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1. GENERAL DATA – ADVISABILITY OF HIRING A TECHNICAL CONSULTANT

ΑΤΤΙΚΟ ΜΕΤΡΟ Α.Ε. (ΑΜ) was established by Law 1955/91 and its purpose is defined in Article 2 of the Second Article of Law 1955/91, as this was amended by Article 35 of Law 3203/03, and includes *inter alia* the design, construction, operation, running and development of the underground railway and Tramway network of Attica and Thessaloniki Prefectures..

The projects implemented by AM are projects requiring special technical skills involving multiple fields of expertise.

AM is currently constructing the projects of the Athens Metro extension to Piraeus, the Tramway network extension to Piraeus, the Base Project of Thessaloniki Metro and its extensions to Kalamaria; moreover, at a design stage are the projects of Line 4, the extension to Ilion and to Glyfada, and projects executed on Line 1 in Athens, as well as the extensions of Thessaloniki Metro to Stavroupoli, Evosmos and the Airport.

Taking the above into consideration and in order for AM to fulfill its obligations, it is necessary for it to seek the support of a specialized Technical Consultant for the projects of Thessaloniki Metro.

2. TECHNICAL SCOPE OF METRO PROJECTS – GENERAL DATA

The technical scope of the Metro projects may be particularly categorized as follows:

Civil Works

- Alignment (layout and profile) of tunnels or, in more general terms, the bearing structures of the railway infrastructure/trackwork
- Alignment of rails
- Planning, dimensioning and locating all the structures or structural elements, e.g. stations, tunnels, shafts, tunnel recesses, buildings and Depot structures et al. The above scope of works includes both, the temporary structures (e.g. piling work, anchoring etc.) and the permanent works, issues covering the geological and geotechnical conditions, issues of construction methods, work site installations etc.
- Flood protection.

Architectural Works

- Architectural design of stations, shafts, Depots, other buildings and the Operation Control Center.
- Architectural finishes of stations, shafts, Depots, other buildings and the Operation Control Center.
- Reinstatement at the surface level and incorporation of the projects in the urban environment.

Electromechanical Works and Railway Systems

- Ventilation of stations and tunnels
- Heating – Ventilation – Air-Conditioning (HVAC) of personnel and technical areas
- Power Supply – 20 KV, AC

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- Power Distribution (400/230V, AC)
- Lighting
- Earthing
- Drainage, sewage
- Pumping stations (for rainwater and foul water)
- Water Supply
- Fire protection (fire detection and fire safety)
- Lifts
- Escalators
- Trackwork, including the Third Rail as well
- Train traction power supply, including traction power release system, 750V, DC
- Control and Supervision System in the Station Master Room (SMR) of the traction equipment of the Rectifier Sub-station
- Signaling (this includes even the Automatic Train Protection (ATP) and the Automatic Train Operation (ATO) systems
- Automatic Train Supervision (ATS) including even the Public Information System (PIS)
- Telecommunications (radio – TETRA and telephone)
- Fare Collection System
- Close Circuit of Television (CCTV)
- Public Address System (PA)
- PABX
- Clock System
- Intercommunication System
- Direct Line Telephony (DLT)
- System of digital transmission of data
- Safety & access control system
- Information technology infrastructure
- Equipment of Station Master Room (SMR)
- SCADA – Central Control Systems (BACS – PRCS)
- 110 V DC supply system
- Uninterrupted Power Supply System (UPS)
- Platform Screen Doors (PSD)

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)

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- Trial Operation
- Operation of the Depot
- Operation of the Operation Control Center
- Operation of the entire Line

Miscellaneous (related to preliminary works)

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

3. AM ACTIVITIES WITHIN THE FRAMEWORK OF THE METRO WORKS

With regard to Metro works stated in unit 2 above, AM has undertaken the following activities:

3.1 Metro Works under Design

The main AM activities for the Metro 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 the Company or with the assistance of designer consultants. In certain specific works, preparation of the DFDs as well, based on which these are put to tender.
- Ensuring of optimal designs in terms of operation and cost and in environmental terms.
- Preparation of the required environmental designs of the Projects either in the Company or with the assistance of designer consultants, which are submitted to YPEHODE for approval.

3.2 Metro Works under Procurement

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

- Organization of the necessary expropriation and temporary occupations required
- Ensuring of the funding of the projects
- Preparation of designs on a DFD level
- Review of the remaining 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

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- Procurement of the projects for the selection of Contractors.

3.3 Metro works under construction

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

- Control and approval of the Contractors' final designs and DFDs
- Supervision of all phases related to the construction of Civil Works, installation of E/M and railway equipment, construction of architectural finishes at 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, time 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, tests and commissioning level.
- Monitoring and administration of the contractual, financial and time schedule progress of the works and the relevant contracts 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.

