

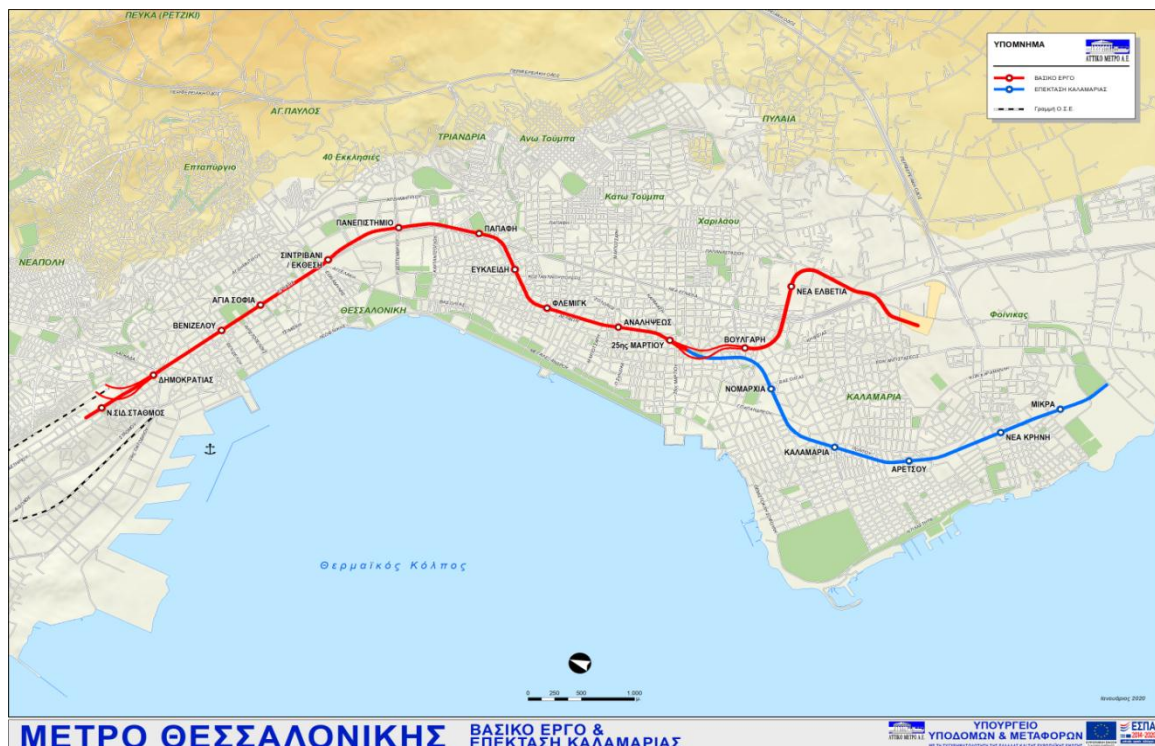
TECHNICAL DESCRIPTION AND SPECIFICATIONS



TITLE: “International Tender based on the Open Procedure for the Conclusion of a PPP Contract concerning the Operation and Maintenance of the Thessaloniki Metro Network”

RFP- 427/22, Α.Σ 164503

TECHNICAL DESCRIPTION AND SPECIFICATIONS



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INTRODUCTION

This document provides to the Bidders information concerning the design, characteristics, specifications and requirements of the Operation and Maintenance work as regards its technical and operational aspects.

In this framework, all relevant data made available by the Contractors involved in the Project Construction, which include all relevant information about Civil Works, the Rolling Stock and the Electromechanical and Railway Systems of the Base Project and the extension to Kalamaria, shall be provided by ΑΤΤΙΚΟ ΜΕΤΡΟ (ΑΜ).

The Operation of the Thessaloniki Metro Project shall be implemented in two phases:

- ❖ Operation of the Base Line
- ❖ Operation of the Extension to Kalamaria as well.

The Operation & Maintenance (O&M) Contractor's scope of Services includes –as a minimum- the following basic services for the Thessaloniki Metro network:

1. Operation
2. Maintenance
3. Cleaning
4. Safety – Security
5. Management of the Automatic Fare Collection System (AFC)
6. Installation and operation of the information system which supports the administrative operation of the Thessaloniki Metro Project.

The aforementioned works and services of the Contractor shall be supervised by ΑΜ in line with article 7 of the Partnership Contract.

TECHNICAL DESCRIPTION AND SPECIFICATIONS**1. DESCRIPTION OF THESSALONIKI METRO****1.1 General**

In this article, description is made of the basic characteristics of the works to which this Operation and Maintenance Contract of Thessaloniki Metro applies and which (characteristics) concern both the Base Project and the Extension to Kalamaria.

1.2 Description of the Base Project

The Thessaloniki Metro Base Project includes an underground main line approximately 9.6km long, with two TBM single track tunnels, whose longest section passes under key road arteries and central points of the city, as well as 13 stations. It also includes a Depot in Pylea area for the rolling stock related stabling, maintenance and repair works, as well as for the works related to the maintenance and repair of the entire electromechanical equipment of the Project. The Operation Control Centre (hereinafter referred to as OCC), as well as the Thessaloniki Metro Administration building are located within the Depot area.

The Line starts from the NW side of the city with the NEW RAILWAY STATION (NRS) station located in front of OSE station, and continues up to NEA ELVETIA terminal station at the SE side of the city. The subject line follows mainly Monastiriou, Egnatias, N. Egnatias, Delfon and Solonos streets to reach NEA ELVETIA terminal station.

The Project includes two single track tunnels, 13 stations, 2 line branches, 2 shafts, 7 railway crossover areas, while a rainwater tank and a pumping station have been constructed at the lowest parts of each tunnel.

The stations of the Thessaloniki Metro Base Project are as follows:

1. NEW RAILWAY STATION (NRS)
2. DIMOKRATIAS SQUARE
3. VENIZELOU
4. AGHIA SOFIA
5. SINTRIVANI
6. PANEPISTIMIO
7. PAPAFI
8. EFKLIDIS
9. FLEMING
10. ANALIPSI
11. 25 MARTIOU
12. VOULGARI
13. NEA ELVETIA

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The branches have been named, respectively, as follows:

- Dimokratias Square (Branch to Stavroupoli)
- 25 Martiou (Branch to Kalamaria).

The names of the shafts are as follows:

- Terminal shaft of the NRS Forestation
- Nea Elvetia Forestation Shaft.

The 7 railway crossovers and train stabling tracks have been constructed at the following points:

- a) Train stabling area, hereinafter referred to as “Forestation” in front of the NRS Station
- b) Crossover right after the NRS Station
- c) Crossover between SINTRIVANI and PANEPISTIMIO Stations, hereinafter referred to as “Sintrivani Crossover”
- d) Crossover right after ANALIPSI Station
- e) Crossover before NEA ELVETIA Station
- f) Two crossovers at the double track C/C tunnel between NEA ELVETIA station and the Depot.

