ATTIKO METPO A.E.

TITLE OF THE TENDER: **"TECHNICAL CONSULTANT SERVICES FOR THE ATHENS METRO PROJECTS"**

RFP-318/17 Α.Σ. 67696

TECHNICAL INFORMATION ABOUT THE CONSULTANT PERSONNEL AND SERVICES

TABLE OF CONTENTS

TECHNICAL INFORMATION ABOUT THE CONSULTANT PERSONNEL AND SERVICES

1. GENERAL DESCRIPTION OF THE COMPANY "ATTIKO METRO S.A."

ATTIKO METRO A.E. (henceforth called AM) was established via Article First of Law 1955/91. AM purpose, which is determined via Article 2 of Law 1955/91, as this is amended through article 35 of L. 3202/03 and articles 121 and 145 of Law 4070/12 is the design, construction, running, operation and development of the Urban Railway Network of Attica and Thessaloniki Region and, in general, of the Electric Railway of Attica and Thessaloniki Region (with the exception of OSE Railway Network) as well as of the TRAMWAY network in the entire Greece.

The projects that AM implements require high technical expertise, their scopes call for a broad spectrum of specialties, and are co-financed by the European Union.

In general, AM is presently involved in the Metro extension to Piraeus, the Tramway extension to Piraeus, the Base project of Thessaloniki Metro and its extension to Kalamaria.

One of AM's major projects is the first section of Metro Line 4 "Alsos Veikou – Goudi", for which AM has announced an international tender based on the pre-selection procedure (restricted procedure). During Stage A of the Tender, interested economic operators submit an Application to Express Interest, so that those operators selected in Stage A' may submit their Technical and Financial Offer for Stage B' of the tender and the pertinent Contractor of the Contact be appointed. The scope of the subject Contractor shall be the preparation of the Design as well as the construction and commissioning of section A' "Alsos Veikou – Goudi" of Athens Metro Line 4.

At the same time, AM is preparing the tendering documents for the award of a contract whose scope includes the execution of the archaeological investigations and the diversions of PUO networks that are required for section A' "Alsos Veikou – Goudi" of Athens Metro Line 4.

Finally, the following projects are currently at a design phase: the remaining section of Metro Line 4, the extension of Line 2 to the north towards Ilion, various projects on Line 1 (ISAP), as well as various extensions of the Tramway network, such as Phase B of the extension to Piraeus (connection of the center of Piraeus with Hatzikyriakio and Freatida), the extension to Elliniko and Argyroupoli, as well as the extension to Keratsini and Perama.

Taking all the above into account and in view of its increased commitments, AM needs to be supported by a specialized technical consultant for implementing its planned Metro projects.

2. ATTIKO METRO S.A. METRO PROJECTS IN ATHENS

2.1 PROJECTS OVERVIEW

This chapter provides information on **all AM projects in Athens**. The scope of the services to be provided by the Technical Consultant of this contract is described in article 3 of this document. The purpose is to provide:

- an overview of the Metro projects in operation, under construction, under procurement and under design, as well as of the future projects
- an overview about each project's phase of the works, as well about the individual activities and actions by AM in the framework of these projects
- an overview about the involved technical issues,
- the framework of the contracts based on which the projects are executed,
- AM's responsibilities, actions, activities and obligations for each of the projects,

in order to give a clear picture of the framework within which the prospective Consultant is called to function.

2.1.1 Metro Projects in operation

The completed Metro and Tramway projects are presented in the tables below:

Table 1: Completed and Operating Metro Projects

No.	PROJECT	DESCRIPTION
1	Line 2: Sepolia – Syntagma and Line 3: Ethniki Amyna – Syntagma	13 Km., 12 stations, 1 Depot (Sepolia), 2 park and ride facilities at Katehaki and Ethniki Amyna (respective capacities 240 and 60 parking spaces)
2	Line 2: Syntagma-Dafni	4.5 Km., 5 stations, 1 park and ride facility at Syngrou-Fix (capacity 642 parking spaces)
3	Line 3: Syntagma-Monastiraki	1.4 Km., 1 station
4	South extension of Line 2, Dafni – Ag. Dimitrios	1.1 Km., 1 station
5	North extension of Line 3, Ethniki Amyna – Plakentia	6 Km., 2 stations, 3 park and ride facilities, one at Halandri (capacity 280 parking spaces), and two at Doukissis Plakentias (capacity 630 parking spaces)
6	Line 3 connection with Athens Airport	24 Km, 1 terminal station using the suburban railway infrastructure
7	West extension of Line 2, Sepolia – Ag. Antonios	1.4 Km, 1 station
8	West extension of Line 3, Monastiraki – Egaleo	4.3 Km., 3 stations
9	Completion of 3 stations (Holargos, Nomismatokopio, Aghia Paraskevi) on the north extension of Line 3	3 stations, 1 park and ride facility at Nomismatokopio (capacity 604 parking spaces)
10	Line 3 extension Egaleo – Aghia Marina	1.42 Km., 1 station and 1 park and ride facility at Aghia Marina (capacity 383 parking spaces) and 1 Depot (Eleonas)
11	Extension of Line 2, Aghios Antonios – Anthoupoli	1.9 Km., 2 stations
12	South extension of Line 2, Aghios Dimitrios – Elliniko	1.9 Km., 4 stations
13	Keramikos – Park and Ride Facility	Underground car parking facility (capacity 272 parking spaces)

Table 2: Completed and Operating Tramway Projects

No.	PROJECT	DESCRIPTION
1	Lines S1 (SEF-P. Faliro) - S2 (Syntagma-P. Faliro) - S3 (P. Faliro-	Total length of revenue service double track line 23 km, 2.2 km of

	Glyfada), Service Line S3-8	service line, 47 stops, 1 Depot at Elliniko
2	Extension of S3 to Voula	700m., 1 terminal stop

The above lines are operated by STATHERES SYGKOINONIES A.E. (STASY). AM's responsibility in relation to the above operating project has to do with Project Management until their final acceptance and it also provides technical supports to STASY on special issues on an as needed basis.