3.4 Metro works in operation

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

- Provision of technical support and co-operation with ATTIKO METRO Operations Company (AMEL) where and when required in order to resolve problems and issues related to failures, non compliance with 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 into 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.

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4. TECHNICAL DESCRIPTION OF THESSALONIKI METRO PROJECTS

4.1 Project Overview

4.1.1 General

The Thessaloniki Metro project comprises of one underground main line approximately 9.6 Km in length with two tracks, running –at its greatest part– underneath main road axes and central points of the city, and with 13 stations. It also has a Depot for train stabling and rolling stock and other electrical and mechanical equipment maintenance and repair at Pilea. Within the Depot is the Operation Control Center, as well as the Thessaloniki Metro administration building, which are also part of the Project’s scope of works.

Moreover, the Project scope includes the rolling stock required for the operation of the line. The system shall be a fully automated driverless system, but provisions for an Automatic Train Operation system with train attendants shall also be made, as described in detail in the technical specifications.

The Line begins on the north-west side of the city with the “New Railway Station” located in front of the OSE Station as its first station, and goes on to reach “Nea Elvetia” Terminal Station on the south-east side of the city. The line follows mainly the Monastiriou, Egnatia, N. Egnatia, Delfon, and Solonos Streets before on its way to “Nea Elvetia ” Terminal Station.

The foreseen stations are the following:

1. New Railway Station
2. Platia Demokratias
3. Venizelou
4. Aghias Sofias
5. Sintrivani
6. Panepistimio
7. Papafi
8. Efklidi
9. Fleming
10. Analipseos
11. Patrikiou
12. Voulgari
13. Nea Elvetia

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4.1.2 Extension to Kalamaria

The Contract for the construction of the extension to Kalamaria was signed in June 2013. The Project encompasses the underground main Line (2 tracks) spanning over a length of approximately 4.7km from Partikiou crossover up to the end of the forestation of MICRA Station. The Project includes the construction of three (3) shafts, as well as the construction of five (5) stations:

Nomarchia
Kalamaria
Aretsou
Nea Krini
Micra

4.1.3 Ridership requirements

The Base Project system is sized for at least 18,000 passengers per hour per direction with headway of 90 sec. Furthermore, the overall Project planning shall also take into consideration the projected ridership figures at every station, as detailed in the Planning Manual of each individual Project. It is noted that, as far as the projected ridership figures are concerned, all future extensions of the system have been taken into consideration. Especially, as regards the addition of the Extension to Kalamaria, the two branches of the line shall be connected at Patrikiou crossover; the first branch shall be directed towards Nea Elvetia and the second branch towards Kalamaria. Given the length of the Line with two stations in the branch towards Nea Elvetia and the length of the Line with five stations in the branch towards Kalamaria, the initial concept is that the circulation of the trains in the main part of the Line shall be distributed based on the ratio 2:1 in both branches. In other words, out of three consecutive trains with a 90 sec headway, the first two trains shall be directed to the branch towards Kalamaria and the third train shall be directed to the branch towards Nea Elvetia.

4.1.4 Provisions for Future Extensions

The scope of the Base Project also includes provisions for future line extensions (with relevant infrastructure); in particular, the extension to Stavroupoli close to “Dimokratias” Station for the extension to Kalamaria close to “Patrikiou” station, which is under construction and for further extensions to Evosmos and the Airport.

4.2 Brief Description of the Scope of the Project

In brief, the scope of Thessaloniki Metro Project includes, but is not limited to, the following works:

4.2.1 Research Work and Designs

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 Implementation Design of the Project as described in more detail in the Specifications. The research work and designs to be prepared by the Contractor include indicatively, but are not limited to, the following:

- Survey works - cadastral diagrams / tables

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- 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 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 Projects
- Noise and Vibration study during the Construction and Operation of the Projects
- Passive Fire Protection study
- Architectural designs (station layouts and architectural finishes)
- Station acoustic studies
- Design of E/M and railway systems
- Design coordinating Civil Works, Electrical and Mechanical and railway systems
- Projects log
- Network Operating Analysis and its maintenance requirements
- Design and organization of the Operation Control Center, Depot and Administration Building
- Reliability, Availability, Maintainability and Safety (RAMS) study, including a hazard analysis
- Compilation of Health and Safety Plan and File

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- 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, EYATH, 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.

4.2.2 Preliminary Works

The above include the following:

- Checking, 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 remaining CW. The existing networks have already been recorded; however, investigation trenches should verify certain of them at particular 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.

4.2.3 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 Thessaloniki area 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.