The scope of the Base Project also includes the Electromechanical and Railway Systems required in the framework of the Project. The scope of these works includes the relevant design, supply, installation, testing and commissioning, as well as the supply of spare parts and special tools related to maintenance, for the following systems:

1. Ventilation
2. Heating / Ventilation / Air-Conditioning (HVAC)
3. 750 VDC traction power system
4. 20 kV AC power supply
5. LV power distribution (400/230VAC)
6. Lighting
7. Fire fighting / Fire detection
8. Escalators
9. Lifts
10. Earthing and stray current protection
11. Lightning protection
12. Water supply, Irrigation
13. Drainage, sewage

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14. Pumping stations
15. Control and Surveillance System of the traction equipment of the Rectifier Substation in the Station Master Room (SMR)
16. 110V DC auxiliary power supply system
17. Emergency tripping system of the Rectifier substation
18. Intertripping system along the Line
19. Signalling (Systems: Automatic Train Control (ATC), Automatic Train Supervision (ATS), Automatic Train Protection (ATP), Automatic Train Operation (ATO), Electronic Interlocking (EIXL), Positive Train Identification (PTI))
20. Passenger Information System (PIS)
21. Platform Screen Doors (PSD) System
22. Radio telecommunications (TETRA)
23. Automatic and direct line telephones
24. Closed Circuit Television (CCTV)
25. Public Announcement (PA) System
26. Clock and time distribution system
27. Indoor structured cabling for the transmission of digital data
28. Safety Management System (SMS) (Access Control System (ACC), Intrusion Detection System (IDS))
29. Intercommunication System
30. Automatic Fare Collection (AFC) System
31. Uninterrupted Power Supply Systems (UPS) - Batteries
32. Building Automation and Control System (BACS)
33. Power Remote Control System (PRCS)
34. Cable and Fibre Optics Networks
35. Data Transmission System (DTS)
36. Trackwork
37. Keying System
38. Signage
39. Integrated Communications Control System (ICCS).

The scope of the Base Project also includes the following infrastructures and items:

1. Depot maintenance and repair equipment
2. Operation Control Centre (OCC) and Emergency Control Room (ECR), located in Pylea Depot
3. Equipment and furniture of the Station Master Room (SMR) and of the Ticket Offices in all stations

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4. Furniture for personnel areas in the Depot.

The scope of the Base Project also includes the design, manufacturing, production, procurement, testing and commissioning of the Rolling Stock (18 trains with 4 cars) in order to meet the transfer capacity related requirements of at least 18,000 passengers per hour and direction; the subject scope also includes the supply of the necessary spare parts.

The rolling stock required for the operation of the line is fully automated and driverless; however, it also includes a provision for train attendants, at least for the initial period of operation.

1.3 Description of the Extension to Kalamaria

The Thessaloniki Metro Project Extension to Kalamaria is an underground line approximately 4.6km long. Civil Works start at KP 0+091.9 (track 1*, as KP reference track) and finish at KP 4+737.8, at the end of the forestation of MICRA Station. Trackwork starts at KP 0+00 in the trumpet shaft of 25 MARTIOU Station of Thessaloniki Base Project, at the end of the existing turnout, and finishes at the end of the forestation, at KP 4+736.8. The line starts by following Solonos street after 25 MARTIOU Station and, moving mainly southwards, follows Kritis, Moshonission, Mitropoliti Kydonion and Pontou streets and finishes just before the rainwater discharge sump, at the intersection of Pontou and Ikaron streets, i.e. at the end of the Project.

As detailed below, the Extension to Kalamaria Project is being implemented based on a series of contracts covering the entire extension project.

The Project includes two single track TBM tunnels, 5 stations, 3 shafts, 3 railway crossovers and pumping stations at all parts where a low point is formed in the tunnels, including Kritis shaft and the Terminal shaft.

The stations of the Thessaloniki Metro Extension to Kalamaria are as follows:

1. NOMARCHIA
2. KALAMARIA
3. ARETSOU
4. NEA KRINI
5. MICRA

The names of the shafts are, respectively, as follows:

- Kritis Shaft
- Pontou Shaft
- Terminal Shaft.

The 3 railway crossovers were constructed at the following points:

- a) One Crossover after NOMARCHIA Station.

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- b) Two Crossovers at the C/C double track tunnel before and after MICRA station, as shown on the contractual drawings.

The names of the pumping stations are as follows:

- Pumping station 1
- Pumping station 2.

The electromechanical and railway systems and the relevant works included in the scope of the Extension to Kalamaria are similar to those required in the Base Project and are recorded in paragraph 1.2 for the aforementioned systems No. 1-39:

Moreover:

- As regards the Depot equipment which also includes the special tools, these shall be supplemented by the Contractors responsible for the implementation of Kalamaria extension to the extent required.
- As regards the OCC and the ECR, their equipment, including the required software shall be supplemented, modified and upgraded by the involved Extension Contractors, so that the extension to Kalamaria is fully integrated into the network. In this framework, it may be required for the relevant central systems and settings of the OCC and the ECR to be replaced by the contractors responsible for the construction.

1.4 Contractors of Projects and Systems

There is only one Contractor for the Base Project, i.e. “AEGEK – IMPREGILO – ANSALDO STS – SELI – ANSALDOBREDA” Joint Venture (for brevity reasons, “AIASA”), whose contract is a “turn key” contract with Lump Sum Price.

As regards the Extension to Kalamaria Project, it is implemented via 6 contracts as follows:

1. Main contract: CON-06/004-AKTOR, with Lump Sum Price, execution of Civil Works and of the majority of E/M and railway systems. All systems are implemented through this contract, except for the following ones implemented through independent contracts.
2. Contract GEN-080/20-HRACT for the Signalling and the Automatic Train Control (ATC) system including, inter alia, the extension of the following systems: Electronic Interlocking (EIXL), Automatic Train Control, Automatic Train Operation (ATO), Positive Train Identification (PTI), Automatic Train Protection (ATP) and Automatic Train Supervision (ATS).
3. Contract GEN-082/21-HON for the Building Automation and Control System (BACS).
4. Contract GEN-085/22-AKTLV for the 10 Low Voltage systems shown below:

1. Power Remote Control System (PRCS)

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2. Safety Management System (SMS)
 3. Access Control System (ACC)
 4. Intrusion Detection System (IDS)
 5. Data Transmission System (DTS)
 6. Closed Circuit Television (CCTV)
 7. Public Announcement (PA)
 8. Radio communication system (TETRA)
 9. Passenger Information System (PIS)
 10. Integrated Communications Control System (ICCS)
5. Contract for the fare collection system of the Extension. This contract shall cover the wider needs of the central management of fare for all Mass Transit Modes of the city of Thessaloniki.
6. Contract for the Rolling Stock (15 new Train-sets). They shall be 4-car, driverless trains and are required in view of meeting the needs of Kalamaria Extension and achieving the 90sec headways in the central common section, namely in New Railway Station – 25 Martiou section.

The Contractors of the aforementioned systems, equipment, infrastructure and rolling stock, not included in the scope of the main Contractor of the Kalamaria Extension Project, are as follows:

- Contract 2: The Contractor is HITACHI RAIL STS S.p.A. – AKTOR ATE Joint Venture.
- Contract 3: The Contractor is the company HONEYWELL Ltd.
- Contract 4: The Contractor is AKTOR ATE
- As regards Contract 5 (Fare Collection System): the relevant tender is under preparation.
- As regards Contract 6 (Rolling Stock – 15 new Trains): the relevant tender is in progress.

1.5 Ridership Requirements

The system was dimensioned for at least 18,000 passengers per hour and direction and a 90-sec headway. Moreover, the design of the Project took into account the following ridership related figures foreseen for the morning peak hours at the Thessaloniki Metro stations, including the Extension to Kalamaria.

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To Center				From Center			
	Stop Name	Boarding s	Alighting s		Stop Name	Boarding s	Alighting s
1	MICRA	368	0	1	NEW RAILWAY STATION	2477	0
2	NEA KRINI	715	0	2	DIMOKRATIAS	2631	34
3	ARETSOU	1523	9	3	VENIZELOU	1222	231
4	KALAMARIA	1280	17	4	AGHIA SOFIA	877	519
5	NOMARCHIA	1417	42	5	SINTRIVANI	451	457
6	PATRIKIOU	1702	140	6	PANEPISTIMIO	205	272
7	ANALIPSEOS	1861	116	7	PAPAFI	195	559
8	FLEMING	1172	146	8	EFKLIDIS	203	1379
9	EFKLIDIS	2053	313	9	FLEMING	191	520
10	PAPAFI	2369	192	10	ANALIPSEOS	151	603
11	PANEPISTIMIO	310	230	11	PATRIKIOU	115	982
12	SINTRIVANI	318	1115	12	NOMARCHIA	12	487
13	AGHIA SOFIA	284	2813	13	KALAMARIA	8	465
14	VENIZELOU	126	3765	14	ARETSOU	4	426
15	DIMOKRATIAS	52	3604	15	NEA KRINI	0	78
16	NEW RAILWAY STATION	0	5102	16	MICRA	0	167
	Total	15550	17604		Total	8742	7179
To Center				From Center			
	Stop Name	Boarding s	Alighting s		Stop Name	Boarding s	Alighting s
1	NEA ELVETIA	1261	0	1	VOULGARI	5	640
2	VOULGARI	799	6	2	NEA ELVETIA	0	926
	Total	2060	6		Total	5	1566
	Total	17610	17610		Total	8747	8745

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Table 1 – Foreseen ridership related figures at stations during morning peak hours

Track 1 is in the direction from the New Railway Station to Nea Elvetia and Micra Stations and track 2 vice versa.