2.1.2 Projects under construction

The Metro and Tramway projects under construction are the following:

Table 3: Metro Projects under construction

No.	PROJECT	DESCRIPTION
1	Line 3 extension: Haidari – Piraeus	The scope of the Project includes: • an underground tunnel 7.6 Km long; 6.5 Km shall be constructed using the TBM and the remaining part at the beginning and the end of the Project shall be constructed with underground excavation. • Six (6) modern stations (Aghia Varvara, Korydallos, Nikea, Maniatika, Piraeus, Dimotiko Theatro) to be constructed using the cut-and-cover method, the NATM method and the cover-and-cut method with diaphragm walls. • Eight (8) ventilation exhaust shafts along the new line, as well as two shafts for TBM lowering and extraction.

Table 4: Tramway Projects under construction

No.	PROJECT	DESCRIPTION
1	West extension of the Tram to Piraeus (Neo Faliro – Center of Piraeus – port of Piraeus)	The scope of the Project is the extension of the existing Tramway corridor from NEO FALIRO stop to the end of the line at the existing terminal stop SEF via Mikras Asias, Lambraki, V. Georgiou, E. Antistaseos and O. Skylitsi streets, with a forecast to construct a terminal station at Akti Possidonos in Piraeus (total length approx. 5,350m). Reconstruction of the existing SEF stop is foreseen, as well as the construction of 11 new stops and the construction of the terminal stop at Akti Possidonos. This Project includes reconstruction works to the existing Project (mainly Depot building installations and terminal stop at Syntagma).

2.1.3 Projects under design and planning

Further to the above projects, the following new projects are under the design stage:

Table 5: Metro Projects under design

	PROJECT	DESCRIPTION
1	Line 4: "Alsos Veikou – Maroussi"	The existing Athens Metro Development Plan includes Metro Line 4 Alsos Veikou – Evangelismos – Faros – Maroussi, along with its extensions (a) to Vyronas/Ano Ilioupoli and (b) to Perissos and the National Road; the total length is 33.5 km., It includes 31 stations in total, while it is made up by five (5) individual distinct sections A, B, C, D and E: - Section A: Alsos Veikou – Goudi (12.6 km long and 15 stations) - Section B: Goudi – Maroussi (9.6 km long and 8 stations) - Section C: Evangelismos – Ano Ilioupoli (3.6 km long and 3 stations) - Section D: Alsos Veikou – Perissos (3.0 km long and 2 stations) - Section E: Maroussi – National Road (4.4 km long and 3 stations) AM's priority is the construction of Line 4, Section A "Alsos Veikou – Goudi", which is under the tendering process.
2	North extension of Line 2: Anthoupoli - Ilion	This project relates to the north extension of Line 2 from Anthoupoli station by approx. 4 km and includes the construction of 3 stations at the following indicative locations: - A station at the intersection of Thivon and Kappadokias streets. - A station at the intersection of Thivon and Eleon streets. - A terminal station at the intersection of Aghiou Nikolaou and Paramythias streets.
3	Line 1 (ISAP) Projects	Conversion of Line 1 (ISAP) into an underground line from Neo Faliro to Piraeus, with the addition of a new station in Keranis factory area.

Table 6: Metro Projects under the tendering process

	PROJECT	DESCRIPTION
1	Line 4, Section A' "Alsos Veikou - Goudi"	This Contract refers to the preparation of the General Final Design, the Detailed Final Design, as well as to the construction and commissioning of Metro Line 4 Section A' "Alsos Veikou – Goudi".

Table 7: Tramway Projects under design

	PROJECT	DESCRIPTION
1	Phase B' extension to Piraeus (Neo Faliro – Centre – Port of Piraeus)	This Project refers to the connection of the center of Piraeus with Hatzikyriakio and Freatyda. The extension includes a single track line 2.8km long and a double track line 1km long as well as 10 new stops.
2	Extension to Argyroupoli	This Project refers to the connection of the Tramway Depot at Elliniko with Argyroupoli Metro station and consists of a double track line 1.1km long with 2 new stops.
3	Extension to Keratsini and Perama	This Project refers to the extension of the Tramway from Piraeus port to Keratsini and Perama, via an underground large section within Keratsini Municipality running along the old alignment of Perama tramway. It consists of 9.4 km of double track line and 11 new stops.

Table 8: Tramway Projects under the Tendering Process

	PROJECT	DESCRIPTION
1	Procurement of Rolling Stock	This Project refers to the procurement of 25 new Tramway vehicles, which would serve the extensive Tramway network that will result after the completion of the extension to Piraeus and the pertinent tender is in progress.

2.1.4 Future projects

AM is concurrently examining other Projects beyond those mentioned above, in order to further extent the Metro and Tramway networks in the Athens Basin.

2.2 TECHNICAL SCOPE OF AM'S PROJECTS

In summary, the scope of the projects incorporates the following works, not limited to them:

2.2.1 Research Work and Designs

In the framework of implementing the works of AM by Contractors, further studies and research work are required in order to confirm the results of the available studies/research work, complete any study/research requiring completion and prepare the Final Design and the Detailed Final Design of the Project. The research work and designs include indicatively, but are not limited to, the following:

- Survey works - cadastral diagrams / tables
- Geological – Hydrogeological & geotechnical surveys and designs
- Layout and profile alignment of the line

- Research work and checking of the location and design of Public Utility Organization Network Diversions
- Traffic and Transport Designs
- Traffic Diversion designs
- Designs for excavation works, temporary retaining works and permanent structures
- Designs concerning the Special Vulnerability and Relative Building and Structure Risk Assessment
- Designs for the implementation of protection measures for buildings and structures and special studies for sensitive buildings and structures, monuments, public use buildings etc.
- Design – Construction of shafts and/or tunnels for the structural monitoring and support, as required, of KAA during the EPB - TBM passage underneath it and reinstatement of these shafts – tunnels upon completion of works to their prior condition
- Geomechanical and Structural Monitoring studies
- Flood Protection study during the Construction and Operation of the Project
- Noise and Vibration study during the Construction and Operation of the Project
- Passive Fire Protection study
- Architectural designs (station layouts and architectural finishes)
- Station acoustic studies
- Design of E/M and railway systems (mechanical, E/M, Power and Weak Currents)
- Trackwork designs
- E/M designs for the simulation of Traction Power, Tunnel Ventilation, Station Acoustics, line operation – signaling, etc.)
- Design coordinating Civil Works, Electrical and Mechanical and railway systems
- Project log
- Network Operating Analysis and its maintenance requirements
- Design and organization of the Operation Control Center and the Depot

- Reliability, Availability, Maintainability and Safety (RAMS) study, including a hazard analysis
- Compilation of Health and Safety Plan and File
- A study for the rational use and saving of energy during the project operation.