4.2.4 Civil Works (C.W.)

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:

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- a) Underground mechanical boring using EPB-TBM, single track, between New Railway station and Nea Elvetia station, apart from the sections where underground boring will be performed with conventional mechanical means. The use of EPB-TBM equipped with proper systems shall be applied in order to ensure that the ground water level will not be affected, ground deformations will be minimized and buildings and structures located at the Project influence zone will not be affected within the framework of the adherence to the Project time schedule. In some cases, such as, for example, in case of sensitive buildings and structures, monuments, KAA etc., special protection measures may be required based on the specialized designs of the Contractor.
- b) Underground excavation using conventional mechanical means (NATM) at certain small tunnel sections.
- c) Cut and cover between NEA ELVETIA station and the Depot of the Base Project, as well as at the forestation of MICRA station of Kalamaria extension.

2. Stations, Shafts and Crossovers

The stations shall be center platform stations and shall be accessible to Persons with Special Needs. They shall include entrances/exits, emergency exits, concourse areas, platforms, electrical and mechanical equipment rooms as shown on the Preliminary Design drawings of AM and the subsequent designs of the Contractors responsible for the construction of the works. The stations will be equipped with Panels - Platform Screen Doors. The Station boxes shall incorporate two blast shafts.

Furthermore, additional ventilation shafts shall be constructed at the following points:

- a) At the start of the forestation of NEW RAILWAY station and the forestation tunnel,
- b) Between NEA ELVETIA station and the Depot, in the Base Project
- c) At three points along the extension to Kalamaria, including the terminal shaft.

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

- a) Cut and Cover method.
- b) Cover and Cut method.

3. Depot

The Depot site is located at the end of the Base Project Line at Pilea.

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The main Civil Works shall include:

- a) Earthworks, retaining walls, roadworks and drainage works
- b) Slope protection for the existing drainage pit on the west side of the Depot. Arrangement of the drainage pit, where required, based on the flood protection design
- c) Noise protection measures
- d) Metal structures
- e) Building works
- f) Co-ordination with electrical, mechanical, railway systems and trackwork in the areas of the Depot.

The main building works shall include buildings for the following functions:

- a) train stabling shed, maintenance and repairs,
- b) trackwork maintenance and repair,
- c) maintenance and repair of E/M equipment,
- d) the Operation Control Center,
- e) the Administration Building.

All above listed buildings shall be equipped with electrical and mechanical systems (heating, air conditioning, lighting, drainage, communications, elevators, control systems etc.) in accordance with the respective specifications.

The extension of the network shall call for the extension of Pilea Depot – which has already been designed - in an area of approximately 50,000m² to the NE of the existing Depot with a respective extension to the train stabling and running shed/workshop facilities.

4. Connection of the Line with the Depot

Civil Works also include the connection of the line after NEA ELVETIA Station with the Depot. This section is to be both underground and surface. Where the profile of the tunnel ascends above ground level, it shall be completely enclosed with a reinforced concrete box providing the same cross-section as the cut and cover tunnel.

5. Provisions for future Metro branch connections

The Works also include the necessary structures / provisions for the future connection of the base line with the new branches of the Metro extensions. These provisions / structures shall be designed and constructed in such a way that future line extensions are possible during the operation of the base

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network to be constructed in the framework of this contracting work with no disruption to passenger service.

6. Geomechanical and Structural Monitoring

The Contractor shall execute all works related to the Geological, Geomechanical and Structural Monitoring of the Project environment, the building and structures of the Project influence zone and the temporary and permanent structures of the Project itself.

7. Measures related to ground treatment, as required.

8. Measures related to the protection, propping and strengthening of the buildings, monuments, antiquities, Main Sewage, etc located adjacent to excavations.

4.2.5 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.

4.2.6 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

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4. 230/400V Power Distribution
5. Lighting
6. Fire fighting/ Fire detection
7. Escalators
8. Lifts
9. Earthing, bonding and protection against stray current
10. Lightning Protection
11. Water Supply
12. Drainage, sewage
13. Pumping Station
14. Traction Power System
15. Signaling (Systems: Automatic Train Control (ATC), Automatic Train Supervision (ATS), Automatic Train Protection (ATP), Automatic Train Operation (ATO))
16. Passenger Information System (PIS)
17. Platform Screen Doors
18. Telecommunications (TETRA)
19. Automatic and Direct Phones
20. Closed Circuit TV (CCTV)
21. Public Announcements (PA)
22. Clocks and Time Distribution System
23. Information Technology (IT) Infrastructure System
24. Safety and Protection System
25. Intercommunication System
26. Fare Collection System
27. Uninterrupted Power Supply Systems (UPS) - Batteries
28. Building Automation Control System (BACS)
29. Power Remote Control System (PRCS)

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30. Cables and Fiber Optics Networks

31. Data Transmission Systems

32. Trackwork

33. Depot Equipment

34. Rolling Stock

35. Operations Control Center (OCC)

4.2.7 Rolling Stock

There shall be a procurement of eighteen (18) trains in the framework of the Base Project and of fifteen (15) additional trains in the framework of the Extension to Kalamaria, to cover also the needs for reduced headways for the Base Project, as a result of the foreseen increased ridership (i.e., nine trains for the extension and six additional trains for the Base Project).