1.6 Provisions for Future Extensions

In the framework of the Thessaloniki Metro Project, provisions are included (along with the relevant infrastructure and structures) for future extensions of the line and, more specifically, for the extension to Stavroupoli near DIMOKRATIAS Station and towards the Airport, from MICRA terminal station of the Extension to Kalamaria. The scope of this tender covers the operation and maintenance of these infrastructures – provisions for connection with these future projects, as required.

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2. DESCRIPTION OF SERVICES

2.1 General

The general summary data, configuring the context of this Contract and are further analyzed in this document, are mentioned below.

The Operation of the Thessaloniki Metro Project shall be implemented in two phases:

- ❖ Operation of the Base Line
- ❖ Operation of the Extension to Kalamaria as well.

The Contractor shall be fully responsible for the daily operation and maintenance of all assets, equipment and spare parts of the Thessaloniki Metro (Base Line and Extension to Kalamaria), in line with the provisions of Chapters 4 and 5 herein.

The Contract duration is specified in article 1.3.3 of the Invitation.

Initially, there shall be a 12-month Preparatory Period that AM is entitled to extend up to 18 months without changing the overall duration of the Contract. During this period, the Contractor shall execute specific works enabling him to ensure that the personnel, to be made either available or hired by him, the systems, procedures and organization of his are the as required for the reliable and safe operation of the projects.

Further to the Preparatory Period, the Base Project with 13 stations (New Railway Station up to Nea Elvetia Station) is scheduled to be commissioned and, 6 months later, the extension to Kalamaria with 5 additional stations (Nomarchia Station to Mikra Station) is also scheduled to be commissioned. Preparatory works and actions for the commissioning of the extension to Kalamaria shall be carried out after the commissioning of the Base Project too.

The Contractor shall be responsible for the integration – in terms of operation - of the projects in the aforementioned 2 phases, taking into account the various E/M systems provided in the Base Project and in the Extension and the two rolling stock generations.

The scope of Services includes –as a minimum- the following basic services for the Thessaloniki Metro network:

1. Operation
2. Maintenance
3. Cleaning
4. Security (Safety – Protection)
5. Management of the Automatic Fare Collection (AFC) System
6. Installation and operation of the information system IT-ERP to support the administrative operation of the Thessaloniki Metro.

The Contractor will be required to operate the Project based on the Reliability, Availability, Maintainability and Safety (RAMS) data which were used in the Project's design, construction and certification.

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The following provisions are considered as pre-requisites for the implementation of the Contract, as presented in detail in § 2.8 herein and in Article 6 of the Partnership Contract:

1. Operation Permit
2. Spare parts, consumables and special tools for the E/M equipment and rolling stock
3. Organizational structure of the Contractor
4. Training of the Operation & Maintenance personnel
5. Project Management Information System (PMIS)
6. Project Log
7. Information Technology Infrastructure – IT-ERP interfaced with the Management Information System (PMIS) of the Project and with the existing IT system that AM uses in the framework of the Project
8. Failure Reporting and Corrective Action System (FRACAS)
9. Claims covered concerning the expiry of the contract.

Other scopes that concern services to be provided by the Contractor, along with the scopes presented above in detail, are described in Chapter 9 of this document:

1. Quality Management
2. Health and Safety Management
3. Environmental Impact Mitigation Measures
4. Status Reports, Documentation and Monitoring of Performance Indicators
5. Meetings
6. Fire protection
7. Correspondence and filing
8. Personal Data Protection
9. Press, social networking – web-communication strategy
10. Presence of personnel of AM and TheTA in Pylea Depot
11. Financial, Accounting and Tax Management
12. Corporate Social Responsibility
13. Risk Management Plan.

Upon delivery of the assets to the Contractor and if measurements or any other actions must be performed in the Project by the aforementioned contractors of works and systems (article 1.4), the Contractor shall be responsible to ensure the coordination between his various organizational structures and the other construction and systems contractors, having updated AM accordingly.

TECHNICAL DESCRIPTION AND SPECIFICATIONS**2.2 Analyses, RAMS targets and safety certifications**

The Base Project and the Extension to Kalamaria have been designed, constructed and tested for safe operation, based on the Reliability, Availability, Maintenance and Safety (RAMS) designs of each system and of the Rolling Stock, while there are also detailed manuals concerning the operation and maintenance of E/M and railway systems and the Rolling Stock, based on which their operation is performed and their scheduled and corrective maintenance is scheduled and executed, when required, in order to meet the specified RAMS values. The significant system Availability related values are stated in total in the Reliability, Availability, Maintenance and Safety (RAMS) document of this tender, while they are described in detail in the approved RAMS documents of the projects, which shall be provided to the Contractor.

During the first operation period and, more specifically, after the first 6 months of dealing with the “light” problems of the projects and for a further period of 2 years, i.e. 2.5 years in total as of the commencement of operation, the construction contractors shall be responsible to verify the RAMS objectives for the projects they have constructed. The Contractor should cooperate with them and facilitate them in the receipt of measurements and the recording of failures as regards the Reliability Demonstration Tests (RDT).

Further on, the Contractor must, as a minimum, meet the requirements and follow the directions of the operation and maintenance manuals to ensure that the systems and the Rolling Stock meet the RAMS requirements of this contract, in brief as shown in the RAMS Requirements document of this Contract and, in more detail, as these shall be delivered to the Contractor based on the approved RAMS designs for the projects already constructed.

If this is not the case, for any reason whatsoever, the Contractor must document the reasons for his non-compliance with the RAMS requirements. If the Contractor's report is documented and approved by AM, the reinstatement shall be carried out either at the Contractor's responsibility, in case of inadequate maintenance or erroneous operation related selections, or at the responsibility of the construction Contractors of the projects or systems, in case these reports have been prepared within the guarantee period (3 years from the acceptance for use) or within a more extended time period up to 10 years in case of “design failure”. Moreover, the Contractor shall observe the requirements of para. 4.13.

Moreover, the Base Project, the systems and the Rolling Stock have been certified at a design level and shall be fully certified for their safe operation before being commissioned by the Independent Safety Assessor of the Project (TUV Rheinland).

As regards the extension to Kalamaria and the 15 new stations, AM shall be responsible to mobilize the respective Independent Safety Assessor who shall receive the respective overall safety certification for the entire construction of the extension project with its numerous contracts.

Finally, the Contractor shall be under the obligation to execute the necessary actions to ensure the safe operation certification, in line with the requirements of para. 4.14.

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2.3 Operation of the Metro Network

The Contractor shall be responsible for the Thessaloniki Metro Operation in accordance with the following Operation Modes, as required based on the conditions, the ridership and AM's concurrent opinion:

- Normal Operation: The operation of trains shall be scheduled based on headways.
- Downgraded Operation Mode: Scheduling of Train Operation, taking into account all deviations from normal operation, either due to scheduled works, or due to sudden events, aiming at keeping the necessary capacity and providing information to the passengers in a rapid and reliable manner.
- Emergency Operation: Design implementation and management of failures, including major scale drills and the involvement of multiple agencies in case of handling emergencies involving trains.

