



8000 SERIES PASSENGER RAILCARS

SCOPE OF WORK

ENGINEERING CONSULTING SERVICES FOR 8000 SERIES PASSENGER RAILCARS



RFP No. FQ18149/MH
MARCH 2018

Attachment A

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SCOPE OF WORK

1. GENERAL

A. PURPOSE

Washington Metropolitan Area Transit Authority (WMATA) seeks to procure professional engineering consulting services in support of the programs associated with the procurement, design, manufacturing, testing, commissioning and warranty support of 8000 Series passenger railcars and an option for the rehabilitation and overhaul of the 6000 Series passenger railcars.

B. DESCRIPTION

The contractor shall provide professional engineering, technical, and administrative personnel to support the procurement, design, manufacturing, inspection, testing, commissioning and warranty services for the 8000 Series passenger railcar and rehabilitation and overhaul of the 6000 Series passenger railcar (if the option is exercised).

C. CONTRACT TYPE

WMATA intends to award a firm fixed price (FFP) task order requirement type contract.

D. CONTRACT TERM

The term of the contract shall consist of a multi-year base of seven (7) years and five (5) one year option years. This contract contains option years and optional services. The option years may be issued in any multitude not to exceed a total of five (5) years, with a total contract term not to exceed twelve (12) years. WMATA may exercise option years for engineering consulting services in support of the rehabilitation and overhaul of the 6000 Series passenger rail car at any time during the contract term.

E. DEFINITION

- a. The Washington Metropolitan Area Transit Authority shall be referred herein as WMATA.
- b. The firm providing engineering consulting services in support of the 8000 Series and 6000 series railcars shall be referred herein as the Contractor.

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- c. The firm to which WMATA will award a separate contract for the procurement and manufacturing of the 8000 Series railcars and/or rehabilitation of the 6000 series railcars shall be referred herein as the car-builder.
- d. The firm(s) providing goods and services to the Car-builder under the contract for procurement and manufacturing of the 8000 Series railcars and/or the rehabilitation of the 6000 Series railcars shall be referred herein as the sub-supplier(s). Unless specifically identified for clarification purposes, the reference “Car-builder” throughout this scope shall mean include any sub-suppliers directly or indirectly providing goods and services to the Car-builder.
- e. The firm(s) providing services to the Contractor which WMATA has awarded the engineering consulting contract will be referred herein as the subcontractor(s).

F. CONFIDENTIAL INFORMATION

The Contractor shall not divulge any confidential information which is acquired in the course of performing the work under this contract. The term “confidential” refers to information that may be considered proprietary to WMATA or any of its contractors. In this respect, estimates of cost developed by the Contractor for WMATA shall constitute WMATA’s estimate and no information pertaining to such estimate or estimating shall be disclosed by the Contractor associates or employees, except to the extent permitted by the WMATA Contracting Officer (CO).

2. SCOPE OF WORK

A. REQUIREMENT

- a. The Contractor shall provide engineering consulting services at the discretion and direction of WMATA in support of all stages in the procurement and manufacturing of the new 8000 series railcars and rehabilitation and overhaul of the 6000 series railcars. Manufacturing and rehabilitation shall be performed by the Car-builder, who shall be under contract with WMATA.
- b. The Contractor shall provide a fulltime dedicated Project Manager to work with WMATA for the duration of the project unless otherwise agreed with WMATA.
- c. The Contractor shall have WMATA approved team members for the project located at WMATA railcar facilities as required and at car-builder and sub-supplier plants where railcars or railcar components are being developed, manufactured or assembled. Engineering consulting work, technical reviews, and design studies and reviews will generally take place at designated WMATA facilities or locations.