The rolling stock shall have the following characteristics:

- Each train shall be capable to run towards both directions, at a fully automated driverless operation, and a driving position at each end for the case a train driver is present (emergencies – failure of the system).
- The minimum external width of each train shall be 2,65 m.
- The train length shall range between 50 and 60 m.
- Each train's capacity shall be equal to or greater than 450 passengers, with 5 passengers /m² and the ratio of seated / standees shall be equal to or greater than 25%.
- The internal height of the passengers compartment shall be maximized along the length of the center axis.
- The train structural requirements shall be in compliance with the standard EN 12663: 2000.
- The passenger doors shall be of the sliding type, fully plugged in the vehicle body, with the option to be passenger operated.
- The feeding power shall 750 V DC supplied by the third rail.
- The train maximum speed shall be 80 Km/h, while the revenue speed shall be at least 30 Km/h.
- The trains shall be equipped with A/C motors.
- The trains shall be equipped with a dynamic and pneumatic braking system and regenerative feature.

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- Each train car shall be equipped with a HVAC system.
- It shall be possible for the passengers to move from one vehicle to another.

4.2.8 Depot equipment

The Contractor of the Base Project shall supply all equipment, the necessary installations and the tools required for maintenance and repair reasons of:

- The rolling stock
- The fixed installations

4.2.9 Operation Control Center (OCC)

The Pylea Depot Operation Control Center (OCC) shall include:

- Supervision and Control of the network Operation and Train Supervision Departments facilities.
- The network safety control, management and protection.
- The Building Automation Control System of the line and the Depot (BACS).
- The Power Remote Control System (PRCS)

The room of the OCC operators shall, also, include the Depot control installations. The movement and the operations of the trains within the Depot shall be checked by the Depot operation controller, who is found in the OCC operators' room.

4.2.10 Administration Building

The Contractor shall construct the Administration Building to accommodate all Departments of Thessaloniki Metro Operation Company. The building shall be within the Depot area and shall include structures that serve the functional needs of the Metro network administration and operation personnel. The said building includes all necessary electrical and mechanical systems of the building (heating, air conditioning, lighting, drainage etc.), as well as the architectural finishes.

4.2.11 Time Schedule

Base Project: The contract for the design, construction and commissioning of Thessaloniki base line was signed on 07.04.2006. The project completion date in the initial time schedule was 02.10.2012. Due to the extensive archaeological investigation that was conducted at various locations of the project, as well as due to the delays in the delivery of construction areas, the project completion deadline was extended until 25.11.2016. It is currently estimated that a new extension of the Project's overall deadline will be required, because there are pending issues related to archaeological works and expropriations, not permitting the timely completion of the project, nor a safe estimate as to the additional time to be required.

Extension to Kalamaria: The contract for the Extension to Kalamaria was signed on 25.06.2013 and the foreseen project completion date was 09.04.2018. This contract

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includes the design and construction of the Civil Works, as well as of part of the required E/M systems. The supply and installation of the remaining E/M systems shall be assigned on the basis of separate contracts, concurrently with the main construction works, enabling thus the Extension project to be commissioned on the aforementioned deadline.

4.2.12 The Extensions of the Base Network

The project described above constitutes the Base Project of Thessaloniki Metro Line and the Extension to Kalamaria. Based on the most recent design drafted for the final section of the Metro alignment, it seems that the extension of the base line towards Stavroupoli (5km with 5 Stations) and to Evosmos (4.4km with 4 Stations) is necessary, as well as further eastbound extension of the line from Kalamaria (for 5.5km with 3 stations) will connect the city with the Airport.

As regards the extension to Stavroupoli and in the framework of implementing the Base Project, all necessary Civil Works next to Dimokratias Station, E/M Works and Railway Systems shall be constructed in order to allow the further construction of the connections of the extensions with the base line without the revenue service in the latter being interrupted and being affected in any way. It is stressed that the base line has been designed in a manner absolutely compatible with the operation of the extensions, since the branches in the eastern and western sections of the line will operate with trains running at double headways, while in the central sections the trains of all branches will be combined to run at a normal headway that may be up to 90 seconds. It is stressed that, as mentioned above, the extensions will require an additional Depot - train stabling area - to be located, in line with the pertinent planning, in a free space at the NE of Pylea Depot.

5. SCOPE OF THE CONSULTANT’S SERVICES

The Consultant’s contractual scope that will result from the present tender includes the Base Project, the extension to Kalamaria and the future extensions of Thessaloniki Metro Project.

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

The role of the Consultant is summarized as follows:

1. Support in issues of design, management and monitoring of the projects.
2. Provision of specialized technical solutions, where required.

The Consultant shall have an advisory role. He shall not have administrative responsibilities.