The Contractor shall be also responsible for the following:

- Operation of all E/M and railway systems of the Line required in order to support the operation of trains;
- Revision, if required, of the operation procedures, programs, manuals and other documents related to Infrastructure, Systems and the Rolling Stock, to be delivered to the subject Contractor by AM with the Project Log (see §2.8.6) and/or development of new ones; the Contractor shall be also responsible for the management of the above;
- Organizational structure and staffing, management of and compensation to the required personnel;
- Ticket issuance and validation and passenger counting: The Contractor shall operate the installed fully Automatic Fare Collection (AFC) System as follows:
 - a. Issuance and validation of tickets and cards.
 - b. Ticket control at stations and on-board the trains, issuance of fines and actions taken for income protection.
 - c. Reloading of vending machines, supervision of the system and checking the system condition and the need for maintenance, management of the stock of the units to be replaced and paper feeding for tickets, receipts and travel cards.
 - d. Fare collection by emptying the issuing machines, safe transfer and deposit to the cash counting center in the Depot and from there, safe transfer to the Bank to be indicated.
 - e. Passenger counting (on a daily basis) based on the capabilities of the fare collection system.
- Compliance with the requirements of the Contract, the Law and the quality requirements;
- Provision of information to AM about the number of passengers, the Services provided (in terms of quality and quantity), complaints, revenue etc.;

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- Provision and promotion of passenger related services;
- Commercial activities at stations/trains, where applicable.

During the Preparatory Period when trial run is carried out by the contractors of works and systems for each one of the two phases of Operation, the Contractor shall participate in and shall monitor the trial run as of the date of signing of the O&M Contract until its expiry, to ensure the safe operation of the system and of each sub-system and verify the efficiency of the normal and emergency operations.

During this procedure and if AM requests so by the Contractor, the subject Contractor shall act as follows:

- a. Confirm that it is possible to carry out the maintenance of the Metro system during non operating hours (execution of technical works) in accordance with the maintenance procedures provided for by the Contractors of Construction Works, Systems and Rolling Stock.
- b. Provide his concurrence to AM at the end of the Trial Operation, so that the revenue service of the system can commence, or document a request for extension to the time of commencement of the system's revenue service.

An extension to the period of commencement of the system's revenue service may be granted in line with article 6 of the Partnership Contract:

The operation related services are described in detail in Chapter 4 of this document.

2.4 Maintenance of the Metro Network

The Contractor shall be fully responsible for the maintenance of all AM assets, as mentioned below. Maintenance works refer to scheduling, coordination, monitoring, execution, supervision and report of the following:

- A. Rolling Stock
- B. E/M and Railway Systems:
 - Ventilation
 - Heating / Ventilation / Air Conditioning (HVAC)
 - 750 VDC traction power system
 - 20 kV AC power supply
 - LV power distribution (400/230VAC)
 - Lighting
 - Fire Fighting / Fire Detection
 - Escalators
 - Lifts
 - Earthing and protection against stray currents
 - Lightning Protection

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- Water Supply, Irrigation
- Drainage, Sewage
- Pumping Stations
- Control and Surveillance System for the traction equipment of the Rectifier Substation in the Station Master Room (SMR)
- 110V DC auxiliary power supply system
- Emergency tripping system of the Rectifier Substation
- Intertripping system along the Line
- Signaling (Systems: Signalling (Systems: Automatic Train Control (ATC), Automatic Train Supervision (ATS), Automatic Train Protection (ATP), Automatic Train Operation (ATO), Electronic Interlocking (EIXL), Positive Train Identification (PTI))
- Passenger Information System (PIS)
- Platform Screen Doors (PSD) System
- Radio telecommunications (TETRA)
- Automatic and direct line telephones
- Closed Circuit Television (CCTV)
- Public Announcement (PA) System
- Clock and time distribution system
- Internal structured cabling for the transfer of digital data
- Safety Management System (SMS) (Access Control System (ACC), Intrusion Detection System (IDS))
- Intercommunication System
- Automatic Fare Collection (AFC) System
- Uninterrupted Power Supply Systems (UPS) - Batteries
- Building Automation and Control System (BACS)
- Power Remote Control System (PRCS)
- Cable and Fibre Optics Networks
- Data Transmission System (DTS)
- Trackwork
- Key System
- Signage
- Integrated Communications Control System (ICCS).

C. Depot Equipment

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- D. Building Facilities: Stations, Depot, OCC and ECR, Tunnels, Shafts, Trackwork, Branches, Crossovers, Pumping Stations, Administration Building, etc.

The Contractor shall be also responsible for the following:

- Revision, if required, of the procedures related to the maintenance of Infrastructures, Systems and Rolling Stock, to be delivered by AM and/or development of new ones; the Contractor shall be also responsible for the management of the above;
- Organizational structure and staffing, compensation to and management of the required personnel;
- Preventive and Corrective Condition based Maintenance of the systems that allow it;
- Management (scheduling, supply, control, sufficiency, storage etc.) of spare parts and consumables;
- Management and maintenance of Depot equipment and special tools;
- Management of Contracts for the Provision of Services that the Contractor is likely to award -on a sub-contracting basis- concerning specific scopes, as foreseen in Article 12 of the Partnership Contract
- Inspections and long-term monitoring
- Condition of all assets at the end of the Trial Operation
- Cleaning of graffiti and repair of damage due to vandalisms.

The maintenance services are described in detail in Chapter 5 of this document.

2.5 Cleaning

The cleaning services to be provided by the Contractor are presented in Chapter 6 of this Document and in more detail in the document entitled “Cleaning and Securing Services Specifications”.

2.6 Security (Safety – Protection)

The security (safety – protection) related services to be provided by the Contractor are presented in Chapter 7 of this document and in more detail in the document entitled “Cleaning and Securing Services Specifications”.

2.7 Management of the Automatic Fare Collection (AFC) System

The Contractor is obligated to execute the following works related to the Management of the Automatic Fare Collection System, which are described in detail in Chapter 8 of this Document:

1. Ensuring Operation
2. Ticket sale
3. Maintenance of machinery

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4. Fare collection, counting and safe money transfer
5. System Reports
6. Control of tickets and cards in the System.

2.8 Pre-requisites for the implementation of the Contract

Apart from the basic Services to be provided by the Contractor in the framework of the Contract, the scopes described as follows shall be executed by the Contractor as prerequisites for the provision of Services.

2.8.1 Operation Plan and Permit

AM for the implementation of its right to undertake the operation and running of the Thessaloniki Metro, according to the applicable Legislation (L. 4482/17, L. 4640/19, L. 1955/91, L. 4070/12-Article 145), submits to the Ministry of Infrastructures and Transport (YPOME) an **Operation Plan** for the operation of the Thessaloniki Metro network, i.e. the Base Project and the Extension to Kalamaria, in combination with the entire network of Urban Transportation in the area under the responsibility Transport Authority of Thessaloniki (THETA).

This Plan is finalized following THETA's concurrent opinion and in cooperation with the Ministry of Environment and is approved based on a decision of YPOME. Upon its approval, the subject Plan is implemented by AM under the supervision of the Ministry of Infrastructure and Networks.

