in the bus would be as per AIS 052 and homologation certificate to be obtained.

57) Wind Screen Wipers:

Electrically operated windscreen wiper system having two wiper arms with blades would be provided. Wiper motor would be heavy-duty steel body for minimum of two-speed operations. Wiper arms would rest horizontally when not in use. The sweep angle would be sufficiently wide for clear view during rainy days. Windscreen wiping system would be 24V, having variable speed, with fitment of time delay relay. Windshield washer system would spray washing fluid on windshield & when used with the wipers, would evenly & completely wet the entire wiped area. Windshield washer system would have a minimum of 2.5 litres capacity tank suitably located for easy refilling from inside the bus and two nozzles at suitable location for proper spray of fluid. Reservoir pumps, lines & fittings would be corrosion resistant & reservoir itself would be translucent for easy determination of fluid level. The windscreen wiping system would be in accordance with CMVR/ BIS: 7827 Part1, 2, 3 (section 1, 2) or latest.

58) Fire Extinguishers:

Multi purpose fire extinguishers would be ISI marked conforming to BIS: 13849-1993 or latest, dry powder type (Stored pressure) duly filled, of capacity and quantity as per the provisions of GSR-853 (E) dated 19.11.2001 notification of Government of India, Bus Code, UBS II. Fire extinguishers would be encased & fitted with proper reinforcement. The enclosure box would have transparent breakable glass at front cover.

59) First Aid Kit:

First aid kit complete with items, medicines, bandages etc. would be provided as per provisions of CMVR fitted near driver seat at appropriate position and level on side with proper reinforcement.

60) Provisions for Persons with Disabilities:

The manufacturer would provide for ease of accessibility, guidance, anchorage of wheel chairs on-board, positioning of aids etc system for Persons with Disabilities (PwDs) that meets the requirements as given in the Bus Code and CMVR.

61) Battery / power supply system for auxiliary systems / aggregates of bus:

a) Power supply system for operation of bus aggregates other than electric propulsion system would be 24V of minimum 100 Amps-hour capacity, low maintenance type lead acid batteries or any other source, which shall be brought out by bus manufacturer in his bid. Such supply system would 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, if any, but insulated against ingress of dust and moisture. In the event of separate batteries/power supply for these systems, the battery box/power supply system would be appropriately mounted and would be well secured, easily accessible & ventilated. Performance requirements of batteries would conform to BIS: 7372-1995 (or latest).

b) In the later case at 41.1. battery terminals, if batteries provided, with positive locking system (e.g. angle type terminal with provision for double bolting) duly protected against all possible short circuit risk would be provided or as per manufacturers design.

c) Each power supply cable would be covered with flame retardant Grey colour corrugated flexible pipe and would be properly encased & clamped as per AIS-052.

d) A relay controlled Heavy-duty type battery/supply cut-off switch (isolator switch) capable of carrying & interrupting total circuit load would be provided 1 each near battery/supply system / driver on side panelling at appropriate level for disconnecting all battery positives/supply system except for safety devices such as fire suppression system & other systems as specified. Two points of battery/supply cut off switch would be connected with battery/supply source and two points would be connected with self- starter. The battery/supply Cut-off switch with power plant operating, would not damage any components of electrical system in off position. The battery / power supply Cut-off switch would be capable of carrying & interrupting the total circuit load or as per manufacturers design with AIS-052 certification.

62) Electrical equipment and wiring for bus aggregate supply system/ source:

As per details given in UBS II or to be as per manufacturers design, certification to be obtained as under:

a) The bus would have 24 Volt D.C with multiplex wiring system for all its electrical equipment's except in unavoidable circumstances to avoid sparking in buses. A separate system/ mechanism would be provided for discharge of electro static charge induced during the operation of vehicle. Adequate precaution would be taken in case of single pole wiring to avoid spark in any of the items etc..

b) An adequate capacity power supply system / source of 24V DC, minimum 150Ah rating with consistent output to take care of high idling periods of city operation would be provided and so located as to minimize ingress of oil or rain water into it. Bus Manufacturer may, if so required, have to install two separate power supply systems / sources one each for Air Conditioning System and bus Auxiliary systems.

c) Details of specifications of Battery / power supply sources for vehicle auxiliary systems / air conditioning etc, the starting mechanism, if any, along with circuit diagrams would be furnished by the manufacture along with their bids.

d) Electrical equipment and wiring would conform to Indian/ international Standards, bus code and UBS II. All cabling would be as per provisions of Bus code / UBS II. The wiring would be multiplex system, flame proof, ISI marked conforming to BIS: 2465-1984 or latest. As far as possible electrical system would be 24V double pole multiplex wiring system except in unavoidable condition. However, in case of single pole wiring all power & ground wiring would have double

electrical insulation, which would be waterproof conforming to the Indian/ International Standards. Wiring would be grouped, numbered &colour coded. Wiring harnesses would not contain wires of different voltage classes unless all wires within the harness or insulated for highest voltage present in harness. Kinking, grounding at multiple points, stretching & exceeding minimum bend radius would be prevented.

e) Wiring looms/ harness for electrical system of bus would be properly routed, encased/ concealed type so mounted to eliminate chances of any spark. Details of above wiring loom including circuit diagram; layout of controls etc would be supplied by the bidder along with the bid Wiring support would be protective & non-conducting at areas of wire contact & would not be damaged by heat, water, solvents or chafing.

f) All electrical fittings and lights would be fully wired up, running in flame retardant black colour PVC sleeves as per applicable Indian Standards (to be specified by the manufacturer) 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 sheet metals/ structural member, suitable rubber grommets/ Bakelite inserts would be provided in these holes to avoid direct contact between cables and sheet metal causing damage to insulation coating.

g) Bus manufacturer would furnish details of above wires/cables and battery / auxiliary items supply system cables.