The designs/surveys/studies shall be obligatorily subject to approval by the Project Owner and, in some cases, by the relevant services and organizations concerned (e.g. PPC, OTE, EYDAP, Municipalities, YPEHODE, Ministry of Culture etc.) before their application. The DFDs shall be prepared only after the Final Design has been approved by the Project Owner.

2.2.2 Preliminary Works

The above include the following:

- Review, verification and completion of the existing data (establishment of topographical network of the Project, topographic surveys, geological, hydrogeological, geotechnical, hydrological, urban and environmental surveys, PUO network surveys, investigation of the condition of the buildings etc.).
- Prior to the main construction works, extensive relocation of PUO networks will be also required at the locations of the stations and the other CW. The existing networks have already been recorded; however, investigation trenches should verify certain of them at specific points.
- Issuance of any type of permit.
- Occupations and expropriations.
- Worksite installations.
- Assistance provided to PUOs during the execution of works related to this Project.

2.2.3 Archaeological - Traffic Works

Prior to the construction of the stations and the execution of other Civil Works, the performance of extensive archaeological works are required.

Multiple traffic diversions - mainly at the stations' locations - shall be required for the execution of the archaeological excavations, the relocations of the PUO networks and, mainly, for the subsequent execution of the Civil Works. The aforesaid traffic diversions will further aggravate the adverse conditions of the traffic in the city only on a temporary basis; however, every effort shall be made to minimize any negative impact, the occupation period of the roads, as well as any impact on adjacent commercial activities.

2.2.4 Civil Works

All Civil Works concerning the scope of the Project shall be constructed. These works include, *inter alia*, the following:

1. Tunnels

   The tunnels shall be constructed in the following ways:

   a) Underground mechanical boring using EPB-TBM. The use of EPB-TBM equipped with proper systems shall be applied in order to ensure that buildings and structures located at the Project influence zone will not be affected within the framework of the adherence to the Project time schedule.

   b) Underground excavation using conventional mechanical means.

   c) Cut and cover method.

2. Stations, Shafts and Crossovers

   The construction methods of stations, crossovers and shafts shall include the following techniques:

   a) Cut and Cover method.
   b) Underground boring using conventional mechanical means.
   c) Cover and Cut method.

   The design and construction method for each station /Shaft / crossover shall be based on the project description and the specifications. The location of the stations, the accesses and other openings shall be as shown on the alignment drawings.

3. Geomechanical and Structural Monitoring

4. Measures related to ground treatment, as required.

5. Measures related to the protection, propping and strengthening of the buildings etc located adjacent to excavations.

6. Flood Protection

2.2.5 Architectural works

All architectural finishes of all buildings / structures of the project shall be constructed and there shall be a reinstatement of the worksite surface areas. The following items shall be mainly included in the architectural works:

- Functional layout of the stations, entrances, concourse areas, personnel rooms and other necessary technical rooms and auxiliary rooms.

- Horizontal and vertical connections (corridors, escalators / staircases, lifts, emergency exits) ensuring, on the one hand, the unobstructed circulation of the users and, on the other hand, the evacuation of the station in an emergency case.

- Architectural finishes on floors, (including provisions for PSNs), walls, ceilings, suspended ceilings (made of materials with sound attenuating properties), balustrades, handrails and any external surfaces of stations, entrances, shafts and Depot buildings, according to the provisions of AM preliminary design (draft architectural drawings, finishes table, technical specifications etc.).

- Reinstatement and configuration of street level surfaces at the worksite locations.

- Signage at stations and shafts.

Operation equipment for the station master rooms, OCC and the personnel areas at the Stations and, in general, what is provided for in the Project Planning Manual.

2.2.6 Electromechanical and Railway Systems

The Electromechanical and Railway Systems required in the framework of the Works shall be installed. The scope of these works includes the design, supply, installation, testing and commissioning of the following systems:

1. Ventilation
2. Heating/ Ventilation/ Air Conditioning (HVAC)
3. Traction Power Supply - Medium Voltage - 20KV
4. 230/400V Power Distribution
5. Lighting
6. Fire fighting/ Fire detection
7. Escalators/ Travelators
8. Lifts
9. Earthing, bonding and protection against stray current
10. Lightning Protection
11. Water Supply, irrigation
12. Drainage, sewage
13. Pumping Station
14. 3rd Rail Traction Power System / Overhead Catenary
15. Signaling (Systems: Automatic Train Control (ATC), Automatic Train Supervision (ATS), Automatic Train Protection (ATP), Automatic Train Operation (ATO), Signaling Data Transmission System
16. Point Machines
17. Road / Railway Traffic Lights
18. Passenger Information System (PIS)
19. Telecommunications (TETRA)
20. Automatic and Direct Phones
21. Closed Circuit TV (CCTV)
22. Public Announcements (PA)

23. Clocks and Time Distribution System

24. Information Technology (IT) Infrastructure System

25. Broadband WiFi for the passengers

26. Safety and Protection System

27. Intercommunication System

28. Fare Collection System

29. Uninterrupted Power Supply Systems (UPS) - Batteries

30. Building Automation Control System (BACS)

31. Power Remote Control System (PRCS) / SCADA, Cables and Fiber Optics Networks

32. Cable and Fiber Optics Networks

33. Data Central Storage System

34. Data Transmission Systems

35. Trackwork

36. Depot Equipment

37. Rolling Stock

38. Operations Control Center (OCC)

39. Spare Parts and Maintenance Systems

40. Issues pertaining to the interfaces and compatibility with existing systems

Rolling Stock

The rolling stock constitutes a fundamental reference point of all the projects and, therefore, the parameters, the issues and the information referring to the rolling stock affect most of the other scopes of works.

Testing and Commissioning

All the electromechanical and railway systems, including the rolling stock, require testing and commissioning.