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- d. The Contracting Officer's Technical Representative (COTR) will provide technical direction and assignments to the Contractor. All work under the contract shall be accomplished under task orders authorized by the Contracting Officer (CO). Written instructions in the task order will include a description of the work, deliverables and services required, and a completion date. It is expected that the Contracting Officer will issue annually a task order to cover all anticipated work for the upcoming year, and may issue additional task orders throughout the year for emergent work not covered by the annual task order.
- e. The Contractor shall prepare and provide a task order proposal and update the task order annually based upon the transmitted Scope of Work for each phase of the project. The task order proposal shall identify the Contractor and any Sub-contractors that will be performing the work along with the labor classifications, fully burdened labor rate, anticipated travel expenses, and the period of performance for everyone projected to spend time on the task order. Proposals shall be submitted within five days from receipt of request, unless a different response time is indicated in the request.
- f. The Contractor shall prepare and provide a task order proposal for additional program support as requested to include additional contract administrator, budget analyst, and cost estimator. WMATA reserves the right to review the resumes and approve any staff requested for additional program support.
- g. WMATA will negotiate the task order required annually not-to-exceed a specified price. The task order will be negotiated by the Project Manager and Contracting Officer, with all fixed billing rates reviewed and certified by the Office of Inspector General. Notice-To-Proceed (NTP) letter will be issued to the Contractor for the negotiated task order by the Contracting Officer. The Contractor shall sign the concurrence portion of the letter and return it to the Contracting Officer, with a copy sent to the Project Manager.
- h. The Contract shall provide audit and oversight support for Buy America and Disadvantage Business Enterprise (DBE) requirements.
- i. All deliverables shall become the property of WMATA, to be used as required by WMATA.

B. TECHNICAL REQUIREMENT

The Contractor shall perform, but not be limited to the following:



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a. PROPOSAL EVALUATION

- i. The Contractor shall advise and assist in the evaluation of Car-builders proposals as a non-voting procurement and subject matter expert advisor.
- ii. All documents, notes and submittals shall be the property of WMATA and shall be deemed confidential during the proposal evaluation process.

b. DESIGN OVERVIEW

- i. The Contractor shall conduct design reviews for the vehicle and major subsystems. Design reviews shall resolve any differences between what the car-builder proposes and what WMATA seeks in the way of design and performance as reflected in the specifications.
- ii. The Contractor shall prepare minutes for each design review meeting, develop an action items list, and prepare a commentary on any outstanding issues.
- iii. Throughout the evaluation of design and manufacturing drawings, the Contractor shall monitor specification compliance and make recommendations for improvements. It is of high importance to ensure that the car-builder is in compliance with all new and existing regulations.
- iv. The Contractor shall review all items the Car-builder submits for approval and recommend approval by WMATA or suggest changes necessary to comply with specifications and meet the program objectives for quality, reliability, maintainability and serviceability. The Contractor shall also perform the following duties:
 - Review the submitted engineering design, calculations, drawings, manufacturing procedures, test plans and procedures, assembly procedures, safety program, production schedules, including key milestones and overall project management plan.
 - Establish procedures and perform technical evaluations for the Car-builder's change orders proposals; prepare independent engineering estimates (ICE) and establish an engineering change control system to monitor changes from the baseline.
 - Monitor and report on all activities to ensure that changes and redefinition do not adversely affect the program schedules, specification compliance, quality, reliability, maintainability and serviceability.

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- Develop a comprehensive list of deliverables required to be provided by the Car-builder; maintain the list of deliverables; and continually monitor the Car-builder's compliance with deliverables.
- Review the list of contract deliverables from the Car-builder and Ensure WMATA receives documents as required for submittal and approval; submit communications, information and correspondence electronically to WMATA.

Design Reviews:

1. Conceptual Design Review

The Contractor shall conduct a conceptual design review with the Car-builder within forty-five (45) days of the Notice to Proceed (NTP) to ensure that the Car-builder comprehends the technical requirements for the vehicle.

2. Preliminary Design Review

In accordance with the project schedule, preliminary design reviews shall be held with all major system suppliers and the Car-builder to confirm the system design. At a minimum, the systems covered shall include but not be limited to the following:

- a. Carbody
- b. Trucks
- c. Interior
- d. Seats
- e. Cab and vehicle control
- f. Coupler, draft gear
- g. Network and trainline Control
- h. Friction Braking System
- i. Lighting
- j. HVAC
- k. Communications
- l. ATC, alerter, and event recorder
- m. Doors and controls
- n. VMDS and event recorders
- o. Low voltage systems and battery system
- p. 700Vdc / 230Vac / 120Vac; and
- q. Diagnostic test equipment and special tools.

At each of the above reviews, relevant system assurance issues shall be addressed.



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3. *Final Design Review*

In accordance with the project schedule, all Final Design Reviews shall be held with all major system suppliers and the Car-builder to confirm the detail design of equipment within the systems. At a minimum, the systems covered in Preliminary Design Reviews shall also be subject to a Final Design Review.