h) Design of electrical, electronic & data communication systems would 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 main body wiring harness would be removable & replaceable. Power Plant wiring would be an independent wiring module. Replacement of power plant compartment wiring module would not require pulling wires through any bulkhead or removing any terminals from the wires.

i) Electrical system & its electronic components would be capable of operating in area of the vehicle in which they will be installed. Electrical & electronic equipments would not be located in an environment that will reduce performance or shorten life of the component or electrical system. No vehicle component would generate or be affected by electro-magnetic interference or radio frequency interference (EMI/RFI) that can disturb performance of electrical / electronic equipments.

j) Bus manufacturer would furnish recommendations regarding methods to prevent damage from voltage spikes generated from welding, jumps start shorts etc.

k) All electrical & electronics hardware would be accessible & replaceable easily. It would be mounted on an insulating panel to facilitate replacement. Mounting of hardware would not be used to provide sole source ground and all hardware would be isolated from potential EMI/ RFI.

l) All electrical/ electronic hardware mounted in interior of bus would be inaccessible to passengers & hidden from view unless intended to be viewed.

m) All electrical/ electronic hardware mounted on exterior of bus i.e. not designed to be installed in an exposed environment would be mounted in a sealed enclosure.

n) All electrical/ electronic hardware & its mountings would comply with shock & vibration

requirements.

o) Bus manufacturer would provide a certificate of testing/estimation of electrical load for each system.

p) Electric supply systems' over voltage output protection would be provided.

q) All branch circuits would be protected by circuit breakers or fuses sized to requirements of the load. Circuit breakers or fuses would be sized to larger than total circuit load current as per UBS II. Current rating for wire used for each circuit must exceed size of circuit protection being used.

r) Electronic Circuit protection for power supply for starting mechanism / device if any would be provided to prevent engaging of for long time / to prevent overheating.

s) To the extent practicable, wiring would not be located in environmentally exposed locations under the vehicle. Wiring & electrical equipments necessarily located under the vehicle would be insulated from water, heat, corrosion & mechanical damage. Where feasible front to rear electrical harnesses should be installed above the window line of vehicle.

t) All electrical motors/subsystems would be easily accessible for servicing.

u) Separate additional out-lets, as required in UBS II, are to be provided with appropriate relays & fuses in wiring harness for fitment of electrical auxiliary devices/ systems to be added later on in buses, if required.

v) AC (Alternating Current) out-let of 220V, as required in UBS II if any, be provided at suitable location for charging of electrical/electronic equipment, etc.

w) If any electronic components have an internal clock, it would be provided with its own power supply back up to monitor time when electric propulsion system power is disconnected.

x) All electronic components/equipment would have self-protecting capability in event of shorts in cabling and also in over voltage and reverse polarity conditions. If an electronic component is required to interface with other components it would not require external pull up and/ or pull down resisters.

y) RF components such as global positioning system (GPS) etc. whenever provided would use coaxial cable to carry the signal. The RF systems require special design consideration for losses along the cable. Connectors would be minimized, since each connector & crimp has a loss, which will attribute to attenuation of signal. Cabling should allow for removal of antennas or attached electronics without removing the installed cable between them.

63) Lights and lighting system to be as per manufacturers design, certification to be obtained:

a) Interior saloon lighting would be sunken type light assembly fitted with LED lights and mounted in staggered formation for uniform lighting in two separate circuits. First row of lamps provided in driver's cabin should be fitted with amber internal filter to reduce glare to driver at night.

b) Headlamps in front-end to be as per AIS-052.

c) White and Red marker lights of 5 Watt each would be fitted at both top side corners of the front and rear panel of the bus respectively.

d) Identical signal lights of 15 Watts would be fitted for inter-changeability in each side i.e.; front, rear and side respectively

e) Brake lights (15 W) and taillights (10W) would be two separate lights to reduce heat generation.

f) Reverse light of 25W, square lamps with white covers would be provided.

g) Side markers would be provided on both sides as per bus code/ AIS 008

h) Rear signal lights, brake lights, taillights and reverse lights would be arranged vertically.

i) Light wattages given above are indicative, however, all the lights and lighting systems would conform to requirements of Bus code, CMVR/Karnataka MVR / UBS II and other relevant AIS Standards.

j) Following lights would be actuated when the headlight are 'ON' and the doors are 'Open':

   i. Lights provided for illuminating exit/entrance door area, lights would illuminate outside area up to at least one meter when door/doors is/are opened. Lights for exit/entrance door areas would be flushed as far as possible to avoid tripping of passengers, protrusions if any would conform to relevant CMVR/ AIS Standards.

   ii. Exterior door lights - Lights would be automatically switched off when the door is closed.

   iii. A well-lighted bus registration number plate would be fitted at rear as per provisions of CMVR duly complying with directives/ regulations regarding high security number plates as notified by Government of India / Government of Gujarat if any.

k) No Electrical fittings would be mounted on front and rear bumpers.

l) Switches would be fitted on right hand side of instrument panel through evenly loaded circuits & fuses as per bus code.

m) A reverse buzzer would be installed at the rear of bus to sound intermittently when reverse gear is engaged.

n) A suitable light would also be provided in electric propulsion system compartment for ease of maintenance/ emergency repairing.

o) Following circuit diagrams would be supplied along with buses:

   i. Complete circuit drawings for exit/entrance door control system, door mechanism. Complete door sensor electrical circuit drawing.

   ii. Complete circuit drawing for sensitive door edge system.

   iii. A layout drawing for all door control switches, gauges, warning lights on driver's dashboard.

   iv. A layout drawing for all lighting and wiring circuits, control switches fuses and fitment details and diagrams along with item specs and types in each case.