2.8.1.1 Operation Plan

The Operation Plan for each operation phase shall be prepared by the Contractor and shall be submitted to AM one hundred and twenty (120) days prior to the commencement of operation of each phase, in order to obtain AM's concurrence. The subject Plan shall include all Project data allowing the Thessaloniki Metro to operate in a reliable and safe manner for the traveling passengers and the operation personnel. This covers the following units that must be sufficiently analyzed /documented:

- Ridership
- Headways and daily operation models
- Rolling Stock (number, size, capacity of the passenger system)
- Depot – Train stabling
- Operating Modes (Normal, Downgraded, Emergency)
- Timetables / Switching / Single Track Operation
- Train attendants (number, availability, training)
- E/M and Railway Systems
- General Plan and Emergencies (dealing with failures, implementation of measures to limit any impact on the operation, Metro System resetting to normal operation mode)

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- Security (Operation Safety Plan, Procedures, Guarding personnel, Guarding of installations – trains – personnel – passengers)
- Maintenance Plan (Preventive and Corrective maintenance, Work Procedures and Instructions for the maintenance of E/M and railway systems, infrastructures and rolling stock)
- Personnel (organization chart, basic personnel, training)
- Training (program and trainers)
- Organizational Scheme (OSETH, AM, Contractor).

If requested by the Contractor, AM shall assist in the finalization of the aforementioned independent documents which form the Operation Plan.

2.8.1.2 Operation Permit

Following the administrative acceptance for use of all Project related works or of all works concerning the part of the Project to be put into operation, AM shall take all necessary actions for the collection of all documents required, in line with the applicable legislation, and for the submission of the pertinent application to YPOME and the subsequent provision of the **Operation Permit** to AM.

i. Supporting documents

The supporting documents accompanying the application for the provision of an Operation Permit shall be organized by AM, while the Contractor shall provide, as a minimum, the following documentation that concerns him:

- Operation Safety Validation Certificate, issued by an International Independent Safety Assessor (For the Base Project, during the issuance of the Base Project Operation Permit and for the entire Thessaloniki Metro network, during the issuance of the Operation Permit for the Extension to Kalamaria);
- Legal Statement for undertaking the Project Operation (L. 2516/97, Article 13.1d)
- Certificate of Commencement of Business Activities & Issuance of a Company Number for the OPERATION COMPANY (Ministerial Decision YAN Φ15/οικ/5239/245 §1)
- Government's Gazette (FEK) publishing the Act of Establishment of the Companies (Ministerial Decision YAN Φ15/οικ/5239/245 §7)

The Contractor shall be under the obligation to assist AM, if needed, in the issuance of the remaining documents issued at the care of AM and which are required for the issuance of the Operation Permit.

ii. Documents for the Operation & Maintenance Procedures

Along with the procedure for the issuance of the Operation Permit, and more specifically four (4) months prior to the commencement of the revenue service for each phase (Base Project and Extension to Kalamaria), the Contractor shall have already compiled the following Documents for AM to grant its relevant approval as concerns:

- The Rule Book

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- The Operation and Maintenance Procedures;
- The Operation and Maintenance Directions.

More precisely, the Rule Book and the Operation and Maintenance Procedures shall be prepared and completed by the Contractor for the Base Project and subsequently, they shall be revised and supplemented by the Contractor, as required, for the Extension to Kalamaria. All relevant available data, programmes and procedures which have been prepared by the contractors responsible for the construction of works and systems in the framework of their contracts shall be made available to the Contractor after the signing of the Contract.

The Rule Book and the Operation & Maintenance Procedures shall be approved by AM's BoD prior to setting each Project phase into Operation. AM shall assist the Contractor so that, based on the available data, all the aforementioned documents are collected or prepared in detail by the Contractor and shall be finalized prior to the revenue service of the Project.

In addition, Operation and Maintenance Directions are anticipated to be covered in fact in their entirety by the contractors responsible for the construction of works through the corresponding operation and maintenance manuals related to every system and to the rolling stock, which they will hand over and which will have been approved by AM. The Contractor shall also review the above and shall suggest any relevant documented additions or modifications, if needed, which shall be approved by AM.

2.8.2 Spare parts, consumables and special tools for the E/M equipment and the rolling stock

The Contractor shall receive all spare parts and special tools foreseen to be provided by the Contractors responsible for Construction Works, the Systems and the Rolling Stock. A list of the spare parts is recorded in Annex A of this document. Moreover, the subject Contractor shall see to the supply and management of spare parts and consumables, shall ensure that the special tools are in good condition, so that the required quantity is always available for the execution of his Services, and that the minimum requirements of the Contract are met as regards the minimum required quantity of spare parts that must be kept at the warehouse, as described in Annex A.

The Contractor shall also take all necessary measures, so that the required spare parts, consumables and special tools are ensured, stored and managed:

- By using the electronic management system for spare parts/warehouse to be delivered to him by AM and which has been provided by the contractor of the Base Project;
- By using the Information System (IT-ERP) (see §4.6) to be installed by the Contractor himself, and
- By adhering to the procedure -approved by AM- entitled "Warehouse management", which had been submitted by the contractor responsible for the construction of the Base Project, and shall be delivered to the Contractor along with the Project Log (see §2.8.6).

If the Contractor considers that the "Warehouse management" procedure must be revised, he shall proceed with its revision and submission to AM for approval prior to its

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implementation. In this procedure, the Contractor shall ensure that the obligation concerning all certificates for calibration, accreditation, control, testing and maintenance of spare parts and tools is included therein and that the Maintenance Management System undertakes the handling of all spare parts and tools (see §5.3.7).

The cost of the above shall be borne by the Contractor and is included in his Financial Offer.

2.8.3 Organizational structure of the Contractor, staffing and management

2.8.3.1 Personnel Mobilization Stages

1. The duration of the Services to be provided by the Contractor shall be as specified in article 1.3.3 of the Invitation and the subject Services shall be allocated into the following time periods as regards the personnel mobilization:

(i-iv) Base Project

- (i) Stage 1, (preparatory stage) of the Contractor's attendance during the execution of tests (System Integration Testing – SIT, System Performance Testing – SPT and Trial Testing - TRT) of the Thessaloniki Metro Base Project, as well as preparation of all procedures of the Contractor regarding readiness for the commencement of the revenue service;
- (ii) Stage 2, revenue service of the Thessaloniki Metro Base Line only, during which preventive and corrective maintenance works shall be carried out by the Contractor for the construction of the Thessaloniki Metro Base Line (for a period of 12 months *from the date of issuance of the Completion Certificate of all Base Project works*);
- (iii) Stage 3, revenue service of the Thessaloniki Metro Base Line only, during which only corrective maintenance works shall be carried out by the Contractor for the construction of the Thessaloniki Metro Base Line (for a period of 24 months upon completion of the 12-month period mentioned in the above paragraph (ii));
- (iv) Stage 4, revenue service of the Thessaloniki Metro Base Line, upon expiry of the corrective maintenance period by the Contractor responsible for the construction of the Metro Base Line (36 months after the date of issuance of the Completion Certificate of all Base Project works);

(v-vii) Base Project and Extension to Kalamaria

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- (v) Stage 5, revenue service of the Base Line with parallel execution of trial operation tests concerning the extension to Kalamaria;
- (vi) Stage 6, revenue service and extension of the Line to Kalamaria, during which corrective maintenance works shall be carried out by the Contractors responsible for construction works and the Contractors responsible for the systems of the Metro extension to Kalamaria (for a 36-month period from the date of issuance of the Completion Certificate of all works related to the Extension to Kalamaria);
- (vii) Stage 7, revenue service of the Base Line and the extension of the Line to Kalamaria, with full execution of corrective maintenance works by the Contractor (36 months from the date of issuance of the Completion Certificate of all works at the Extension to Kalamaria).

It is noted that AM:

- 1. In the aforementioned stages, stages (v) and (vi) shall start before the end of stages (ii) and up to (iv).
 - 2. If AM exercises the right to option for an extension of the Preparatory Period, as foreseen in Article 1.3.3 of the Invitation, then the personnel mobilization stages will be extended by an equal duration respectively.
 - 3. For the Preparatory Period, applicable shall be article 1.3.3 of the Invitation.
2. During each one of the above stages, the Contractor shall properly adjust both his operation and maintenance procedures and his administrative and technical personnel, cooperate with the Contractors for the construction of the Base Project and the Extension to Kalamaria and the supply of Rolling Stock, and shall participate in the coordination of the works related to the operation and the preventive and corrective maintenance, as well as the tests that shall be in progress, in line with the Time Schedules of the various Projects. From the time that fixed assets have been delivered to the Contractor, the subject Contractor shall be responsible for the coordination among the construction and systems Contractors, as these are described in paragraph 1.4.