4. *First Article Inspections (FAI)*

- i. The Contractor shall help to ensure that the Car-builder and Sub-suppliers conduct FAIs in a manner that verifies compliance of the physical equipment and materials with approved drawings and specifications, and that the equipment fulfills the design functional requirements.
- ii. The Contractor shall verify that the Car-builder has passed on to its sub-suppliers all conceptual requirements placed by WMATA.
- iii. The FAI shall confirm that the manufacturing processes and quality procedures are appropriate to ensure that the equipment shall be constructed, manufactured and produced consistently and to an acceptable level of quality which shall be established during the FAI.
- iv. Qualification or design verification tests shall in some cases take place concurrently with the respective FAI. The Contractor shall monitor such tests to confirm acceptable results and adherence to the approved test procedures.
- v. The Contractor shall anticipate, at a minimum, supporting FAIs to include but not limited to the following components:
 1. Car structure
 2. Truck frames and bolsters
 3. Communication system, including exterior and interior signs
 4. Under-frame
 5. End-frame
 6. All seat assemblies
 7. Friction brake and holding brake systems
 8. Cab control and layout
 9. ATC system
 10. All interior materials
 11. Battery



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12. Low voltage power supply / battery charger
13. VMDS / event recorders
14. Electrical Panels; and
15. Completed vehicle.

c. IN-PLANT INSPECTIONS

The Contractor shall conduct in-plant inspection and quality assurance (QA) activities at the Car-builder's facilities and the facilities of major subsystems suppliers during the fabrication, manufacturing, assembly, and testing of equipment. This phase shall conclude at the shipment of the last vehicle from the Car-builder.

i. Quality Program

1. The Contractor shall review and critique the Car-builder's and Sub-suppliers quality assurance and inspection programs and capabilities. The associated quality assurance documentation shall be reviewed for completeness and specification compliance.
2. During the review of the Car-builder's and Sub-suppliers quality system, the production tooling, machinery and test equipment shall be inspected to confirm that it can produce components to the required quality standards. In addition, the training, experience and ability of the Car-builder's and Sub-suppliers work force to produce quality work shall be evaluated.
3. The Car-builder's and Sub-suppliers in-process and final inspection programs shall be examined to ensure that proper production "hold points" are provided to permit confirmation of acceptable quality levels before work proceeds to the next level of production. . Hold points shall be inserted in the production schedule at areas that are about to become hidden. Inspection of in-process and completed components shall be provided.
4. The Car-builder's and Sub-suppliers material handling procedures shall be reviewed to be certain they include acceptable procedures for material receiving, returning of defective items, material storage, material delivery at work sites, packaging and shipment of finished items, and unloading at delivery sites.
5. The Contractor shall verify the existence and utilization of proper acceptance/rejection procedures and documents, including component status identification and discrepant components segregation.
6. The Contractor shall review Car-builder's and Sub-suppliers procedures, including but not limited to the following:

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- a. Data verification
 - b. Material verification
 - c. Fabrication and assembly processes
 - d. Production testing
 - e. Electrical requirements
 - f. Component identification
 - g. General workmanship
 - h. Welding and brazing processes
 - i. Documentation control
 - j. Control of suppliers
 - k. Receiving inspection
 - l. Production and process control
 - m. Functional test
 - n. Discrepancy control including segregation of discrepant materials
 - o. Metrology and calibration / certification
 - p. Drawing control
 - q. Pre-shipment inspection; and
 - r. All other quality assurance procedures necessary to meet the requirements of the contract.
- ii. Inspection
1. The Contractor shall provide full-time quality assurance inspectors at the Car-builder's facility, and representatives at the Sub-suppliers facilities and on-site at WMATA to witness testing, delivery, receiving and field modifications. These quality assurance representatives shall provide in-plant inspection services, receiving inspection of subsystem supplier equipment at the Car-builder's facilities and shall witness production testing.
 2. Inspectors shall be supported with additional staff on a task order basis, and shall be responsible for the following tasks:
 - Maintain QA documentation;
 - Provide progress reports and special reports as required by the WMATA Project Team and engineering staff;
 - Review receiving inspection area and documents;
 - Review production tooling, test equipment and qualifications of workers assigned to the project;
 - Inspect and verify sub-assemblies of new components including adherence to approved drawings, Car-builder's in-house specifications

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for welding, dimensional and workmanship standards as well as AAR, FTA and WMATA standards; and