v. Complete circuit diagram for the electric propulsion system inter-alia highlighting high, medium and low voltage cable, safety / protection systems, etc

64) Performance Statement:

a) Bus manufacturers would furnish following information for performance evaluation of bus chassis and/ or complete buses supplied to other customers and now in service for at least 5 years. The information should be furnished separately order wise:

a) Type/Model

i. Name and address of the bus operating agencies where this model is operating
ii. Number of the buses supplied
iii. Order no. against which buses have been supplied.
iv. Date of supply and date from which in service
v. Maximum/minimum turning radius.
vi. Maximum climbing ability/ gradeability
vii. Type of bus body
viii. Electric propulsion system details such as max power, battery data, usable power, max min battery charging and discharge data, controllers, safety devices/provisions, SPECS AND STDS against each item,
ix. Electric propulsion system - load speed performance curves and data, range (Kms) between two consecutive charging,
x. Battery charging system, charging rate, charging time, types of batteries, battery pack mountings, etc
xi. Specific energy consumption – bus kms operation per unit energy(kwh) consumed, specific weight of batteries (weight per kwh rating), annual deterioration factor of batteries with age with respect to specific energy consumption,
xii. GVW of buses
xiii. Noise emission Norms
xiv. Type of suspension system
xv. Dimensions- Length, width, height, floor height, wheel base,
xvi. Angle of approach, departure and ramp over
xvii. Axle –rear and front
xviii. Passenger carrying capacity – seated and standees as worked out by using AIS 052
xix. Any other performance data.

65) Technical information

Technical information required to be furnished by bus manufacturers along with Bid with respect to the following amongst others:

a) Bus manufacturer's technical information of the bus i.e. General Drawings comprising of elevations –sides, front & rear ends along-with main dimensions i.e. overall length, overall width, overall height, saloon height, pillar to pillar distance, isometric views, exterior & interior details,

seating layouts, no. of seats (excluding seat for driver), environmental friendly colour scheme as per the Authority, etc. would submit same along-with the Bid.

b) General appearance & structural details of roof, floor, sides, front & rear show and driver's cab would be provided by the bidder along with their bids. Details of main structural members, material specifications, shape, size, thickness, etc be indicated on the above drawings.

c) Power Point presentation material on a DVD for offered design of bus (indicative) and painted in environmental friendly colour scheme as given by the Authority would be submitted along-with the bid. The presentation will cover elevations –sides, front & rear ends along-with main dimensions, isometric views, exterior & interior details, seating layouts, colour scheme etc.

66) Tools, Gauges and Testing Instruments:

Bus manufacturers would furnish a list of special tools, gauges and testing instruments for inspection, repair and maintenance of buses along with a complete list of spare parts recommended for:

i. Normal wear and tear; and

ii. Emergency requirements for any breakdowns, damages etc.

67) Operation and Maintenance Manual:

a) At least 2 hard bound copies, for every 25 buses or part thereof, of operation and maintenance manual containing essential technical information required for satisfactory operation, inspection and maintenance would be supplied by bus manufacturers. and

b) 1 Softcopy of operation and maintenance manual containing essential technical information required for satisfactory operation, inspection and maintenance would be supplied by bus manufacturers.

i. One set of Coloured wall charts would also be provided of following units for every ten buses or part thereof showing assembly details:

ii. Chassis lubrication and brake system.

iii. One set of Coloured wall charts of following units amongst others for every 25 buses showing assembly details:

- Electric propulsion system, batteries / packs, motor,
- Traction Controller system, power input system for auxiliary systems/aggregates of bus
- Drive line and Rear axle
- Front axle
- Steering system, suspension system, etc
- Brake system, ABS etc
- Regenerative braking system
- Safety devices
- Bus AC System
- Any other necessary for skill development of operator staff

68) Training

a) For each lot of up to 25 buses or part thereof, bus manufacturer would arrange orientation training at Bengaluru for two days for 60-70 drivers in batches of 20-25 (up to a total of 150 man days) besides similar orientation training at Bengaluru for 3 days for 50 technicians/ supervisors/ engineers in batches of 25 (Total 75 man-days).

b) Bus/ energy/ available facilities will be provided by Service Provider and course materials will be provided by bus manufacturer on free of cost basis. This training will be provided free of cost, as and when required by the Authority / Service Provider within one year of purchase of buses.

c) If training needs to be provided at Service Provider / OEM / Bus Manufacturer site, all expenses for such training shall be borne by the Service Provider to fulfill their training obligations.

d) Training for 2 days on the operations of BMTC and one day of test would be conducted and all costs thereof shall levied from the operator

69) Tool kit

Bus manufacturer would 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 tool kit to be supplied with every bus would be supplied by the manufacturer. One (1) Hydraulic Jack per bus of a capacity of at least 12 Ton as per design of bus would also be supplied.

70) Inspection and Testing:

a) Bus may be inspected at various stages of fabrication by the Authorities representative at manufacturer works. Inspection would comprise of ensuring that all materials, components, items, accessories and assemblies used in fabrication of buses conform to contractual specifications. Wherever required to ensure this, laboratory test would be carried out at bus manufacturer's cost.

b) The inspection may be undertaken at any and or all stages such as component fabrication stage, chemical pre-treatment stage, fabrication of assembly, sub assembly stage, structure, panelling and equipping stage and Pre-dispatch inspection.

c) Final Inspection of buses would be carried out at manufacturer's facilities and or at a place finalized by the Authority After the bus is finally inspected, it would be subjected to test run and trials as required by the Authority.

d) The bus would be taken over by the Authority after satisfactory final inspection, testing and trials in Bengaluru.