As regards the staffing of all O&M Services, the Contractor shall take into account that, during the revenue phase of the Thessaloniki Metro, work positions in the organization chart shall be covered, on a per case basis, on a 24h-basis, 7 days/week, including public and national holidays, in all operational posts of the Project, including the OCC, the Work Crews responsible for Maintenance and Repair, cleaning, supervision, security and safety of the Metro and in all other scopes required for the safe and smooth operation of the Line.

3. The Contractor shall be responsible for the hiring, provision and management of the entire personnel, addressing directly or indirectly to him (e.g. Sub-Contractors), possessing the appropriate experience and having been properly trained for each work position, considered necessary and being suitable for the provision of integrated services of the Thessaloniki Metro. The obligations of the Contractor include the following, indicatively but not limited to: ensuring safe execution of works by the personnel, payment of the personnel, training of the personnel, provision of the required equipment and means, materials and consumables for the execution of services (e.g. tunnel access), as and where required, supervision of the personnel

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and all obligations and provisions of the Employer from the relevant Greek Legislation and are described in the remaining contractual documents.

4. The Contractor shall be fully responsible both for the personnel addressing directly to him and the personnel of the Sub-contractors to be engaged by him, as regards the subject personnel's training on the duties this personnel shall perform and the risks related to these duties, the use of PPE required for the execution of this personnel's duties, the supervision of the execution of works and the quality of works, the recording of events and the imposition of penalties, if required, to ensure the safe and smooth operation of the Metro Line and of all relevant installations.

2.8.3.2 General Requirements of the Personnel of the Contractor

1. Requirements related to the Staffing & Structure of the Organization Chart of the Contractor

For each stage of execution of his Services, the Contractor shall submit for approval, in due time, the documented staffing presented in his Organization Chart which must be in correspondence with the Table of Staffing to be submitted and in accordance with the requirements of this Contract.

The Basic Work Positions of the personnel of the Contractor for which the relevant CVs have been submitted and assessed in the framework of the submission of the Contractor's Offer, shall cover the minimum requirements related to the formal and essential qualifications required by the Contract, as these are mentioned in the following Figure 1 – Organization Chart of the Basic Personnel. The Contractor shall be under the obligation to employ the basic personnel included in his offer.

The Contractor shall keep an updated detailed list of personnel, individual detailed organization charts for each branch or sector of activity, diagrams and tables, as well as the number of personnel employed at each work position, in accordance with the requirements of the Contract, for each one of the aforementioned stages of the Contract.

The Table of Personnel of the Contractor, which is attached to this document as Annex F, specifies the minimum acceptable number of members of the personnel of the Contractor.

It is clarified that the stages mentioned above also include the training and organization of the group and the systems of the Contractor until the expiry of this Contract.

The tables of Annex D present the minimum duties and qualifications of the executives of the Key Positions of the Contractor's Personnel, as shown in the following diagram:

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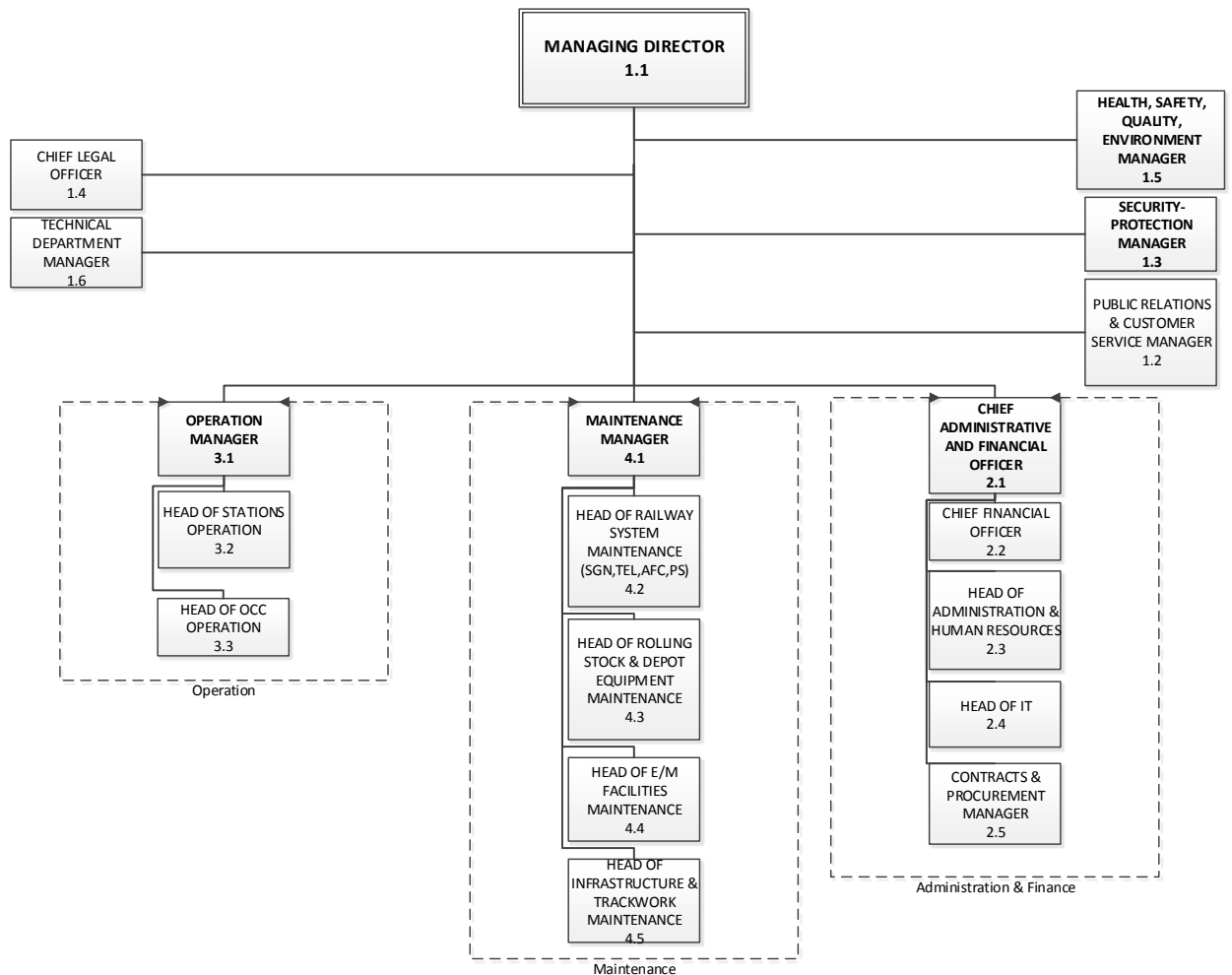


Figure 1 – Organization Chart of the Basic Personnel

The detailed Organization Charts of the Contractor are presented in Annex G, while the staffing tables concerning the entire personnel per work position are shown in Annex F.

2. Replacement of the Personnel of the Contractor

If a member of the personnel included in the Contractor's offer leaves the Contractor's manpower for a significant reason, the Contractor shall immediately notify the departure of the employee and shall request his/her replacement by another employee of equal experience as a minimum. The Contractor shall submit the relevant CV to AM, in order to obtain the relevant approval prior to the subject replacement, without creating any gaps in the relevant organization structure. It is noted that AM maintains the right to call for interview the candidates to replace the Basic Personnel.