His general duties shall be as follows:

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- 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 design works, review of designs, supervision of the Project, tests, monitoring of the progress of works etc.) within the existing organizational structure of AM.
- To propose changes/modifications in respect of special technical issues, whenever there is a demonstrable likelihood of deviation from the existing designs.
- 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 provide support to 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.
- Regarding the Thessaloniki Metro extension projects, to propose solutions and technical choices based on the technology advancement, the international practice in modern Metro systems, possible techniques contributing to the reduction in the cost of the construction, installation, maintenance and operation works in general.

5.2 Consultant's Technical Scope of Works

Based on the scope of the projects mentioned above in the chapter entitled “Thessaloniki Metro Projects”, the Consultant is expected to participate in the scope of works set out below.

- Design and construction of Thessaloniki Metro Project.
- Supply, installation and commissioning of the rolling stock and the remaining electromechanical systems of Thessaloniki Metro Project.
- Design and preparation of tendering documents and supervision of the construction of the extensions of the base line towards Stavroupoli, Kordelio, the Airport etc..

The following categories of works are covered by the description of the required specialties that the Consultant should provide, as shown in the following unit 6.

A. Designs for Civil Works

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- Participation in the review of the designs produced by the Contractor of Civil Works of works under construction and new works, especially as regards specific issues of underground structures, as well as the control of constructibility, settlements, protection of buildings etc.
- Preparation of reports containing proposals addressing special issues of structural character, inclusive of the examination of buildings in cases of extensive damage inflicted by the Metro works and increased risk run by buildings, thus providing support to AM in its decision making process.
- Assistance in the evaluation process regarding results of investigations and geotechnical interpretation reports, which give the parameters necessary for the preparation of the structural designs of the structures.
- Review, from the geotechnical point of view, of the designs and other documents submitted to AM. Review and validation of the geotechnical parameters given in designs, at the construction stage.

B. Designs for Electromechanical and Railway Systems

The scope of works includes participation in the review of the designs of E/M and railway systems and the rolling stock of the AM projects. The term “designs” covers the technical specifications, the materials submission sheets, the drawings, the calculations, the testing procedures, the simulations, etc.

Special emphasis has to be given: a) to the interfaces with Civil Works and b) to the interfaces of the systems of the already existing Metro network with the systems that are going to be installed, both at a level of preparation of the tender documents, as described in category G, as well as a level of design review falling under the present category.

C. Organization, Coordination and Supervision of Civil Works

Participation in the organization, coordination and supervision of the Civil works under construction (stations, tunnels, shafts, Depots), with emphasis to the special issues of underground works with the use of the NATM method, the use of diaphragm walls, Tunnel Boring Machines (TBM, EPB) and opining on the methods, the cost and time schedule of the construction of the works.

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

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

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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 of 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 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 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 monitoring of these tests.
 - Compilation of the respective test performance 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 list of pending issues fully commented upon and structured in the order of priority, so that AM may receive the necessary corrective measures.

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F. Quality Assurance and Quality Control

- Review and improvement of the procedures intended for the quality assurance and quality control of the works.
- Assistance in the review of the Contractors' quality assurance and quality control systems.
- Providing support to the personnel on the quality assurance and quality control procedures.
- Assistance in the process related to the ISO certification.

G. Preparation of Designs and Tender Documents related to Future Projects of AM

The Consultant shall participate in the preparation and the review of the preliminary and final designs, as well as in the compilation of the tender documents for the future extensions.

H. 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.

I. Consultancy services on matters pertaining to costing (new prices etc.) and contracts (RTW, etc.).

It is finally stressed that the Consultant shall give his opinion on all matters related to designs, supervision, quality, safety, contracts, quantities, cost, time schedule, testing and commissioning of works and systems.

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

6.1 General

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

Group 1 – Basic; it includes specialized executives, possessing special technical and professional competence, who shall cover the positions required in line with the progress of the works.

Group 2 – Supporting; it includes executives possessing general experience, who shall cover positions as needed by the progress of the works.

It is pointed out that AM reserves its right to modify the man-months of employment of its executives belonging to Group 1, as well as of the executives of Group 2, according to the actual needs and the time schedule of the works.

The necessary part-time personnel and their period of employment per field of expertise is indicative and was evaluated in advance in line with the experience acquired until the present day by AM from the progress of Thessaloniki Metro works. This personnel shall be engaged in the works within a reasonable time after AM has issued the relevant instruction.