- Inspect and verify structural components to approved drawings, workmanship standards, welding, and dimensions.
3. The Contractor shall review the Car-builder's defective material system and control documents including the parts identifications system. Material found to be non-conforming during any phase of manufacturing must be immediately identified, tagged and, if feasible, segregated from compliant materials. If the discrepancy is anything other than a missed process or manufacturing step that can be added without any negative effect on the component, it must be reviewed by the Material Review Board (MRB) for proper disposition. The MRB shall be comprised of representatives from WMATA, the Car-builder's engineering and quality departments and the Contractor. MRB forms shall be reviewed and approved by WMATA. MRB forms shall provide a space for approval of disposition by WMATA representative. The MRB form must be completed and contain all required signatures before this disposition can be implemented.
 4. The Contractor shall conduct surveillance inspection of in-process assembly and installation. Quality assurance representatives shall audit and monitor the Car-builder's and Sub-supplier's processes and process personnel. Welding and non-destructive test (NDT) activities shall be reviewed by an American Welding Society (AWS) Certified Welding Inspector (CWI) or ASNT level II NDT personnel, as appropriate. The Contractor shall review records of welding and NDT.
 5. The Contractor shall review the Car-builder's and Sub-supplier's inspection plans to ensure that all inspections are conducted using the latest approved revision of all-drawings and specifications. This can be accomplished by incorporating into the inspection or test procedure an initial step of verifying that the drawing number and revision level are printed on the procedure. That information shall then be compared and verified against the latest drawing control list. The drawings supplied by the Car-builder at the inspection or test site shall be compared and confirmed as the appropriate drawings.
 6. The Contractor shall review the Car-builder's configuration management activities for compliance with performance needs of major functions of the production program. The activities must address product identification, change control, configuration accountability and drawing status control.

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7. The Contractor shall participate in discussions of modifications, with the goal of minimizing the number of modifications to be installed after shipment of the railcars from the Car-builder's facility.
8. The Contractor shall verify that all modification parts and materials are packaged as a complete kit for installation and ensure completeness before taking a railcar out of service to perform such modification. The Contractor shall review the kit list to ensure inclusion of properly revised and approved drawings, installation instructions and maintenance manual.
9. The Contractor shall also verify that any spares in stock at WMATA warehouse or to be delivered by the Car-builder are modified as specified and returned to WMATA stores. A qualified inspector shall visit major equipment vendors, as required by WMATA. A report outlining the findings and conclusions shall be submitted for each visit.

iii. Testing Supervision

1. The Contractor shall witness qualification, acceptance testing of materials, subsystems and completed railcars at the Car-builder's and Sub-suppliers' plants. Test schedules shall be carefully reviewed to ensure that critical path items have sufficient schedule allowance to permit possible additional testing or re-testing. Test procedures shall be reviewed and approved to determine that they comply with specification requirements and contain all pertinent information prior to the start of testing.
2. The Contractor shall monitor that the test personnel are using the latest revision of each procedure and that data sheets are legible and correctly filled out.
3. The test facilities, test instrumentation and calibration procedures shall be reviewed to help assure that satisfactory test results can be provided by the Car-builder and its subsystem suppliers prior to the commencement of each test to be witnessed.
4. Test areas shall be examined for suitability and safety requirements as well as identifying current certification certificates for all the instrumentation. Each data sheet or test report shall be reviewed and approved (or rejected) based on compliance with the specification requirements.

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5. Throughout the entire test program, the Contractor shall monitor failure data to determine if failures are random or develop a trend indicating a design deficiency exists relative to obtaining the required reliability objectives.
6. The Contractor shall monitor the Car-builder and Sub-supplier, as necessary, shall provide its own reports of testing to WMATA. The Contractor shall witness to include but not limited to proof of design tests, car-builder structural tests, truck tests, and lighting tests.
7. The Contractor shall witness tests for the operation of any new or significantly modified major subsystems.

iv. Final Assembly

1. The Car-builder may elect to perform final assembly of the vehicle at a different location than the location of car-shell fabrication and initial assembly work. If this is the plan for WMATA railcars, the Contractor shall provide staff at the Car-builder's assembly facility to monitor the construction and testing of the railcars.
2. The Contractor understands that all assembly, including final assembly shall be done in the Car-builder's facility.
3. The following on-site production testing activities shall be monitored to include but not limited to:
 - Wire continuity, megger and hi-potential testing
 - Air leakage testing
 - HVAC pipe purging
 - Holding brake operation
 - HVAC operation
 - Doors
 - Lighting
 - Train line operation
 - Communications, equipment operation
 - Water tightness test
 - Auxiliary Power System
 - Cab Control
 - Weighing procedure
 - Dimension check
 - Cooling system operation
 - Event Recorder, Alerter, Traction interlock and ATC operation; and