3. Requirements related to the Staffing & Structure of the Organization Chart of the Bidder

At each stage of execution of the Services in the framework of this Contract, the Contractor shall submit the total staffing shown in his Organization Chart, as foreseen in

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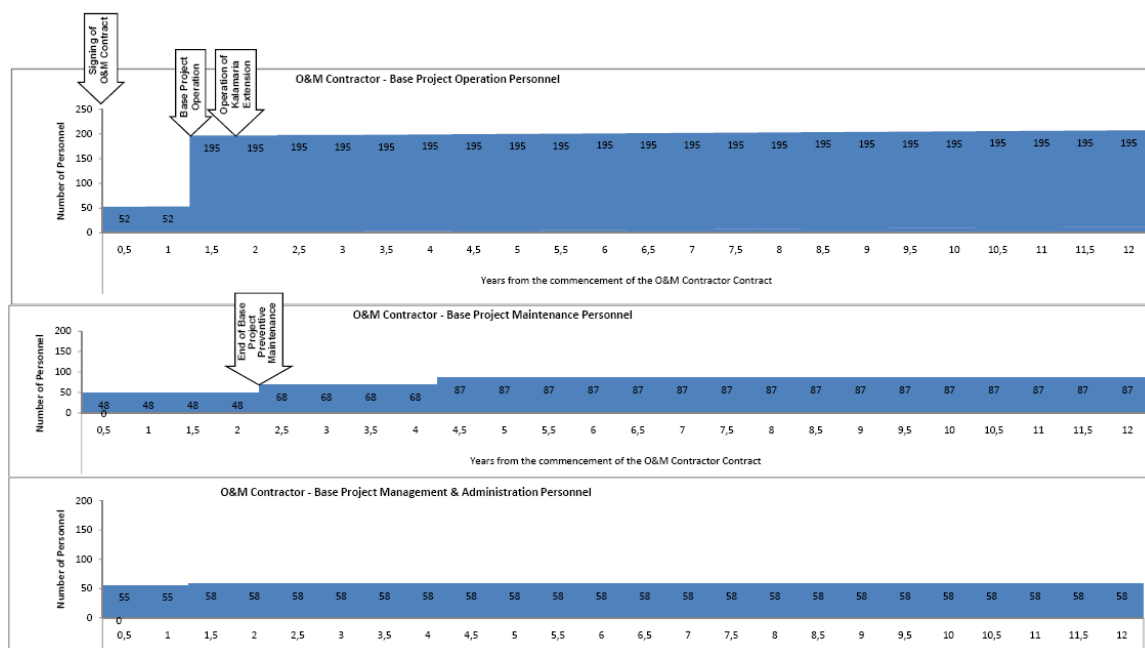
the Staffing Table of Annex F, as well as the CVs to cover all Basic Work Positions that meet the requirements of the Descriptions of the Work Positions of Annex D.

The aforementioned differentiations do not concern the Basic Personnel, whose number and work positions are binding.

It is noted that in this article and in the relevant tables included therein it was assumed that the Contractor shall use Sub-Contractors, indicatively for the services related to cleaning, fare collection, safe transfer of money from fare collection, maintenance of lifts and escalators and maintenance of fare collection equipment.

The Contractor shall submit the Subcontractor's data for approval by AM in line with the provisions of Article 12 of the Partnership Contract.

The stages of mobilization of the Contractor's staff are shown in the following diagram and in the Table of Annex F and provide the minimum staffing requirements. All the hirings to be made per phase must timely comply with the diagram and must not be less than the hirings foreseen. In the compilation of the diagram the assumption shall have been made that the revenue service of the Extension to Kalamaria commences six months after the commencement of the revenue service of the Base Project.



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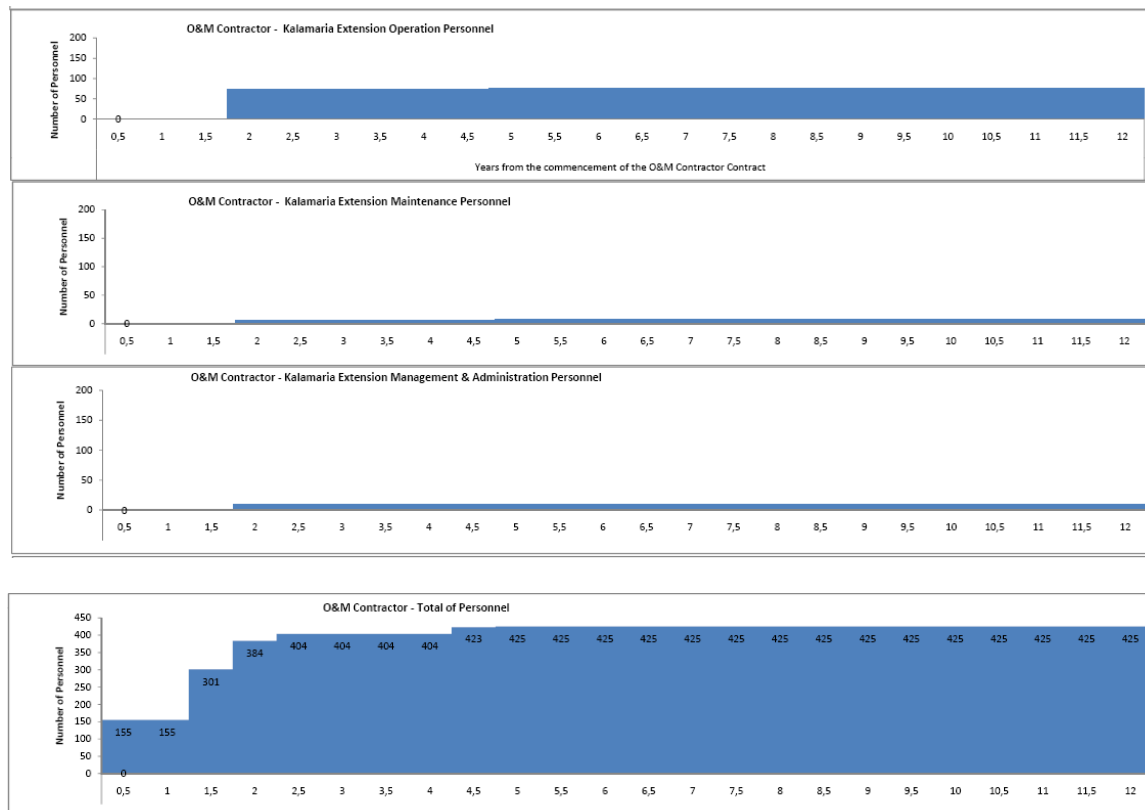


Figure 2– Diagrams of the Contractor's personnel

2.8.3.3 Hiring and Management of Personnel

1. General Requirements

Following the signing of the Contract, the Contractor shall receive the Project Log (see §2.8.6) and shall be granted access to the Information System PMIS of the project (see §2.8.5), shall inspect all areas and installations, shall develop the required documents and shall submit them to AM for approval and shall implement them during Operation & Maintenance.

The operational procedures of the Contractor shall be followed by the Sub-contractors, as provided for in §2.8.3.3.4.

Personnel Hiring and Management Plan

The Contractor shall prepare and submit for approval to AM within 60 days from the signing of the Contract, the Personnel Hiring and Management Plan, which shall include hiring for Basic Work Positions, the trainers and the remaining personnel required for all the aforementioned stages of the Contract.

The Contractor shall explain in the Hiring Plan, in accordance with the requirements of the Contract, the basic principles based on which he shall proceed with the hiring of the appropriate personnel for all work positions required for the safe and unobstructed operation and maintenance of the Thessaloniki Metro system.

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This plan shall include the organization chart of the Contractor with the full administrative and organizational structure to be provided for the management of the Metro operation and maintenance system. A description shall be made of each work position, title, duties, criteria and requirements of the position (as regards training, certificates and previous employment, in accordance with the requirements of this Contract), the working hours and the number of shifts per work position, the number of the required personnel per position and of the direct Managers. A description shall be also made of the required and executed training on the duties, the required and provided Personal Protection Equipment (PPE) and the special tools/components and devices related to the execution of duties, the security related classification of the work position etc. The filing system of the Contractor shall keep relevant traceability related data, which shall allow to cross-check the correctness of the recorded data.