The tests are, generally, of many levels, as follows:

- Factory Acceptance Tests (FAT)

- Stand Alone Tests (SAT)
- System Integration Tests (SIT)
- System Performance Tests (SPT)
- Trial Operation (on all installations, new and old)

Commissioning

- Commissioning of the Metro and Tramway extensions
- Commissioning of the Depots
- Commissioning of the Operation Control Centers for Metro and Tram

Miscellaneous (related to preliminary works)

- Traffic diversions
- Relocation of Public Utility Organization Networks
- Archaeological Works
- Temporary occupations and expropriations of areas

As regards the technical scope of the extensions, it is pointed out that the designs and works for the extensions are not limited geographically only to the areas of the new extensions, but also to stations or installations of the operating network, as well as to the OCC at Syntagma Station (Athens Metro) and Elliniko Depot (Athens Tramway), depending on the individual scope.

2.3 AM ACTIVITIES WITHIN THE FRAMEWORK OF THE ABOVE WORKS

With regard to works stated in paragraphs 2.1.1 to 2.1.4 above, AM has undertaken the following activities:

2.3.1 Works in operation

The main AM activities for the Metro and Tramway works in operation are as follows:

- Provision of technical support and co-operation with STATHERES SYGKOINONIES S.A. (STASY) where and when required in order to resolve problems and issues related to failures, non compliance with contractual specifications, requirements for upgrading of systems, etc. Within the same framework, AM monitors the operation of the E/M and railway systems and rolling stock, as well as the relevant statistical analyses and it draws conclusions for implementation to new works.

- Organization of the temporary and final acceptances of the works, preparation of the relevant lists of pending issues, recapitulative tables, etc. and implementation of all necessary administrative actions for the Contractual and Financial closure of the contracts related to the construction of the works in operation.

2.3.2 Works under construction

The main AM activities related to the Metro and Tramway works under construction are as follows:

- Review and approval of the Contractors' designs (usually final and DFDs).
- Supervision of all phases related to the construction of Civil Works, installation of E/M and railway equipment, construction of architectural finishes in the stations, tests of integrated systems, system performance tests and trial operation.
- Enactment of decisions related to the interface points between Contractors on a technical, temporary and contractual level. AM shall have the overall responsibility on the general coordination of the works on a design level as well as on a construction, equipment installation, testing and commissioning level.
- Monitoring and administration of the progress of the works and the relevant contracts in contractual and financial terms, as well as in terms of the time schedule and organization of the necessary corrective actions where required.
- Ensuring quality control of the works.
- Supervision as to the adherence to the health and safety regulations in the worksites.

2.3.3 Works to be tendered

The main AM activities as to the Metro and Tramway works under procurement are the following:

- Organization of the necessary expropriations and temporary occupations
- Ensuring of the funding of the projects
- Preparation of conceptual and DFD level designs
- Review of the other DFD prepared by the Consultants-Engineers
- Preparation of the tender documents of the projects and ensuring of the coordination between contractual documents and designs
- Preparation of cost lists and project budgets, as well as their time schedules
- Tendering of the projects for the selection of Contractors.

2.3.4 Extension Works under Design

The main AM activities for the Metro and Tramway works under design are as follows:

- Preparation of the conceptual designs, preliminary designs and/or final designs of the works required for their tendering. This preparation is carried out either in-house or with the assistance of designers/consultants.

- Ensuring the optimal designs in terms of operation, cost and environment.

- Preparation of the required environmental designs of the Projects either in-house or with the assistance of designers/consultants, which are submitted to the YPEKA for approval.

2.3.5 Planned Extension projects:

The main AM activities related to the future Metro and Tramway projects are the following:

- Prepares the strategic planning designs on the basis of the transport needs and selects the optimum solution for the expansion of the Metro and Tramway networks, in conjunction with the forecasts on the expansion of the city, the evolution of land uses, the employment, the transport networks and infrastructures, etc.

- Prepares the feasibility studies for the projects in order to secure their funding. Up to now, the above projects have been funded by the EU, the European Investment Bank and the Greek State.

- Prepares the conceptual and/or final designs of the projects and, in general, sees to everything required as per the above paragraph 2.3.4.

2.3.6 Park and Ride Facilities

In parallel to the Metro extensions, AM has also worked out an extensive program for the development of Park and Ride Facilities, which encompasses the construction of underground and surface parking areas at the bus stations in the vicinity of the Metro stations.

AM has already constructed and made available to the public nine (9) car park facilities, i.e. five (5) at-grade facilities at four (4) Metro stations (Katehaki, Ethniki Amyna, Halandri, D. Plakentias) with an overall capacity of 1,210 parking places and four (4) underground parking facilities at Syngrou – Fix, Nomismatokopio, Aghia Marina and Keramikos stations with a total capacity of 1,901 parking places. Thus, the overall car parking places at Metro stations rise to 3,111.

As regards the car parking facility at Ethniki Amyna Metro Station, AM has already completed the necessary designs for its expansion and optimum organization, the target being to put the project in tender as soon as the necessary funding has been secured.

In parallel, the preparation of similar designs in other stations such as Eleonas, Argyroupoli and Elliniko is scheduled. At the same time, there is an effort towards better organization of the open air parking facilities at D. Plakentias station.

3. SCOPE OF THE CONSULTANT'S SERVICES

The Consultant's contractual scope that will result from the present tender includes the provision of supporting services for the projects of the Athens Metro presented below.

a) LINE 3 EXTENSION "HAIDARI - PIRAEUS"
b) ATHENS METRO LINE 4 – SECTION A' "ALSOS VEIKOU – GOUDI".

3.1 The role of the Consultant – General obligations related to the provision of services

The role of the Consultant is summarized as follows:

1. Participation in issues related to the design, management and monitoring of the projects.

2. Provision of specialized technical solutions, as necessary.

3. **Participation in every activity (design, tendering, construction and commissioning) required in the framework of the technical scope of AM's aforementioned projects, so as to ensure their successful completion.**

The Consultant shall have an advisory role. He shall not have managerial duties.

His general duties shall be as follows:

- To monitor the progress of the works, to evaluate the technical choices and solutions proposed during their development, to estimate their effectiveness and to propose improvements, where required.

- To participate in the daily activities of AM, as regards the advancement of the works, review of designs, supervision of the Project, monitoring of the progress of works, tests, commissioning, etc.) within the existing organizational structure of AM.

- To support AM's engineering scope in cooperation with AM's personnel, as required, in the framework of the various projects related to the Metro, the Tramway, the car parking facilities or other similar projects.