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- Air Brake System
4. After construction and testing at the Contactor's facility, the railcars shall be prepared for shipment. As part of the Contractor's tasks, the Contractor shall perform the following pre-shipping procedures including but not limited to:
 - Verify operation of all systems on each railcar;
 - Final inspection on 100% of the railcars;
 - Inspect the documents and equipment to be shipped separately to WMATA;
 - Review railcar in-plant record book and verify installation of all agreed modifications, deviations and engineering changes;
 - Review Railcar History Book for specification compliance in the area of content, correctness and legibility;
 5. Once the above activities are successfully completed, a recommendation to release the vehicle for shipment shall be made.

d. ON-SITE INSPECTION AND ACCEPTANCE TESTING

The contractors shall conduct on-site inspection and quality assurance (QA) activities at WMATA to include inbound inspection, static and track testing. This phase shall begin at the arrival of the first vehicle at WMATA and conclude when the last vehicle is accepted by WMATA.

i. Inspection

1. When the vehicles arrive at WMATA's designated property, the Contractor shall conduct a receiving inspection to document whether any damage has occurred during shipment. The inspection shall also confirm that components have not been disturbed or become loose during transit and that all connections both electrical and mechanical, are correctly made and the railcars are ready to run for acceptance testing.
2. A qualified test engineer shall monitor all functional testing of each vehicle. The test engineer shall review all adjustments, settings, test documentation, charts and data to verify compliance with the specification, and provide recommendation for acceptance by WMATA.
3. The Contractor shall review the Testing and Commissioning (T&C) plan including all Test procedures and Test reports.



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4. The Contractor shall provide engineering and inspection oversight consulting support of the Testing and Commissioning of each equipment and sub-systems during each phase of the project development and railcars upon delivery to WMATA.

ii. Follow-Up Supervision

1. The Contractor shall verify that the Railcar History Books have been updated as changes have been made to the railcar equipment prior to acceptance by WMATA. The Contractor shall monitor open items lists developed by the Car-builder prior to delivery.
2. The Contractor shall review these lists on a regular basis to track progress and confirm that open issues are addressed in a timely fashion. The Contractor shall monitor the quality of the work being performed in the field to verify that the same attention to detail shall be applied to all modification activities. The Contractor shall monitor all engineering changes and field modifications during retrofits, and shall inspect the quality of work.
3. The Contractor shall verify all modifications are performed and accomplished as designed and Railcar History Books are updated as such to reflect the modification work.

e. WARRANTY ADMINISTRATION

- i. The Contractor shall assist in the management oversight and maintenance of the warranty when the first vehicle is accepted by WMATA. This phase shall end at the conclusion of the warranty period for the last vehicle.
- ii. The Contractor shall be available during the warranty period to assist with technical requests, design concerns, reliability and maintainability issues, and outstanding correspondence items.
- iii. The Contractor shall provide recommendations to WMATA for administering claims. During the warranty period, the Contractor shall assist with warranty administration by reviewing and developing solutions to problems, recommending actions and remedies in discussions with the Car-builder and its Sub-suppliers.



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f. RISK MANAGEMENT

The Contractor shall provide risk management support and update the Project Risk Management Plan prepared by WMATA to make sure the plan provides a consistent method to manage risks and ensure project success.

g. SYSTEM INTEGRATION

The Contractor shall provide system integration support and expertise to WMATA.

C. DELIVERABLES

a. The Contractor shall establish and maintain records to include but not limited to the following reports:

- i. Railcar project monthly progress reports;
- ii. Milestone billing;
- iii. Extra work required and justifications; and
- iv. On-site daily status reports
- v. Meeting minutes
- vi. Internal Quality Control Program
- vii. DBE reports

b. The Contractor shall develop standard reports as approved by WMATA for the items listed above.

c. The monthly progress reports submitted to WMATA shall include project summary and document activities for that month and planned activities for the following month. The reports shall record open technical issues and stats or correspondence, drawings submittals, CDRL submittals, engineering changes, and railcar design, construction and testing progress of the Car-builder.

d. The Contractor shall review project correspondence from the Car-builder, prepare responses and provide recommendations as required. If further specialist knowledge or capability is required by the project Contractor, the Contractor must have engineers and subject matters experts verify the information provided by the Car-builder and prepare drawings and sketches as required.

e. The Contractor shall provide railcars inspection report as part of the monthly progress report or as a standalone report if requested.

f. The Contractor shall provide technical reports as requested by WMATA. The reports shall include results of technical reviews, cost analyses and industry surveys as



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assigned by the COTR if applicable. Technical reviews cover reviews of Car-builders drawings, test procedures and reports and contract change proposals.