71) Maintenance Spares and Materials

a) The Service Provider would provide details of components/spares required for maintenance of vehicle for twelve months' operation taking daily utilization of bus of up to 230 Kms.

b) The Service Provider would also provide complete details of vendors, for every component/ spares for complete bus and the spare parts catalogue in 2 sets for every 25 buses or part thereof.

c) The Service Provider would ensure that during service life of 10 years or 8, 00,000 Kms. (whichever is later) of service, adequate spare parts in kit form/ individual components are made available in time to the Authority on demand along with other essential items required.

d) All spare parts availability would be more than 95% at any time

72) Maintainability

a) Design and fabrication of bus would be such as 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 electric propulsion system , traction controller system, differential, battery cooling system, door closing mechanism, PIS etc. would be easy for repair & maintenance purpose. Enough space would be provided between wind screen glasses and PIS boards for facilitating cleaning of glasses.

b) Battery cooling system coolant top up/ filling and electric propulsion system charging inlets would be easily accessible with suitable closing devices complete with locking arrangement/- holding arrangement.

c) Also an easy access would be provided for attending to other assemblies mounted in the vehicle.

73) Warranty/ Guarantee

As per the manufacturers design.

74) General Requirements:

a) The Authority reserves the right to alter, modify, change specifications as per requirement to suit the latest provisions of CMVR/ any other Notifications, safety aspects, regulatory aspects besides any practical/ operational difficulties etc. faced/likely to be faced by the Authority. Vehicle Manufacturer would ensure that all alterations, changes or modifications in specifications, if necessary, as mentioned above would be carried out in buses built by them as per the advice of the Authority without attributing any additional cost.

b) Ministry of Road Transport & Highways, Government of India (MORT&H) vide Notification No.GSR-853 (E) dated 19.11.2001 in the Gazette of India, inter-alia stipulated the following measures which need to be complied with for enhancement of safety by the Vehicle Manufacturers as per the statutory requirement for registration of vehicles

i. While registering every bus, Vehicle Manufacturers & transport authority would 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.

ii. For electrical installations, flameproof cables would be used, especially positive terminals would be locked firmly with all cables & pipes with proper looming to take care of vibrations, fire retardant material would be used for seats, roof & sidewalls. Safety instructions about fire hazards would be displayed.

iii. 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, Rub rail tube, stretch & body panel stiffeners, gussets etc. would be provided by bus manufacturers.

iv. All aluminum extrusions to be as per AIS 052.

v. All edges would be rounded off and would not cause injury to bus occupants.

vi. Complete bus would be rattle-free.

vii. All the rivet and bolt holes would be jig drilled as far as possible. The rivet holes should be drilled before the corrosion treatment. Holes drilled after the corrosion treatment be suitably treated with anti corrosion materials. Rivet heads neatly formed and each bolt/ rivet would be tightened after full mating of the surfaces to be fastened.

viii. All safety aspects should be considered while designing and fabricating the bus.

ix. Continuous length piano type hinges and tower bolts of stainless steel would be used as per relevant Indian Standards.

x. Similarly Aluminum extruded sections wherever not painted would be anodized.

xi. All flaps wherever provided should have heavy-duty support to keep it open for ease of maintenance.

xii. All miscellaneous M.S pipes would be phosphated with the coating of 2.16 to 2.70 gm/m2 or by any other pre-treatment process conforming to Indian/ international Standards (to be specified by the manufacturer). Samples of all materials & components would 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%.

xiii. Anodized decorative aluminium mouldings/ beadings etc would be used.

xiv. All M.S pipes used in the bus would be ERW conforming to BIS 3601:1984 or latest, of grade WT –160.

xv. All rubber items used on the bus body would be made of Ethylene Propylene Dien Monomer (EPDM) rubber of black colour conforming to the Indian/ International Standards to be specified by the Manufacturer.

xvi. EPDM rub rail of aesthetic profile would be fitted in anodized extruded aluminium channel between stretch panel and skirt rail longitudinally at the widest portion of the bus. The quality of EPDM material would be as per the Indian/ International Standards to be specified by the Bidder or to be as per manufacturers design.

xvii. Every trap/-opening flap would be secured in a manner that the vibrations can't dislodge it. Lifting devices must not protrude above the flap.

xviii. Ease of accessibility to electric propulsion system & other aggregates for easy maintenance would be ensured. Assemblies / units would be so mounted that they are easily accessible & can be removed without disturbing other components / assemblies.

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

xx. Exterior protrusions if any would 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. Advertising frames would protrude no more than 22mm from the body surface and would have the exposed edges and corners rounded to the extent practicable. Grills, doors, bumpers and other features on the sides and rear of the bus would be designed to minimize the ability of unauthorized riders to secure toeholds or handholds. The exterior body features would be shaped to allow complete & easy cleaning by automatic bus washers without snagging washer brushes or retaining water & dirt.

xxi. Hydraulic Grease Nipples would be provided for ease of proper lubrication & maintenance.

xxii. Front panels, bumpers and grill should be designed such that there are no pointed or sharp protrusions to minimise injuries to vulnerable road users in case of impact.

75) Quality assurance

a) The Bus manufacturer would use materials including fasteners conforming to relevant Indian/ International Standards and would get the same tested before use, meeting requirements of all specified parameters to ensure quality of material specified. However, random sample of materials picked up and duly sealed by representative of the Authority in presence of bus manufacturer, out of purchased lot at works of the manufacturer or out of the bus under fabrication/ completed bus and be sent for testing quality of components at ICAT/ARAI/BIS approved testing laboratories having testing facilities for testing all parameters of specifications of materials/ items. In the event of failure of samples in lab tests, testing would be conducted in same way again from fresh lot. The bidder would replace failed materials by those duly passed in lab tests.

b) In the event of failure of material/ items in laboratory test, failure of material/ items (removed from completed bus) in laboratory test, acceptance decision about bus be taken by the Authority after obtaining compensation/ recoveries of liquidated damages from bus supplier as per system decided by the Authority. Wherever, failure of material on one parameter or more than one parameter, recoveries for complete lot of materials used in bus would be made from manufacturer plus 20% damages thereof.

c) Completed bus would be subjected to water leakage test conforming to BIS: 11865- 1986 or latest.

d) Add list of items to be tested for bus bodies as had been given earlier .