- To recommend changes/modifications in respect of special technical issues, whenever there is a demonstrable likelihood of deviation from the existing designs and the time schedules of the Projects.

- To provide special technical information, technical solutions and advice, utilizing all the potential of the companies forming the Consultant's entity (acquired from previous projects, data bases, specifications etc.), as well as their experience gained from monitoring and executing similar projects.

- To develop, through his direct participation in the daily activities of AM, the know-how transfer to AM.

- To train AM personnel in the implementation of the simulation plans for the proper operation of E/M systems in case of allocation of the right of use.

- To propose solutions and technical choices based on the progress of the technology, the international practice in modern Metro and Tramway systems, possible techniques contributing to the reduction in the cost relating to their construction, installation, maintenance and operation, in general.

3.2 Consultant's Technical Scope of Works

With regard to AM's projects, namely:
a) LINE 3 EXTENSION, HAIDARI – PIRAEUS and
b) LINE 4 – SECTION A, ALSOS VEIKOU - GOUDI, the Consultant and his technical staff, described in Section 4, is hereby requested to provide his Services at least in the following scopes related to the implementation of Metro projects. Namely:

A. Civil Work Designs

- Participation in the review of the designs produced by the Contractors of Civil Works of projects under construction and new projects, especially as regards specific issues of underground structures, as well as the control of constructability, settlements, vulnerability and protection of buildings and structures.

- Preparation of technical reports containing proposals for addressing special issues of structural and geotechnical character, inclusive of the examination of buildings in cases of extensive damage due to Metro works and increased hazards to buildings, thus, providing support to AM in its decision making process.

- Preparation of design related data for permanent and temporary civil works, in cooperation with the pertinent engineering sections of AM.

- Assistance in the evaluation process regarding results of investigations and geotechnical interpretation reports, which give the parameters necessary for the preparation of the structural and geotechnical designs of the structures.

- Assistance in the preparation of the necessary traffic designs and traffic management designs in the framework of the planning for new projects.

- Assistance in the review of the designs and other documents submitted to AM. Review and validation of design parameters during construction stage.

- Assistance in the management and insurance against general risks in the framework of Athens Metro Line 4.

- Submission of technical reports on issues related to the Metro projects concerning, as an example but without however being limited to it, environmental issues, issues related to the mechanical boring of tunnels using TBM machines etc., in line with the requirements of the Service.

B. Electromechanical and railway system designs

The scope of works includes:

- Participation in the review of designs of the E/M and railway systems/rolling stock for AM's projects. The term "designs" covers the technical specifications, the

Material Submittal Sheets, the drawings, the dimensioning, the calculations, the testing procedures, the simulations, etc.

- Preparation of designs for the various E/M and railway systems and cooperation with the pertinent AM Departments.

- Preparation of various simulations with are required for certain scopes of works and projects.

- The consultant shall specifically assist in the technical, spatial and operational cooperation of the designs with an emphasis on:

  a) the interfaces with Civil Works
  b) the interfaces of the systems of the already existing Metro network with the systems that are going to be installed.
  c) the interfaces with systems belonging to third parties (suburban railway, PUO networks, technical projects etc.)
  d) issues of new technologies related to the existing systems.

C. Organization, Coordination and Supervision of Civil Works

Participation in the organization, coordination and supervision of the Civil works (stations, tunnels, shafts, depots, transfer stations), with emphasis on special subjects related to underground works, such as the use of the NATM method, the use of diaphragm walls, Tunnel Boring Machines (TBM, EPB) and opining on the methods, the cost and the time schedule for the construction of the projects.

D. Organization of Works relating to the Installation of Electromechanical and Railway Systems

- Organization and management of parallel and successive works for equipment installation, taking into consideration the actual conditions, the progress of the works, their safe performance and functional sequence that is necessary for the various systems.

- Participation in the organization, coordination and supervision of works related to the construction and installation of E/M equipment, the railway systems and rolling stock, signaling systems and BACS in the AM extensions under construction.

E. Testing and Commissioning of the E/M and Railway Equipment

- Participation in the tests at all stages, as described, with special emphasis on the processing of the results of each stage, the determination of the prerequisites for each following stage, the management of the test reports for each stage etc.

- Organization and management of the Trial Operation of the system, as follows:

- Preparation of the testing procedures of the system's trial operation, in cooperation with all the E/M Contractors ensuring adherence to AM's performance specifications.
- Ensuring the suitable and necessary conditions that will allow the system's Trial Operation.
- Management and monitoring of the system's Trial Operation.
- Preparation of procedures related to the system behavior testing during emergency passenger safety related issues and monitoring of their proper execution.
- Compilation of the respective test protocol where it shall be clearly stated that the system can be operated in accordance with the requirements of the operation plan that has already been issued by AM with any remarks fully substantiated, so that AM may be in a position to proceed with the necessary corrective measures.

➢ Organization and management of the SPT tests:

- Preparation of testing procedures for the system "performance" in a manner covering the performance specifications, as they are described in the contractual documents of the Contractor.
- Preparation of the time schedule for the performance testing, taking into account the actual conditions and the progress of the works.
- Ensuring the suitable and necessary conditions that will allow the execution of these tests with special emphasis on safety.
- Organization of these tests in cooperation with the Contractor and AM.
- Management and witnessing of these tests.
- Compilation of the respective performance test protocols where it shall be clearly stated that the system has been constructed in accordance with the performance specifications; the protocols shall be accompanied by a Punch List Items fully commented upon and structured in the order of priority, so that AM can implement the necessary corrective measures.

F. Consultancy services, control and monitoring of reliability, availability, maintainability and safety (RAMS) of the E/M and railway systems, as well as of the Rolling Stock.

G. For the smooth and timely provision of the Consultant's Services, the specific technical scopes (deliverables) and the time of their delivery to AM shall be specified in writing, taking into consideration the Time Schedule of the works and/ or AM's requirements. Whether deliverables shall be accepted or not within the time of

delivery shall be taken into consideration in the Contractor's payment certificates, as per article 4.4 of the Conditions of Contract.

4. DESCRIPTION OF JOB POSITIONS AND QUALIFICATIONS OF THE REQUIRED CONSULTANT'S TECHNICAL PERSONNEL

4.1 Description of job positions and qualifications

The Consultant has to make available two groups (categories) of personnel.