6.2 Experience of the Consultant's Technical Personnel

TABLE LISTING THE EXPERIENCE OF THE CONSULTANT'S PERSONNEL				
CODE	POSITION	NUMBER max	Man-months	EXPERIENCE - EXPERTISE MINIMUM EXPERIENCE
Group 1. Basic				
1.1	Head Coordinator – Consultant	1	60	Civil Engineer, Coordinator of the Consultant's Team, possessing an experience of 15 years in management/administration/coordination of major Civil Works, 5 out of which in management/administration/coordination of Metro projects.
1.2	Civil Engineer - Designs	1	60	Structural Civil Engineer, possessing an experience of 15 years in Civil Work designs, out of which 5 in underground railway projects.
1.3	Quality Engineer	1	60	Civil or Mechanical or Electrical Engineer possessing an experience of 15 years in Quality Control, Quality Assurance as regards ISO certification procedures etc.,.

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1.4	Civil Engineer - Construction	1	60	Structural Engineer possessing an experience of 15 years in the organization and construction of Civil Works, out of which 5 in underground railway projects.	15
1.5	Electrical Engineer – Installation, Testing and Commissioning	1	60	Electrical Engineer possessing an experience of 15 years in E/M Works, out of which 5 in underground railway projects.	15
1.6	Contracts Engineer	1	60	Civil Engineer possessing an experience of 15 years in the administration of large public projects contracts.	15
1.7	Costing Engineer	1	60	Civil or Mechanical or Electrical Engineer possessing an experience of 15 years in the costing of large public projects contracts.	15
1.8	TBM Engineer	1	24	Supervising Civil or Mineral or Mechanical Engineer possessing an experience of 15 years in the organization and construction of civil works, out of which 5 in projects constructed with a TBM, concerning tunneling works using Tunnel Boring Machine – Earth Pressure Balance Shield (TBM-EPB).	15
1.9	SCADA Engineer	1	20	Electrical Engineer, possessing an experience of 15 years in E/M works, out of which 5 in SCADA systems of railway, industrial or large building projects	15
1.10	Trackwork Engineer	1	18	Civil or Mechanical or Topographer Engineer , possessing an experience of 15 years in the design or construction, 5 out of which in trackwork projects.	15
1.11	Power Supply Engineer	2	36	Electrical Engineer, possessing an experience of 15 years in E/M works, out of which 5 in electrical systems of power supply or distribution for railway, industrial or large building projects.	15
1.12	Ventilation Engineer	1	14	Mechanical Engineer, possessing an experience of 15 years in Mechanical designs, out of which 5 in tunnel ventilation designs, station ventilation and air conditioning, as well as Building and E/M Automation and Control Systems (BACS)	15
1.13	Signalling Engineer	1	50	Electrical Engineer, possessing an experience of 15 years in E/M works, out of which 5 in underground railway projects such as Metro signaling systems, EIXL, ATS, ATO, ATP, driverless, as well as in PSD, responsible for the respective installation, testing and commissioning works.	15
1.14	Telecommunications and Weak Currents Engineer	1	24	Electrical Engineer, possessing an experience of 15 years in E/M works, out of which 5 in underground railway projects, specialized in telecommunication systems in the framework of design support in the areas of telecommunications and weak currents.	15
1.15	Telecommunications and Weak Currents Engineer	1	20	Electrical Engineer, possessing an experience of 15 years in E/M works, out of which 5 in telecommunication and weak current systems of railway, industrial or large building projects.	15

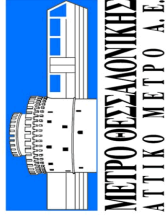
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1.16	Rolling Stock Engineer	1	28	Rolling Stock Electrical or Mechanical Engineer, possessing an experience of 15 years in E/M systems, out of which 5 in Rolling Stock.	15
1.17	Operation Engineer	1	18	Electrical or Civil or Mechanical Engineer, possessing an experience of 15 years, out of which 10 in commissioning and operation of Metro systems.	15
1.18	Maintenance Engineer	1	12	Electrical Engineer, possessing an experience of 15 years, out of which 10 in in trains and railway systems maintenance organization.	15
	Total for Group 1	19	684		

Group 2. Support

2.1	Civil Engineer – Construction	9	150	Civil Engineer for construction works, possessing an experience of 12 years in the organization and construction of major Civil Works.	12
2.2	Architect Engineer	3	75	Architect Engineer, possessing an experience of 12 years in major building works.	12
2.3	Topographer Engineer	2	70	Topographer Engineer, possessing an experience of 12 years in the organization and supervision of topographic works.	12
2.4	Civil Engineer – Structural Designs	2	60	Civil Engineer possessing an experience of 12 years in structural designs.	12
2.5	Civil Engineer – Geotechnical Designs	2	48	Geotechnical Engineer possessing an experience of 12 years in geotechnical designs.	12
2.6	E/M Construction Engineer	5	100	Mechanical or Electrical Engineer, possessing an experience of 12 years in E/M works, such as ventilation, escalators, lifts, pumping stations.	12