76) Statutory Requirement

a) Bus manufacturer would ensure that all statutory requirements in respect of each and every item of bus are fully met. Manufacturer would also obtain type approval certificates etc. for bus & any other items from testing agencies specified in the CMVR namely or Automotive Research Association of India, Pune or Indian Institute of Petroleum, Dehradun and or any other agencies as specified by the Central Government on date of testing/ type approval or any other agency specified by competent authority. A certificate showing details of make/type/model of various units like electric propulsion system items, Traction Controller system items, rear axle, batteries, tyres, steering, instruments on the panel, air compressor, shock absorbers, suspension system items, etc. would be furnished.

b) Bus Manufacture/ Bodybuilder must make sure that the Fully built bus complies with standards and regulations for Electrically propelled vehicle provided in the AIS-052, AIS 024, AIS 028, any other applicable standard; CMVR 1989 as amended till date, CMVR 1989 and Gujarat MVR 1989 and all amendments thereto.

77) Manufacturer's Nameplate

Manufacturer's nameplate may be fixed as per approval of the Authority.

78) Any Other Provisions to make the Bus Fully Functional.

Notes indicated in this doc form part of the specs / bus body building requirements. Should however there be any conflict details contained in notes would over-ride others.

79) Specifications related to Fire Detection and Alarm System (FDAS) General Requirements (if required to be provided as per AIS-052)

a) FDAS provision is to be made in the bus at appropriate location(s) for detection and alarming about any likely fire at all fire prone systems (bus supplier to identify such fire prone systems and make above provisions)

b) Vehicles shall be equipped with fire detection & alarm system detecting fires in the fire prone areas based on sensors that senses either abnormally high temperature or rate of temperature rise, or both.

c) Upon detection of fire in the fire prone areas, the system referred in clause no 1.1, shall provide the driver with both an audio and a visual signal, and activate the hazard warning signal. The placement of the visual alarm shall be such that it is visible unobstructed while viewed from the driver seat.

d) The detection & alarm system shall be operational irrespective of whether electrical propulsion system of bus has been started and the vehicle's attitude.

e) The installation of the fire detection & alarm system shall comply with the following requirements;

f) The fire detection & alarm system shall be installed according to the system manufacturer's installation manual.

g) An analysis shall be conducted prior to the installation in order to determine the location of fire detectors and alarm system. Potential fire hazards within the fire prone areas shall be identified such that the fire detectors shall be positioned to cover the fire hazard. The system shall also be ensured to work properly regardless of the vehicle’s altitude, road conditions etc.

h) Fire hazards to be taken into account in the analysis shall at least consist of the following: Components whose surface may reach temperatures above the auto-ignition temperature for fluids, gases or substances that are present in the fire prone areas and electrical components and cables with a current or voltage high enough for an ignition to occur as well as hoses and containers with flammable liquid or gas (in particular if those are pressurized). The analysis shall be fully documented.

i) The Fire Detection and Alarm System (FDAS) installed in the Buses shall comply with the requirement of AIS 135, UBS II as applicable, CMVR and other relevant standards as well as best market practices.

j) Make, model, specs etc of various components / sub-systems / system of FDAS be clearly indicated for each item as part of the offer..A detailed drawing of the system details / specs be also provided for.

80) Electric Bus Battery charging Requirements

a) The Electric Buses shall be operated with Single/Multiple Charging throughout the day to maintain the operation plan. The Buses shall be available for charging during night orafter

completion of scheduled trips. The Service Provider is required to install and operate adequate charging stations at the Depot/Parking space provided by the Authority.

b) Under No circumstances should the performance of the buses suffer in case of low battery charge status. If buses showing are such performance, Service Provider shall have to forthwith remedy the situation, shall attract damages and persistent and repeated failures on this count shall constitute a material breach of the performance conditions.

c) The Authority will make bulk power available at identified Spaces for parking, charging and maintenance. Service Provider will arrange for site level distribution of power to its charging points along with related equipment and infrastructure for charging including any civil and other ancillary work required for parking, charging and maintenance. The decision on number of chargers to be provided is left to the Service Provider according to his solution.

22.1.1 The Authority shall pay for the power consumption Charges for Energy consumptions for Bus charging shall be paid by BMTC and debited to operator in his monthly bills. All Information regarding Electricity Rates applicable may be obtained directly from BESCOM. The Service Provider will present the best solution in terms of bus, capacity of batteries, charging infrastructure required, charging time etc. looking to the operational requirements of the Authority.

d) The Service Provider will support the procurement, supply, operation and maintenance of the Bus including battery charging, maintenance /replacement in all respects throughout the Contract Period. It will make its appropriately trained and qualified technical staff available for any solutions, challenges and fine tuning.

e) The Service Provider must provide details of his proposed solution in terms of charging time, charging stations requirement, space requirements, scheduling and charging plan etc.

f) The Service Provider must commit to keep upgrading his technology is and as required based on approval of Authority.