The first group (category K1) shall remain the same as far as the number of people and specializations are concerned throughout the duration of the contract.

The second group (category K2) shall be variable as to the specializations, depending on the needs of the works. Namely, AM reserves its right to modify the allocation of the engineers per specialty, in the projects, according to the actual needs and the projects' Time Schedule.

The first group (Category K1) shall consist of the following personnel:

K1.1 Civil Engineer, Structural Designs

The scope of works includes the review of the designs, ensuring the specifications of the Civil Works, the assistance in the preparation of structural designs and reports etc. In addition, he will have an advisory role on technical issues related to design review and compliance with the specifications, the preparation of the designs for the extensions, the new specifications and the technical tender documents.

K1.2 Civil Engineer, Geotechnical Designs

The scope of works includes the review of the designs, ensuring the specifications of the Civil Works, the assistance in the preparation of geotechnical designs and reports etc. In addition, he will have an advisory role on technical issues related to design review and compliance with the specifications, the preparation of the designs for the extensions, the new specifications and the technical tender documents.

K1.3 Electrical Engineer, Power Supply

Technical Support Consultant for designs and construction in the fields of power supply. The scope of works includes the assistance on issues pertaining to MV and LV power supply and distribution, lighting, earthing and stray current protection, coordination of electrical systems with other systems in stations, tunnels and Depots, as well as testing and commissioning of E/M equipment and railway systems. He shall have an advisory role on technical issues related to design review and compliance with the specifications, preparation of designs for the new extensions, compilation of new specifications and tender documents.

K1.4 Ventilation/A/C Mechanical Engineer

Technical support consultant on issues related to tunnel ventilation, station ventilation and air conditioning, testing and commissioning procedures for the respective E/M equipment. He shall have an advisory role on technical issues related to design review and compliance with the specifications, shall participate in the preparation of designs for new extensions, compilation of new specifications and tender documents.

K1.5 Electrical Engineer – Telecommunications and Weak Currents

Technical support consultant on issues related to design and monitoring of telecommunication and weak current works, testing and commissioning procedures for the respective E/M equipment. He shall have an advisory role on technical issues related to design review and compliance with the specifications, shall participate in the preparation of designs for new extensions, compilation of new specifications and tender documents.

K1.6 Electrical Engineer – Automation Systems

Technical support consultant on issues related to design and monitoring of automation systems. He shall have an advisory role on technical issues related to OCC, PRCS, wired and wireless data communication, SCADA systems and HMI for underground railway systems, traction power, MV power supply for underground railway systems and automations for electrical and mechanical installations (BACS), testing and commissioning procedures for the respective E/M equipment. He shall have an advisory role on technical issues related to design review and compliance with the specifications and he shall participate in the preparation of designs for new extensions, compilation of new specifications and tender documents.

K1.7 Electrical Engineer – Signaling

Technical support consultant for designs in the fields of signaling and control systems of trains with or without train attendant. He shall have an advisory role on technical issues related to design review and compliance with the specifications, shall participate in the preparation of designs for new extensions, compilation of new specifications and tender documents. The scope includes the coordination of interfaces and the operation among signaling systems, rolling stock, trackwork, traction power and other railway systems, both for the main lines and the Depots.

K1.8 Electrical Engineer - Traction Power

Technical Support Consultant for designs and construction in the fields of traction power. The scope of works includes the assistance of the Consultant on issues related to train traction power systems based on a 750V DC third rail and/or overhead catenary, the evaluation and conducting of relevant simulations and testing and commissioning procedures for E/M and underground railway equipment. He shall have an advisory role on technical issues related to design review and compliance with the specifications, preparation of designs for the new extensions, compilation of new specifications and tender documents for these projects, depending on AM's needs.

K1.9 Civil Engineer or Mechanical Engineer or Electrical Engineer or Electronic Engineer or Architect experienced in issues related to the setting up of a digital BIM environment

Technical Consultant for the application of the BIM system and for supporting AM in issues related to the management and coordination of designs, construction, delivery and commissioning of the works under execution in BIM environment. In addition, he shall support AM in issues pertaining to the development of BIM's digital environment and to the scheduling and implementation of the future extensions.

The second category (category K2) shall consist of the following personnel:

K2.1 Civil Engineer – Designs

The scope of works includes the review of the designs, ensuring the specifications of the Civil Works, the participation in the preparation of designs and reports etc.. In addition, he will have an advisory role on technical issues related to design review and compliance with the specifications, the preparation of the designs for the extensions, the new specifications and the technical tender documents.

K2.2 Civil or Topographer Engineer, Traffic Engineer

The scope of works includes the review and preparation of general transport and traffic designs using strategic planning transport models and traffic management models. In addition, he will participate in the preparation of cost benefit designs for the new projects by providing the necessary ridership data and trips data in general.

K2.3 Civil Engineer, Geotechnical Designs

The scope of works includes the review of the designs, ensuring the specifications of the Civil Works, the participation in the preparation of geotechnical designs and reports etc.. In addition, he will have an advisory role on technical issues related to design review and compliance with the specifications, the preparation of the designs for the extensions, the new specifications and the technical tender documents.

K2.4 Electrical or Mechanical Engineer - Rolling Stock

Technical consultant providing supporting services in issues related to the design and monitoring of Metro and Tramway Rolling Stock construction and tests. The scope of works includes carbody structure, loads and, mainly, train E/M systems, such as the traction power system and the motors, the auxiliary power supply system, the doors system, the braking system, the HVAC systems, the control systems, etc.

K2.5 Electrical Engineer or Mechanical Engineer – Systems

Technical Support Consultant for designs and interfaces between E/M and railway systems. In addition, he shall have an advisory role on issues related to systems' reliability, availability, maintainability and safety (RAMS) and on issues related to assessments of systems' safety. Moreover, he shall have an advisory role on technical issues related to design review and compliance with the specifications and shall participate in the preparation of designs for extensions, preparation of new specifications and compilation of tender documents.

K2.6 Electrical or Mechanical Engineer – Installations Supervision

Technical support Consultant for the organization and supervision of the works related to the testing and commissioning of Electromechanical and Railway systems. The scope includes the organization and supervision of the E/M equipment installation works, the on-site coordination among the various Contractors, the testing of individual and integrated systems, performance testing and trial run.