- g. To facilitate successful project execution, the Contractor shall develop and prepare specific procedures (Program Handbook) to be incorporated into a manual that shall be issued to the project organizations after approval of WMATA. The procedures manual shall include but not limited to the following topics:
 - i. **Organization:** The section shall identify the organizations directly involved in the project and define the responsibilities of the key individuals in each organizations.
 - ii. **Communication:** This section shall identify the channels of communications and identify both written and oral; define the method for requesting technical and administrative data and engineering drawings; and establishing responsibilities with respect to correspondence control, approvals and response to schedules. It shall also cover procedures and processes for formal and information meetings and record keeping including agenda and meeting minutes.
 - iii. **Engineering Data:** This section shall describe how necessary technical and cost analysis data shall be submitted including information systems support.
 - iv. **Project Schedules and Reports:** This section shall include the Project's master schedule. Progress and milestones with respect to schedule shall be maintained and noted. Other areas of the manual shall discuss the means for processing payments and procedural as well as contractual changes. In addition, specific guidelines shall be defined that show the methods by which the performance of the Car-builder can be evaluated. Milestones shall be defined to measure quality, timeliness and budget.

D. STAFFING

- a. GENERAL
 - i. The Contractor shall submit resumes of all staff personnel that are qualified under the job discipline outlined below. Resumes shall include education, related experience, past projects completed, current projects at hand, work location (home office vs. field office vs. other) and travel requirement. Individual billing rates detailing the salary rate (per hour), overhead and profit for each person shall be submitted, separately from resumes, to the Contracting Officer (CO). Submittals of this information should not be construed as giving authorization for staff personnel to work on any tasks. The Contractor negotiated task order cost estimate will list all staff personnel that are approved



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to work on the project. Staff personnel to be added later will require written approval by the Contracting Officer's Technical Representative (COTR) prior to working on the task order.

- i. The Contractor shall have sufficient number of staff and shall submit their resumes to demonstrate its capability and capacity to manage the scope of work.
- ii. WMATA will not be liable for hours worked in excess of a normal work week (i.e. 40 hours) without prior written authorization and approval by the COTR.
- iii. The Contractor shall have its staff and employee attend safety training sessions, and shall observe WMATA safety procedures at all times while performing work in the system. The Contractor shall be responsible for attending safety training sessions at no cost to WMATA.

b. DISCIPLINES

The following list of staff disciplines shall not be construed as being final or complete. Over the course of the contract, there may be a need for services from a discipline that is not listed below. Each job descriptions below encapsulates the minimum expertise required for each position. The Contractor shall provide detailed resumes detailing the required knowledge and experience to meet the needs and requirements outlined in the scope of work. Personnel must have a minimum of 5 years of experience in their specific discipline and formal education in a technical or engineering field to be evaluated as acceptable unless otherwise noted below.

Project Manager – professional and educational experience in transportation vehicle engineering, development, operations and procurement. Shall be a seasoned manger with proven experience to effectively assemble, coordinate and direct the necessary and appropriate resources to accomplish the contract work in a continuous and timely manner. Must have exceptional oral and written communications skills. The Project Manager shall have in-depth familiarity with rail car systems, including automatic train control (ATC) systems, network and communications, propulsion, friction brakes, HVAC, car coupler, car body, passenger doors, trucks and auxiliary power. The project manager must have a minimum of 10 years of project management or related experience.

Safety Engineer - professional and educational experience working in the field of system safety, smoke and fire analysis, fire protection engineering and risk management in the mass transit industry. Background shall involve performing



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hazard analysis, design review and assessments, and writing safety management plans on vehicle systems and programs. Direct experience in the conduct of failure mode and effects analyses (FMEA), fault tree analyses (FTAs), and operating and support hazard analyses (O&SHA) is a must. Also, have training and experience working on system assurance applications, such as reliability engineering, maintainability, and quality assurance.

Risk Manager / Administrator – professional and education experience in the field of risk management, risk analysis and risk mitigation. Must have in-depth knowledge of risks as it relates to vehicle engineering and railcar procurement.