PART C : BUS SPECIFICATIONS FOR 12 M ELECTRIC AC BUS

The Contracted buses shall be complaint to UBS-II/DHI along with ITS and Bus Code (AIS-052, 140, 153 and AIS-049). The homologation certificate should be provided during the supply of proto type bus and the technical specifications required are as below:

S. No.	Parameter	Specification
1.	Propulsion System	Electrically Propelled Bus using Electric Propulsion System.
2.	Type of Battery	Li-ion or Li-ion Phosphate Battery or Li-NMC or Superior.
3.	a. Battery Pack Rating and Energy/Power b. Minimum & Maximum Charging% c. Maximum30 Min. Power(kw) d. Motor/s Capacity	1. No. of Motors / Batteries as per Manufacturer's design. 2. Power consumption – As per Manufacturers design 3. Electrical Re-generation required. 4. Charging Mode –as per manufacturers design. 5. Off-Board or On-Board Charging Required 6. Charging Time less than 4hours. 7. Safety–Short circuit/ Over Temperature / Lightening Protection is mandatory. 8. To Operate 200 kms in a single charge.
4.	Battery Cooling System	Efficient & Robust Battery Cooling System to be provided for Minimum Maintenance.
5.	Battery Life	As per Manufacturer's design.
6.	Battery Charging System	As per Manufacturer's design.
7.	Electric Drive Motors	Optimal Rating, Type, Make, Model of Electric Drive Motors with minimum maintenance.
8.	Rated Performance at GVW in Stop/ Start In Urban Operation	As per manufacturers design UBS-II / AIS 052/CMVR
9.	Acceleration (Meter / Sec.^{2})	As per manufacturers design UBS-II / AIS 052/CMVR
10.	Bus Speed of 0 – 30 kmph in Seconds.	As per manufacturers design UBS-II / AIS 052/CMVR
11.	Maximum Speed	As per manufacturers design UBS-II / AIS 052/CMVR
12.	Grade ability from Stop at 1.5 GVW	As per manufacturers design UBS-II / AIS 052/CMVR
13.	Electrical Propulsion System.	Electrical Propulsion System / Sub Systems(Batteries) Temperature, Motor Speed in RPM, Vehicle Speed, Motor Percent Load (Torque), Diagnostic Message (Electrical Propulsion System Batteries, Cooling System, Motor, Traction Controller Specific), SOC ith Vehicle Health Monitoring System (Battery Health + Regenerative Brake Charging).
14.	Electrical Propulsion System Location	As per Manufacturer's Design / Preferably Battery Location below floor.
15.	Charging Range	The bus should have a capacity of operating 200km in single charge on actual condition with GVW .

<table>
<tr><th>S. No.</th><th>Parameter</th><th>Specification</th></tr>
<tr><td>16.</td><td>Transmission</td><td>As per manufacturers design UBS-II / AIS 052/CMVR</td></tr>
<tr><td>17.</td><td>Front Axle</td><td>As per manufacturers design UBS-II / AIS 052/CMVR</td></tr>
<tr><td>18.</td><td>Rear Axle</td><td>As per manufacturers design UBS-II / AIS 052/CMVR</td></tr>
<tr><td>19.</td><td>Steering</td><td>As per manufacturers design UBS-II / AIS 052/CMVR</td></tr>
<tr><td>20.</td><td>Brakes</td><td>As per manufacturers design UBS-II / AIS 052/CMVR</td></tr>
<tr><td>21.</td><td>Wheels (Tyres)</td><td>As per manufacturers design UBS-II / AIS 052/CMVR</td></tr>
<tr><td>22.</td><td>Turning Circle</td><td>As per manufacturers design UBS-II / AIS 052/CMVR</td></tr>
<tr><td>23.</td><td>Front End Structure</td><td>As per manufacturers design UBS-II / AIS 052/CMVR</td></tr>
<tr><td>24.</td><td>Driver Seat</td><td>As per requirements of AIS: 023.</td></tr>
<tr><td>25.</td><td>Chassis</td><td>As per CMVR Rules
<table><tr><td>Wheel base</td><td>CMVR</td></tr><tr><td>Front Over Hang</td><td>As per CMVR</td></tr><tr><td>Rear Over Hang</td><td>As per CMVR</td></tr><tr><td>Total length</td><td>Not more than 12,000 mm</td></tr></table></td></tr>
<tr><td>26.</td><td>Towing Hook</td><td>As per manufacturers design UBS-II / AIS 052/CMVR</td></tr>
<tr><td>27.</td><td>Suspension</td><td>As per manufacturers design UBS-II / AIS 052/CMVR</td></tr>
<tr><td>28.</td><td>Shock Absorber</td><td>As per manufacturers design UBS-II / AIS 052/CMVR</td></tr>
<tr><td>29.</td><td>GVW</td><td>As per CMVR Rules & its amendments from time to time.</td></tr>
<tr><td>30.</td><td>Speed Limiting Device</td><td>As per manufacturers design.</td></tr>
<tr><td>31.</td><td>Accessibility</td><td>For ease of maintenance the assy/units i.e. Battery Pack, Air Cleaner Assembly, Rear Axle, Air Bellows, Brake Valves etc. shall be so mounted that they are easily accessible and can be removed without disturbing to other components.</td></tr>
<tr><td>32.</td><td>Control Panel</td><td>The Control panel with required control meters shall be easily visible and accessible as per current CMVR & AIS: 052 requirements.</td></tr>
<tr><td>33.</td><td>Type of Bus</td><td>Type I Non AC 12Meter, Bus Model should be approved as per AIS: 052 and its amendments from time to time by any Government Approved Organization.</td></tr>
</table>