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2.7	Contracts Engineer	4	95	Civil or Mechanical or Electrical Engineer, possessing an experience of 12 years in the administration of contracts for large public projects.	12
2.8	Costing Engineer	1	45	Civil Engineer, possessing an experience of 12 years in the costing of large public projects	12
2.9	Costing Engineer	1	20	Mechanical or Electrical Engineer, possessing an experience of 12 years in the costing of large public projects.	12
2.10	Quality Engineer	2	72	Civil or Mechanical or Electrical Engineer, possessing an experience of 12 years in quality control and quality assurance in the ISO certification procedures etc..	12
2.11	Time Schedule Engineer	1	50	Civil or Mechanical or Electrical Engineer, possessing an experience of 12 years in the time scheduling of large public projects.	12
	Total for Group 2	32	785		
	Grand Total	51	1469		

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6.3 Job Description of the Consultant’s Technical Personnel

6.3.1 Group 1

1.1 Head Coordinator - Consultant

Official representative of the Consultant before AM and Coordinator of the Consultant’s Team. His scope of work includes design review and coordination ensuring adherence to the Specifications, preparation of designs and reports, etc. In addition, he shall provide consultancy services on technical issues and shall participate in preparation of the designs and the technical tender documents for the new extensions.

1.2 Civil Engineer – Designs

The scope of works includes the review of the designs, ensuring the specifications of the Civil Works, the preparation of designs and reports etc. Regarding the Metro extension works, he will have an advisory role on technical issues, and shall participate in preparation of designs and of technical tender documents, depending on AM’s needs.

1.3 Quality Engineer

He shall provide consultancy services in all the individual subjects set out below:

- Review and improvement of procedures related to the quality control and quality assurance of the works.
- Assistance in quality control and quality assurance of the Contractor.
- Providing support to AM’s personnel on the quality control and quality assurance procedures.
- Assistance in the procedures related to ISO certification.
- Review and improvement of the company’s operational procedures

1.4 Civil Engineer – Construction

Technical Consultant for the organization and the coordination of the supervision and the in-situ supervision of the civil works execution, ensuring adherence to the approved designs and specifications about the works under construction. Regarding future extensions, he shall have an advisory role on technical issues regarding the designs under preparation for these works, depending on the needs of AM.

1.5 Electrical Engineer – Installation, Testing and Commissioning

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

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1.6 Contracts Engineer

He shall provide consultancy services on contractual issues (RTW, Contractors' requests) in the framework of the projects to be constructed.

1.7 Costing Engineer

He shall provide consultancy services on costing issues (new prices etc.) in the projects under construction both for CW works and E/M systems.

1.8 TBM Engineer – Construction

Technical Consultant for the organization and the coordination of the supervision and the in-situ supervision of the TBM works, as well as for ensuring adherence to the approved designs and specifications of the works under construction. Regarding future extensions, he shall have an advisory role on technical issues regarding the designs under preparation for these works, depending on the needs of AM.

1.9 SCADA Engineer

Technical Consultant responsible for the review of designs, installation, testing and commissioning of Automatic Control Systems (SCADA) for the supervision and control of the Mechanical and Electrical Systems of the Project.

1.10 Trackwork Engineer

Technical Consultant on issues pertaining to design review and compliance with the specifications, who shall participate in the preparation of designs for the extensions, compilation of new specifications and tender documents. The scope also includes the organization of the supervision of the works related to the installation of the trackwork, the on-site coordination, the testing of individual and consolidated systems, performance testing and trial run.

1.11 Power Supply Engineer

Technical Support Consultant for designs and construction in the fields of traction power, medium and low voltage.

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, the evaluation and conducting of relevant simulations on systems pertaining to MV power supply, low voltage power distribution, coordination of electrical systems with other systems in stations, tunnels and Depots, as well as earthing and stray current protection 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

1.12 Ventilation Engineer

Technical support consultant on issues related to tunnel ventilation, station ventilation and air conditioning and E/M installations Building Automation and

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Control Systems (BACS). 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.

1.13 Signaling Engineer

Technical support consultant for designs in the fields of signaling and control systems of train 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 shall also include the coordination of interfaces and operation among signaling systems, rolling stock, trackwork, traction and other Railway Systems for the main lines and the Depot.

1.14 Telecommunications and Weak Currents Engineer

Technical support consultant for designs and supervision of works in the fields of telecommunications and weak current systems. 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 new extensions and compilation of new specifications and tender documents.

1.15 Telecommunications and Weak Currents Engineer

Technical Support Consultant for designs and supervision of works in the fields of telecommunications and weak current systems. He shall have an advisory role on technical issues related to design review and construction, compliance with the specifications, and shall participate in the preparation of designs for the new extensions, compilation of specifications and tender documents

1.16 Rolling Stock Engineer

Technical consultant providing support in issues related to designs, supervision of construction and commissioning works, as well as in issues related to the interfaces and the securing of the RAMS for the rolling stock. Moreover, he shall provide advice on RAMS issues, on safety assessment of safety-related systems and shall provide guidance in relation to the entire procedure for the Rolling Stock safety approval. In addition, he shall have an advisory role and shall conduct design reviews, ensuring their compliance with the specifications.