K2.7 Electrical Engineer – Telecommunications and Weak Currents

Technical support consultant on issues related to design and monitoring of telecommunication and weak current works, testing and commissioning procedures for the respective E/M equipment. He shall have an advisory role on technical issues related to design review and compliance with the specifications, shall participate in the preparation of designs for new extensions, compilation of new specifications and tender documents.

K2.8 Electrical Engineer – Signaling

Technical support consultant for designs in the fields of signaling and control systems of trains with or without train attendant. He shall have an advisory role on technical issues related to design review and compliance with the specifications, shall participate in the preparation of designs for new extensions, compilation of new specifications and tender documents. The scope includes the coordination of interfaces and the operation among signaling systems, rolling stock, trackwork, traction power and other railway systems, both for the main lines and the Depots.

K2.9 Mechanical or Civil Engineer – Trackwork

Technical support consultant on trackwork (track systems, 3rd rail systems, walkways/cable ducts, invert filing concrete, cable conduits, stray current collection grid, etc. in tunnels and Depots). In relation to the above, he shall provide technical advice on issues related to design review and compliance with the specifications, shall participate in the preparation of designs for new extensions, compilation of new specifications and tender documents. Moreover, he shall have a consultancy role on issues related to interfaces with other systems, groundborne noise and vibration, and the corresponding performance audits & tests.

K2.10 Civil Engineer, Construction

The scope of his services includes the organization and coordination of the construction and the *in situ* supervision of the civil works execution, as well as ensuring that the works under construction will be executed according to the approved designs and pertinent specifications. With regard to the future extensions, he shall have an advisory role on technical issues related to designs under preparation for these works, depending on AM's needs.

K2.11 Geologist (University Graduate)

Technical Consultant responsible for verifying and further investigating the geological, hydrological and other conditions and the procedures related to surface and underground geomechanical monitoring of the soil and the existing structures in the areas where excavation and retaining works are executed. With regard to the future extensions, he shall have an advisory role

on the investigation and evaluation of geological and other data and the identification of the parameters required for the preparation of the structural and geotechnical designs of the works.

K2.12 Quality Engineer

He shall provide consulting services with regard to all individual scopes described below:

- Checking and improvement of the procedures as regards quality control and quality assurance of the works;
- Providing assistance to the quality control and quality assurance of the Contractor;
- Providing support to AM's personnel as regards quality control and quality assurance;
- Providing assistance as regards the ISO certification procedures
- Checking of the implementation and submission of proposals as regards the operating procedures of the company.

K2.13 Contracts and Cost Engineer

His scope includes the provision of consulting services in contract and cost related issues (contractor's compliance with the contract, contractors' requests, RTW, new prices, etc.) for the works under construction, as well as the provision of assistance to AM in the preparation of tender documents for the future extensions (preparation of documents, quantities' estimates, costing, etc.).

K2.14 Time Scheduling Engineer

His scope includes the provision of consulting services in following-up the time schedule of the works under construction, as well as the provision of assistance to AM in time scheduling issues for the future extensions.

K2.15 Software and Data Engineer

His scope includes architecture design, the incorporation and management of big data from multiple sources. He has knowledge in Structured Query Language (SQL), Data Base and Machine Learning Technology.

K2.16 E/M Engineers, Construction

Technical consultant responsible for the organization and supervision of installation, testing and commissioning of Electromechanical and Railway Systems.

His scope includes the consultant's contribution to the installation of ventilation, fire protection, power supply and distribution, train traction power, signaling and automatic protection, operation and supervision of trains, telecommunications, weak currents, PRCS systems, etc. In addition, his scope of works includes the organization of the supervision of trackwork and E/M equipment installation works, the *in situ* coordination of different contractors, the individual and integrated systems' tests, performance tests and the trial runs.

4.3 Required Experience

The Consultant's technical personnel required experience is presented in detail in the Invitation to Tender and in the following Table 7.

In view of supplementing the said table, it is pointed out that the proposed Civil Works and Electromechanical Works Coordinators must possess the following qualifications. Namely:

The proposed by the Consultant Coordinator exclusively responsible for any issues related to the Civil Works of the Group shall necessarily be a Civil Works Engineer from executives K1.1 or K1.2 of Group K.1. He must possess as a minimum a 25-year general experience in Civil Works (in the relevant scope depending on the position proposed), out of which a 15-year experience at least in the management / administration / coordination of major Civil Works out of which 5-year experience as a technical consultant in the management / administration / coordination of Metro projects.

The proposed by the Consultant Coordinator exclusively responsible for any issues related to the Electromechanical Works of the Group necessarily be an Electromechanical Engineer from the executives K1.3 up to K1.8 of Group K.1. He must possess as a minimum a 25-year general experience in E/M Works (in the relevant scope depending on the position proposed), out of which at least a 15-year experience in the management / administration / coordination of E/M Systems of major projects out of which 5-year experience as a technical consultant in the management / administration / coordination of E/M Systems in Metro projects as a minimum.