<table>
<tr><th>S. No.</th><th>Parameter</th><th>Specification</th></tr>
<tr><td>34.</td><td>Seating System & Seating Capacity.</td><td>2 x 2 High back seats, seating capacity as per UBS II</td></tr>
<tr><td>35.</td><td>Body Dimensions<table><tr><td>i.</td><td>Overall Length Max.</td><td>12000 mm.</td></tr><tr><td>ii.</td><td>Overall Width Max.</td><td>2600 mm.</td></tr><tr><td>iii.</td><td>Over all Height Max.</td><td>3800 mm.</td></tr><tr><td>iv.</td><td>Floor Height Max.</td><td>400 mm.</td></tr></table></td><td></td></tr>
<tr><td>36.</td><td>Floor Structure</td><td>As per manufacturers design.</td></tr>
<tr><td>37.</td><td>Vehicle Structure</td><td>As per manufacturers design: to meet AIS:052 norms.</td></tr>
<tr><td>38.</td><td>Step pan</td><td>As per manufacturers design UBS-II / AIS 052/CMVR</td></tr>
<tr><td>39.</td><td colspan="2">Paneling<table><tr><td>a.</td><td>Out-Side Paneling</td><td>As per Manufacturers design</td></tr><tr><td>b.</td><td>In-Side Paneling</td><td>As per Manufacturers design</td></tr></table></td></tr>
<tr><td>40.</td><td>Decorative Aluminium Extruded Section</td><td>As per manufacturers design UBS-II / AIS 052/CMVR</td></tr>
<tr><td>41.</td><td>Insulation</td><td>Glass wool as per IS: 15061 of 2002, in between outside, inside & roof paneling for insulation & anti-drumming.</td></tr>
<tr><td>42.</td><td>Passenger & Driver Cabin Flooring</td><td>As per manufacturers design UBS-II / AIS 052/CMVR</td></tr>
<tr><td>43.</td><td>Driver Work Area</td><td>Driver Work Area should be as per AIS: 047</td></tr>
<tr><td>44.</td><td>Dash Board</td><td>As per manufacturers design UBS-II / AIS 052/CMVR</td></tr>
<tr><td>45.</td><td>First Aid Box</td><td>1 No. in Driver Cabin as per CMVR Rules.</td></tr>
<tr><td>46.</td><td>Passenger Door</td><td>In-swing / Out-swing Pneumatic Door with clear glass window as per requirement of AIS: 052 at LH Side in front of front axle 1 and between front and rear axle. Door mechanism should be robust type to avoid any rattling with good aesthetic look with proper rubber sealing to avoid ingress of water & dust.</td></tr>
<tr><td>47.</td><td>Driver Door</td><td>As per manufacturers design UBS-II / AIS 052/CMVR</td></tr>
<tr><td>48.</td><td>Emergency Exit & Door</td><td>As per manufacturers design UBS-II / AIS 052/CMVR</td></tr>
</table>

S. No.	Parameter	Specification
49.	FRP Front Show	As per manufacturers design UBS-II / AIS 052/CMVR
50.	FRP Rear Show	As per manufacturers design UBS-II / AIS 052/CMVR
51.	Battery Box	As per manufacturers design UBS-II / AIS 052/CMVR
52.	Roof Hatch	As per manufacturers design UBS-II / AIS 052/CMVR
53.	Window & Window Glasses	As per manufacturers design UBS-II / AIS 052/CMVR
54.	Decency frame/Step Partition	Near passenger step suitable size and space hand holds to be provided for boarding the passengers.
55.	Hand Holds.	Hand Holds should be provided as per AIS: 052 Bus Body Code Norms. Seat belts and Hand holds be provided for suitable seats for safety of passenger.
56.	Provision for Disabled Person	Provision for disabled person as per CMVR, AIS: 052
57.	Sun visor for Windshield	To be provided full width with Good Quality Material and Roller type as per manufacturers design.
58.	Rear View Mirror	As per AIS-052 / UBS-II
59.	Cabin Mirror	Suitable 1 No. in Driver cabin to observe movements of passengers.
60.	Destination Board	4 Led Digital Display Destination Board - 1 No. at Front, 1 No. at LH Side, 1 No at Rear and 1 No. at Internal Display Board as per AIS: 052 Bus Body Code along with voice announcement system as per UBS II Guidelines.
61.	Mud Flap	To be provided as per manufacturers design
62.	Passenger Seats	Type Approved High Back type Seats 2x2 seats as per AIS: 023. Seat belts to be provided wherever it is necessary.
63.	Front, Rear Bumper	As per manufacturers design UBS-II / AIS 052/CMVR
64.	Spare Wheel Bracket	As per OEM design.
65.	Registration No. Plate	Registration plate as per the standard size of golden yellow colour be provided
66.	Paint	The approval of design and shade of the paint be obtained from CME(P) before painting.
Electrical		

S. No.	Parameter		Specification
67.	Battery for Ancillaries Equipment's, Lights and Light Signalling Devices.		1. Maintenance Free Two Batteries of 12 V each, Minimum 100 AH of OE Approved Brand only, in polypropylene container with circuit breaker for Ancillaries Equipment's, Lights and Light Signaling Devices. 2. The Battery cable should be as per IS: 2465 & IS / ISO 6722. The connections shall be tinted copper enclosed in high density PVC Sleeve (with plastic corrugated) as per CMVR Rules. 3. The remote battery cut off switch with dash board control be provided or Battery Cut-off Switch near driver seat be accepted. The battery cable should pass through good quality rubber grommet at required places to avoid short circuit and thermal incidences.
	i.	Head Light Assy, Fog Lamp,Side Indicator Lamp, Tail Lamp Assy. etc.	Head lights –As per CMVR Fog lamp -2 nos. in Bumper/suitable place Side indicator lamp-As per CMVR Rules &requirements of AIS: 052 (At Front show). Tail lamp Assy.-As per CMVR Rules &requirement of AIS: 052.
	ii.	Passenger saloon Light	Sufficient and attractive LED Tube Lights with inbuiltLED night lamps to meet the requirement of LUX as per AIS: 052.
	iii.	Night Lamps	2 Nos. LED Night lamps to be provided
	iv.	LED Light	Sufficient LED Lights should be provided at Driver Cabin, Battery Box, Step Light, etc.
	v.	Number plate Light	For Rear side number plate light should be provided.
	vi.	Charging Socket	Deleted
	vii.	ETM Charger	ETM Charger should be provided in Driver Cabin
	viii.	PA System	Mike, Amplifier, 4 Nos. Speaker of reputed make
	ix.	Warning Device for Emergency door	Good quality as per requirements of CMVR & with suitable Sound level.
	x.	Hooter	1 No. of Hooter (Audio Visual Alarm) with Red Blinking Lights and connection in Side Indicator RH & LH Category 6 Lamps as per requirement of CMVR & AIS: 052 with required Sound level. It is clarified that as per new AIS: 052 requirements, hooter is essential for safety of passengers.
	xi.	Side Indicator Lamp	2 Nos. of Side Indicator Category 6 Lamps at LH & RH (Type Approved)
	xii.	Side Marker Lamp	Type Approved with Umber Reflector as per AIS: 052 requirements.
	xiii.	End Outline Marker(Height marker)	2 Nos. White at Front & 2 Nos. of Red at Rear with Proper Fitment(Type Approved).