Brake Engineer - professional and educational experience in the field of mechanical and electrical/electronic engineering, focusing on brake system and brake system interface design, brake control logic software/hardware design, testing and evaluation in the mass transit industry.

Electrical Engineer – professional and educational experience in electrical/electronic engineering, focusing on system integration, instrumentation, signaling and lighting in the mass transit industry. Must have working knowledge of ATC, network and communications, propulsion, HVAC, passenger doors and auxiliary power.

Door System Engineer - professional and educational experience in the fields of mechanical and electrical/electronic engineering, focusing on door system and door system interface design and door control logic software/hardware design, testing and evaluation in the mass transit industry.

Propulsion Engineer - professional and educational experience in mechanical and electrical/electronic engineering, focusing on electromagnetic compatibility (EMC), propulsion power circuits, propulsion control and propulsion system design, powertrain components, testing and evaluation in the mass transit industry. Also, experience in diesel power combustion.

HVAC Engineer - professional and educational experience in mechanical and electrical/electronic engineering, focusing on the design, material selection, and development of specifications and drawings for electrical and heating, ventilation and air conditioning (HVAC) equipment and systems used in the mass transit industry.

Carbody Engineer – professional and educational experience in the field of mechanical and electrical/electronic engineering, focusing on carbody and design, testing and evaluation of structure and interior of railcars in the mass transit industry.



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Truck Engineer – professional and educational experience in mechanical and electrical/electronic engineering, focusing on truck design, propulsion and suspension, testing and overall railcars knowledge in mass transit industry.

ATC/Electronic Control System Engineer - professional and educational experience in electrical/electronic and communications engineering, focusing on design development, testing and operations of carborne electronic systems, including automatic train control (ATC) systems, in the mass transit industry. Direct experience in the conduct of failure mode and effects analyses (FMEA), fault tree analyses and hazard analyses of these systems is a must.

Mechanical / Structural Engineer - professional and educational experience in mechanical and structural engineering, focusing on design, development, testing and operations of carborne mechanical systems, including propulsion, HVAC, truck frames, truck mounted equipment (i.e. gearboxes, axles), door operators and controls, car coupling, seating, carbody and structural analysis in the mass transit industry. Must have working knowledge of mechanical system interconnections on railcars.

Metallurgical Engineer – professional and educational experience in metallurgical engineering, metallurgy, or materials science, focusing on the use and interpretation of finite element analysis (FEA) for determining failure of railcar components and structures. Must have a firm understanding of railcar components such as brakes, couplers, doors, truck assemblies, and car frames.

Vehicle Engineer - professional and educational experience in the engineering disciplines while working in all phases of the mass transit industry, including manufacturing, maintenance and operations. Must have a firm understanding of railcar systems such as brakes, doors, propulsion, ATC, HVAC, trucks, couplers, network and communications.

Welding Engineer (AWS) - professional experience in the manufacturing process of the mass transit industry and who is an AWS certified welding engineer. Expert in both domestic and foreign welding procedures/certifications/classifications.

Certified Welding Inspector - professional experience in the manufacturing process of the mass transit industry. Expert in both domestic and foreign welding procedures/certifications/classifications.

Quality Assurance Inspector / Test Engineer - professional experience in the operation and maintenance of heavy rapid transit rail cars, with a background in railcar production/assembly and facility inspection. Shall also have experience in the inspection and testing of vehicles during all phases of fabrication and while undergoing qualification and/or acceptance testing. Inspection and testing work will be conducted on-site at the Authority's and/or



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manufacturer's facilities as inspectors and as qualified test observers are required. Must be familiar with the engineering disciplines and exhibit good oral and written communication skills. Reporting of activities and observations, as well as maintaining associated project files, shall be required.

Document Control - experience in document control functions, including the management of the flow of control documents and ensuring proper maintenance of contract files. Must have working knowledge of DMS used for documenting vehicle program files.

Software Engineer - professional and educational experience in software engineering while working in all phases of the mass transit industry, including manufacturing, maintenance and operations. Must have a firm understanding of railcar electro/mechanical components and working knowledge of the software systems used in the railcar industry.

Network Engineer - professional and educational experience in electrical/electronic and computer engineering, focusing on design, development, testing and operations of both hardware and software networking systems for transit applications.