Table 7: Required Experience of the Consultant's Technical Personnel

No.	POSITION	No OF PERSONS	MAN-MONTHS	Experience - Expertise	MINIMUM GENERAL EXPERIENCE
Group K1					
K1.1	Civil Engineer - Structural Designs	1	60	Structural Civil Engineer, possessing a minimum experience of 15 or 25 years (*) in structural designs, out of which at least 5 years in structural designs of Metro projects.	**15 or 25 (*)**
K1.2	Civil Engineer - Geotechnical Designs	1	60	Geotechnical Civil Engineer, possessing a minimum experience of 15 or 25 years (*) in geotechnical designs, out of which at least 5 years in geotechnical designs of underground Metro projects.	**15 or 25 (*)**
K1.3	Electrical Engineer – Power Supply Systems	1	60	Electrical Engineer possessing a minimum experience of 15 or 25 years (**) in low & medium voltage power supply – distribution, lighting and earthing, out of which at least 5 years in Metro projects designs, as described above.	**15 or 25 (**)**
K1.4	Mechanical Engineer – Ventilation / A/C	1	60	Mechanical Engineer possessing a minimum experience of 15 or 25 years (**) in ventilation and air conditioning designs, out of which at least 5 years in Metro projects designs, as described above.	**15 or 25 (**)**
K1.5	Electrical Engineer – Telecommunications and Weak Currents	1	60	Electrical Engineer possessing a minimum experience of 15 or 25 years (**) years in telecommunications and weak currents designs, out of which at least 5 years in Metro projects designs, as described above.	**15 or 25 (**)**
K1.6	Electrical Engineer – Automation Systems	1	60	Electrical Engineer possessing a minimum experience of 15 or 25 years (**) in designs concerning remote-control, wired and wireless data collection systems, SCADA and HMI systems, as well as electrical and mechanical facilities automation, out of which at least 5 years in Metro projects designs, as described above.	**15 or 25 (**)**
K1.7	Electrical Engineer – Signaling	1	60	Electrical Engineer possessing a minimum experience of 15 or 25 years (**) in signaling and train control systems, out of which at least 5 years in Metro projects systems, as described above.	**15 or 25 (**)**
K1.8	Electrical Engineer – Traction Power Supply	1	60	Electrical Engineer possessing a minimum experience of 15 or 25 years (**) in issues related to train traction power with an 750V 3rd rail and/or stinger duct, DC, to the evaluation and execution of the relevant simulation tests, testing and commissioning of E/M equipment and underground railway systems, out of which at least 5 years in Metro projects designs, as described above projects systems, as described above.	**15 or 25 (**)**
K1.9	Civil Engineer or Mechanical Engineer or Electrical Engineer or Electronic Engineer or Architect experienced	1	60	Civil Engineer or Mechanical Engineer or Electrical Engineer or Electronic Engineer or Architect, possessing a minimum experience of 15 years and at least 2 years of experience in issues related to the setting up of a digital BIM environment.	15

	in issues related to the setting up of a digital BIM environment				
Group K2					
K2.1	Civil Engineer - Designs	2	40	Structural Civil Engineer possessing a minimum experience of 12 years in CW designs.	12
K2.2	Civil or Topographer Engineer, Transport Engineer	2	40	Transport Engineer (Civil or Topographer Engineer) possessing a minimum experience of 12 years in the preparation of general transport and traffic studies, using strategic plan transportation models and traffic management models.	12
K2.3	Civil Engineer, Geotechnical Designs	1	40	Geotechnical Civil Engineer, possessing a minimum experience of 12 in geotechnical designs, out of which at least 5 years in geotechnical designs of underground Metro projects	12
K2.4	Electrical Engineer or Mechanical Engineer, Rolling Stock	1	40	Electrical or Mechanical Engineer, possessing a minimum experience of 12 years in Rolling Stock related issues for railway and tramway projects, out of which at least 5 years in Metro projects Rolling Stock related issues.	12
K2.5	Electrical Engineer or Mechanical Engineer – Systems	2	40	Electrical or Mechanical Engineer, possessing a minimum experience of 12 years in design and interfaces related issues for electromechanical and railway systems and in Reliability-Availability-Maintainability and Safety systems related issues.	12
K2.6	Electrical Engineer or Mechanical Engineer for Supervision of Facilities	2	40	Electrical or Mechanical Engineer possessing a minimum experience of 12 years in issues related to the organization of supervision of E/M equipment installation works, the on-site coordination of different contractors, the individual and integrated systems' testing activities, performance tests and trial run in railway or major industrial – building projects.	12
K2.7	Electrical Engineer – Telecommunications and Weak Currents	2	40	Electrical Engineer, possessing a minimum experience of 12 years in telecommunication and weak currents issues, testing and commissioning procedures of the respective E/M equipment in railway or major industrial – building projects.	12
K2.8	Electrical Engineer – Signaling	1	40	Electrical Engineer, possessing a minimum experience of 10 years in signaling and train control systems.	12
K2.9	Mechanical Engineer or Civil Engineer – Trackwork	1	40	Mechanical Engineer or Civil Engineer, possessing a minimum experience of 12 years in trackwork designs, out of which at least 5 years in Metro projects designs, as described above.	12
K2.10	Civil Engineer, Construction	2	40	Construction Civil Engineer, possessing a minimum experience of 12 years in the organization and construction of major Civil Works	12
K2.11	Geologist (University Graduate)	2	40	Geologist (University Graduate), possessing 12 years of experience as a minimum in the investigation and evaluation of geological and other information and in the identification of the parameters required for the preparation of structural and geotechnical designs of the works, out of which 5 years mainly in relevant designs of Metro Projects.	12
K2.12	Quality Engineer	1	40	Graduate Engineer possessing 12 years of experience as a minimum in Quality Control, Quality	12

				Assurance, in the ISO certification related procedures, etc.	
K2.13	Contracts and Cost Engineer	1	40	Graduate Engineer possessing 12 years of experience as a minimum in major public works contract administration and in major public work contract costing	12
K2.14	Time Scheduling Engineer	1	40	Graduate Engineer possessing 12 years of experience as a minimum in major public works Time Scheduling	12
K2.15	Software and Data Engineer	1	40	Civil Engineer or Mechanical Engineer or Electrical Engineer or Electronic Engineer or Architect or Information Technology Graduate possessing 12 years of experience as a minimum in architecture designing and in incorporating and managing big data from multiple sources. He/she must have knowledge in Structured Query Language (SQL), Data Base and Machine Learning Technology.	12
K2.16	Electrical / Mechanical Engineer, Construction	3	40	Mechanical or Electrical Engineer, possessing 12 years of experience as a minimum in E/M works, such as ventilation, escalators, lifts, pumping stations.	

(*) The required 25 years of general experience referred to in the table pertaining to CW specialties (K1.1 and K1.2) apply only to the person to be appointed as Civil Works Coordinator, taking into account that the appointed Civil Works Coordinator, among the other qualifications stipulated in paragraph 21.2.2.1 of the Invitation, must possess at least 25 years of general experience. Therefore, in relation to the 25-year experience, Bidders have the option to select between executives K1.1 and K1.2 depending on the executive to be appointed coordinator.

(**) The required 25 years of general experience referred to in the table pertaining to E/M specialties (K1.3 up to K1.8) apply only to the person to be appointed as E/M Coordinator, taking into account that the appointed E/M Coordinator, among the other qualifications stipulated in paragraph 21.2.2.1 of the Invitation, must possess at least 25 years of general experience. Therefore, in relation to the 25-year experience, Bidders have the option to select executives from K1.3 up to K1.8 depending on the executive to be appointed coordinator.