S. No.	Parameter		Specification
	xiv.	Reverse Horn	1No. to be provided.
	xv.	Inverter	Sufficient capacity inverter should be provided for avoiding fire incidences
	xvi.	Intelligent Transport System (ITS) as per	Refere to Section 1 : Terms of Reference, Point No.52 for information and responsibility of ITMS syste.
	xvii.	Wiring.	As per AIS-052/ CMVR/ UBS-II
68.	Wind Screen Wiping System		Wind Screen Wiping System should be as per CMVR and IS : 15802.
69.	Retro-Reflective Tape of 50 mm wide as per AIS : 090 (Type Approved)		i. White Colour at Front Side as per AIS : 052 Requirements ii. Red Colour at Rear Side as per AIS : 052 Requirements iii. Yellow colour at LH & RH as per AIS: 052 Requirements.
70.	Stickers		Electric, Monogram, brand etc. be done by using good quality reflecting stickers as per choice and design of BMTC. One set of blue signage stickers be provided in the saloon portion mentioning seats for ladies, physically challenged ladies, physically challenged men, senior citizen, emergency door, no smoking and red colour cross mark for door glass. Radium stickers with BMTC monogram be provided on either side of the vehicle and on the rear side as BMTC in kannada, BMTC sign be provided on front grill, all the letterings shall be in kannada, type, size and colour and location as per BMTC requirements. One chart showing the chassis details be screen printed below waist rail by the side of front door.
71.	Tool Box		Standard Tool Box to be provided at appropriate space With Light Arrangement.
72.	Reflector		As per CMVR requirement 2 nos. white reflectors to be provided at front and 2 nos. red reflectors to be provided at rear in addition to reflective tape.
73.	Door Lock & Hinges		Should be Type Approved.
74.	Fire Extinguisher		2 Nos. (6 Kg 1 No + 4 Kg 1 No) Should be Provided as per given standard.
75.	Fire Detection & Suppression System (FDSS)		If required to be provided as per AIS : 135 & AIS : 153
76.	Safety Belts		Safety Belt where ever Necessary as per IS: 15140 of 2003 (Type Approved) should Provide, 3 Point Safety Belt For Driver Seat should be provided.
77.	Noise Level		Noise level shall be as per requirements of CMVR & AIS: 052 & Its amendments time to time, applicable at the time of delivery of the chassis.
78.	Bus Should be Type Approved As per AIS: 052 & Complies to AIS:153, AIS :140 & IP 65		

Notes:

- *All cross and or T or X-joints of structural elements of bus body structure (Front, rear, sides, roof, floor, etc) be provided with MS gussets of min 2.5 mm thickness. All Weld- ments / structural sub*

elements be properly cleaned and treated for corrosion prevention

- *Service / inspection hatches with covers be provided for servicing of various aggregates / sub-systems of bus.*
- *Width of wheel arches frame be maintained as per chassis manufacturer specs for providing adequate ventilation to tyres amongst fulfilling other needs.*
- *Stanchion pipes and grab rails to be of Aluminum tubing of appropriate specs, size / wall thickness etc. Handholds supporting hand rails and the stanchion pipes be painted in cannery yellow color, Brackets be grey matching the colour of the inner paneling. Brackets however need to be of proper size and shape to ensure perfect fittings. No redundant fastening holes be provided on brackets*
- *Hand holds be of polycarbonate material, transparent and provision for space*
- *No Spare-wheel carrier and spare-wheel hatch need be provided on the bus. As the same need not be carried on-board during urban operations. Spare wheel would be retained in bus depot as float.*
- *Stop buzzers may be provided as one in frontal area, one in middle and one in the rear area on stanchions at reasonable height ensuring easy accessibility as well as preventing unnecessary usage. Design of buzzer switch be sturdy, long lasting and sunk-in type to avoid undesirable / inadvertent operation.*
- *LED illumination provided in saloon area of the bus be covered with ground glasses to prevent glare.*
- Mounting of *bus body cross bearers on chassis be as per design / instructions of the chassis manufacturer.*
- *Tail lamps be as per AIS-052/ UBS-II*
- *Front and rear facia of the bus body may be fabricated out of FRP suitably designed, ensuring its strength, finish and ease of repair / replacements at par or better than the metallic ones asked for in the specs.*
- *Where type approval, of any of the bus body items including full bus body / bus is a mandatory requirement Type approval be undertaken by test agencies authorized under CMVR. In other cases approval of selection of testing agency be obtained from the Authority.*
- *Design approval of multiplexing wiring in bus body / bus be obtained from test agencies authorized under CMVR or any other agency accredited for the purpose subject to approval of the Authority.*
- *Bus body builder to provide detailed drawings / specifications / make / model etc as called for in specs for all items as generally indicated in RFP specs. Including but not limited to electrical Circuit diagrams of electrical subsystems in the bus.*