System Integration Engineer – professional and educational experience in electrical/electronic and computer engineering, focusing on design and development techniques for linking together railcar component subsystems into one system. Must have background with integration of all carborne electronic systems, including but not limited to automatic train control (ATC) systems, Wi-Fi, PA, radio, and VMS, propulsion, friction brakes, auxiliary power, HVAC, passenger door, car coupler, network and communications within the mass transit industry.

Communication Engineer – professional and educational experience in electrical/electronic and communications engineering, focusing on design, development, integration and testing of transit related communications systems, including Wi-Fi, PA, radio, VMS, and CCTV. Must have working knowledge of IP network architecture design within the mass transit industry.

Human (Ergonomics) Engineer – professional and educational experience shall be in ergonomic engineering or related field, focusing on how the design of railcars and system components interact with human physical and mental abilities for both passengers and maintenance personnel. Must have firm understanding of railcars and system components within the mass transit industry.

Chemical Engineer – professional and educational experience shall be in chemical engineering, focusing on corrosion issues impacting railcars, including structural, electrical/electronic and mechanical components. Must



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have firm understanding of railcars and system components within the mass transit industry.

Vehicle Dynamicist – professional and educational experience shall be in mechanical engineering or related field, focusing on classical vibrations and dynamics of structural systems using strength of materials and finite element based methods. Must have firm understanding of railcars and system components within the mass transit industry. Must also have experience in dynamics testing of railcars and systems components.

RAMS/Warranty Administrator – Professional and educational experience shall be in the field of warranty administration. Must have a firm understanding of warranty management as it relates to railcars, system components, testing, and commissioning and rail operation.

Technical and Manual Writer / Reviewer – Professional and educational experience in technical writing and had an understanding of railcars and system components within the mass transit industry. Must have experience in reviewing and critiquing technical writing including manuals, drawings and technical documents.

Administrative Assistant – thorough knowledge of office management practices and procedures. Skills in both written and oral communication, thorough knowledge of word processing, spreadsheet and presentation programs. Excellent interpersonal skills. Ability to organize, set priorities, manage workload, handle multiple responsibilities and meet deadlines. Highly proficient in keyboarding and knowledge of database software desirable.

Industrial Design Engineer – Professional and educational experience in production schedule, engineering specifications, process flows and general understanding of railcar productions and manufacturing projects. Must have a firm understanding of railcars equipment, system components and general mass transit industry.

Contract Administrator – Professional and educational experience in procurement with knowledge of the principals and practices of government procurement, including contract preparation and administration for bids, contract modification, cost/price analysis and profit analysis.

E. ADMINISTRATIVE REQUIREMENTS

a. GENERAL

All technical correspondence relating to the program shall be addressed to the WMATA COTR assigned to the project.



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b. SPECIFIC

In accordance with Scope of Work, the Contractor shall attend, or be represented at, meetings and conferences with officials of the WMATA, governmental agencies, the Car-builder and others interested in the work. All such meetings and conferences shall be made a matter of record. The Contractor is responsible for preparing a memorandum stating the time and place of the meeting, the names and identification of those present, and a brief description of the matters discussed and the agreements reached. Memoranda shall be prepared and submitted to the WMATA COTR assigned to the project no more than five days after the meeting.

c. INTERNAL QUALITY CONTROL PROGRAM

The Contractor shall have in place and be responsible for executing a Quality Control (QC) Program for all engineering consulting services. This program shall require internal reviews and checks by supervisors and independent QC checks by well qualified technical staff to confirm that acceptable quality is provided. A Quality Assurance/Quality Control (QA/QC) plan shall be submitted to the WMATA for approval.

d. TECHNICAL FILES AND OTHER DATA

Technical documentation produced under this contract and provided by either WMATA for reference purposes or by the Car-builder shall become the property of WMATA. It shall be maintained neatly and protected from loss and shall be made available upon request by WMATA for reference purposes or retention and shall not be disposed of unless such disposal is authorized by the COTR.

e. REPORTING

- i. The Contractor shall provide monthly status reports to the COTR. The reports shall be in a resource profile format showing graphical representation of the budgeted cost, forecasted cost, actual cost and DBE participation cost over the period of performance. The profile shall be updated and contain current information, including the title, report date (month), and any additional pertinent data.
- ii. The Contractor shall provide DBE status reports to the (COTR) and to WMATA's DBE office. (See Appendix B)
- iii. The Contractor shall provide written notification to the COTR of when 80% of the total firm fixed price for each annual negotiated task order has been expended.