1.17 Operation Engineer

Technical consultant providing support in issues related to designs, organization and operation of the Project, including operation of stations, trains and systems and the respective running of the Operation Company in issues related to its operational structure, determination of needs and description of job positions, drafting of procedures regarding the selection of personnel, allocation of the personnel (geographically or depending on scope of work), training of personnel, supporting systems and software, organization and allocation of works and responsibilities in the Operation Control Center, securing both operation safety and quality, compliance of operation with

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environmental terms, preparation of Regulations related procedures and books, etc.

1.18 Maintenance Engineer

Technical consultant providing support in issues related to designs and organization of the maintenance for rolling stock, systems and fixed structures of the Project and the respective running of the Operation Company in issues related to maintenance, determination of needs and description of job positions, selection - allocation and training of the personnel, supporting systems and software, organization and allocation (geographically or depending on scope of work) of maintenance works, securing safety and quality during maintenance, compliance of maintenance works with environmental terms, preparation of Regulations related procedures and books regarding maintenance, description and organization of technical groups and work crews and of their personnel, covering of issues related to preventive and corrective maintenance, organization of warehouses and management of spare parts, etc.

6.3.2 Group 2

2.1 Civil Engineer – Construction

The scope of works includes the organization, coordination and in-situ supervision of the civil works execution, ensuring adherence to the approved designs and specifications for the works under construction. Regarding future extensions, he shall have an advisory role on technical issues regarding the designs under preparation for these works, depending on the needs of AM.

2.2 Architect Engineer

The scope of works includes the organization, coordination of the supervision and in-situ supervision of the architectural works execution, ensuring adherence to the approved designs and specifications for the works under construction. Regarding future extensions, he shall have an advisory role on technical issues regarding the architectural designs under preparation for these works, depending on the needs of AM.

2.3 Topographer Engineer

The scope of works includes the design review, ensuring adherence to the specifications, the preparation of topographic designs, etc. He shall have an advisory role on technical issues related to design review and compliance with the specifications, preparation of designs for the extensions, compilation of new specifications and technical tender documents.

2.4 Civil Engineer – Structural Designs

The scope of works includes the design review, ensuring adherence to the specifications for CWs, the preparation of designs and reports, etc. Moreover, he shall have an advisory role on technical issues related to design review and compliance with the specifications, preparation of designs for the

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extensions, compilation of new specifications and technical tender documents.

2.5 Civil Engineer – Geotechnical Designs

The scope of works includes the design review, ensuring adherence to the specifications for CWs, the preparation of geotechnical designs and reports, etc. He shall have an advisory role on technical issues related to design review and compliance with the specifications, preparation of designs for the extensions, compilation of new specifications and technical tender documents.

2.6 E/M Engineer – Construction

Technical Consultant for the organization and supervision of the installation, testing and commissioning of E/M and Railway Systems.

The scope of works includes the contribution of the Consultant to the installation of systems concerning ventilation, fire protection, power supply and distribution, train traction power, signaling, ATP, ATO and ATS, telecommunications, weak current systems, control and remote control systems etc. Moreover, it includes the organization of the supervision of the works for the installation of trackwork and E/M equipment, the in-situ coordination of different Contractors, the independent and integrated systems' tests, the performance tests and the trial run.

2.7 Contracts Engineer

He shall provide consultancy services on contractual issues (RTW, Contractors' requests) in the framework of the projects to be constructed.

2.8 Civil Engineer – Cost

He shall provide consultancy services on contractual issues (RTW, Contractors' requests) in the framework of the projects to be constructed.

2.9 E/M Systems Engineer – Cost

He shall provide consultancy services on contractual issues (RTW, Contractors' requests) in the framework of the projects to be constructed.

2.10 Quality Engineer

He shall provide consultancy services in all the individual subjects set out below:

- Review and improvement of procedures related to the quality control and quality assurance of the works.
- Assistance in quality control and quality assurance of the Contractor.
- Training of AM's personnel on the quality control and quality assurance procedures.
- Assistance in the procedures related to ISO certification.
- Review and improvement of the company's operational procedures

2.11 Time Scheduling Engineer

He shall provide consultancy services on time schedule issues and he shall participate in the monitoring of the time schedules of the projects to be constructed.

7. SCHEDULE OF REQUIRED SERVICES

The program of the required services as well as the time when personnel is incorporated into or leaving the Consultant's Group shall be defined by AM, depending on the current needs of its works and taking into account the construction time schedules and the design submittal planning.

The Consultant's personnel shall provide their services according to the instructions of the Managing Department, who shall be the authority responsible to assign the pertinent duties and to describe the required actions, shall define the deadlines for their completion and shall monitor the progress.