The number of personnel shall be sufficient enough to meet these needs, taking into account the alternating personnel shifts, so that all work positions are covered based on the requirements of the applicable legislation and the international experience concerning the reduction of work risk and personnel safety and the Metro operation related to the fatigue of the personnel.

The Personnel Hiring and Management Plan shall describe the work positions requiring shifts with relevant work plans for all periods of the year (weekdays, weekends, holidays, special incidents, events, scheduled maintenance works, damage etc.) as well as for all operating conditions, as described in paragraph 4.3 and shall comply with the relevant provisions of labor law.

The Personnel Hiring and Management Plan shall also include the training program of each employee of the Contractor as regards the general operation of the Metro system, special issues concerning their duties as regards the operation and/or maintenance, the proper use of the appropriate PPEs and safety related issues at work, the proper manner of addressing the public (in case members of the personnel contact passengers), dealing with emergencies and preparing work and incidents reports and recording them in the PMIS. Moreover, the time limits to meet the training related targets shall be also included as personnel suitability criteria. In addition, provision shall be made of the strategy for on-going training of personnel for reasons of further evolution.

The Contractor shall prepare and implement a code of conduct for all employees about the acceptable behavior at work and how to maintain safety at work to the benefit of the image of the Metro and AM. This code shall describe the equivalent disciplinary actions to be imposed in case the personnel does not comply with the subject code.

Within 30 days from the signing of the Contract, the Contractor shall mobilize the O&M Basic Personnel at the highest key positions to organize the remaining team. Within the first 4 months (120 days) from the signing of the Contract, a total of 65 employees-executives shall have been mobilized. These 65 O&M employees-executives shall be trained by the construction contractors until the commissioning of the Project, while after have been trained, they shall then undertake, in their turn, the training of the remaining - necessary in number- employees.

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2. Personnel Qualification Controls

Formal and Essential Qualifications

The Contractor shall set up an experienced group, which shall be responsible for hiring personnel and shall implement the appropriate techniques to attract and select the suitable personnel. The recruitment group shall be responsible for cross-checking data to be presented by the candidates to be selected as members of personnel, regarding their previous experience, training, degrees and certifications etc.

The Contractor shall guarantee the suitability of his personnel, while for the Personnel in Key Positions - in particular - the requirements shown in the Table of Formal and Essential Qualifications must be covered, as a minimum, as presented in paragraph and Annex D. Therefore, the Personnel Hiring and Management Plan shall include the duties of each work position, as well as the information concerning previous employment, skills, training and certifications, which shall be required by the employees of the Contractor for each work position. In order to select the appropriate personnel, the Contractor shall include in the subject plan relevant systems to evaluate the capacity of each candidate for the various work positions, the conduct of interviews and, depending on the position of responsibility, duties too.

Health Checks for Personnel Suitability

The Hiring Plan shall provide for appropriate psychometric tests, where required, and medical examinations, as well as the general health condition of the candidates, based on the predefined lowest levels, to check their competence in performing tasks assigned to them each time.

3. Compensation of Personnel and of Sub-contractors of the Contractor

Costing of the O&M Services shall concern the finally configured Table of Personnel, which –in case of questions- shall be added to the Clarifications Document and shall be common for all Bidders. The Contractor must keep the minimum number of persons of the personnel and satisfy the relevant Performance Indicators.

Personnel attendance shall be recorded by the personnel control system to be implemented by the Contractor and information about the engaged personnel shall be provided by this system to AM on a monthly basis. AM has the right to regularly check the aforementioned system through the presence of the Contractor's personnel.

The Contractor is responsible for the compensation and execution of works of his sub-contractors, for permits required, if any, as well as for classifying the security level of each employee which shall be applicable on a per case basis, depending on the required accesses to the areas where they shall perform their duties.

4. Sub-contractors of the Contractor

The sub-contractors shall be subject to the approval of AM, according to the stipulations of article 11 of the Partnership Contract.

The works which the Contractor is going to assign to sub-contractors/suppliers shall be presented in a manner documenting that it is possible to meet all needs related to the provision of qualitative and complete services for the Operation and Maintenance of the

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Thessaloniki Metro, in accordance with the requirements of this Contract. Such cases shall indicatively concern particular and specialized scopes, as stated in the aforementioned article.

As regards these Sub-contracting contracts, the Contractor:

- Shall remain fully and exclusively responsible for the performance of his contractual obligations related to the delivery of the scopes of work to be executed on a sub-contracting basis.
- Shall make the following commitment: any works whatsoever shall be executed under his supervision and control, and in accordance with the approved procedures and manuals.
- In case of execution of maintenance works, he shall fill in the required documents and record all works in the relevant management/maintenance system, while the documents shall be co-signed by the Contractor.
- Shall submit the foreseen reports and certificates.
- The Subcontractors who undertake the maintenance works of the systems (e.g. escalators, lifts, fare system equipment etc.) are obligated to provide these services through Service Level Agreements (SLA).

2.8.4 Training of the Operation and Maintenance Personnel

This paragraph refers to the training to be provided:

- to the personnel of the Contractor, and
- to the personnel of AM,

by the Contractors responsible for construction, systems, rolling stock of the Base Project and the Extension to Kalamaria and by the Contractor himself.

At first, training shall be provided by the Contractor of the Base Project to 85 employees from AM and the Contractor (20 employees from AM and 65 employees from the Contractor). These 85 employees shall be also trained by the contractors of the Base Project, by the main contractor of the Extension to Kalamaria, as well as by the contractors responsible for the systems and the Rolling Stock of the Extension to Kalamaria, as provided in the Table 2 below.

Subsequently, the aforesaid 65 trained persons (along with the 25 trained employees of AM) shall serve as trainers and shall train the remaining Contractor's personnel to be required.

The Contractors responsible for the execution of works and systems to provide their training services shall demonstrate to AM that the trained personnel, including trained trainers, have reached the minimum specified level required for the positions they will occupy. To this end, they will have each employee under training to sit an examination for the acquisition of a Fit to Work Certificate for the intended work position. The corresponding obligation applies to the Contractor, as well, with regard to the training schemes that he will provide.

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The Training Programs of the personnel to be mobilized –at first- in the project shall be made available to the Contractor by AM. They have been prepared by the construction contractors and have been approved by AM and are included in the Project Log (see § 2.8.6). These shall include the program and syllabus, as well as the procedures to monitor the progress made in the program and as regards the individual training. The program clearly includes the date of commencement and the date of completion, as well as the number of trainees in each training course.

In any case (i.e. for the first 20+65 trainees by the contractors responsible for the construction, as well as for the entire personnel to be finally trained by the (20+65) already trained employees), the training shall be scheduled and carried out in a manner appropriate for the position to be covered by the trainee and shall include:

Training prior to the commencement of operation:

- (a) Theoretical training and practice in a classroom;
- (b) Practical training in the work involved in the operators' and equipment rooms, as well as in tunnels and Depot – theory and practice.

Training after the commencement of operation of the trains (during trial operation of the Base Project trains):

- (c) Practical training in the work involved in the operators' and equipment rooms, as well as in tunnels and Depot – training during testing period.

The training programs shall be coordinated with the testing, commissioning and trial operation programs.

The Contractor shall properly revise, if required, the Training Programs and shall integrate them into one, including also the Training Program to be provided by himself to his personnel and shall submit it to AM for approval within 60 days from the signing of the Contract. The subject program shall also include the syllabus and the procedures to monitor the progress of the program and the training on an individual basis. The program shall clearly include the date of commencement and the date of completion, as well as the number of trainees in each training course. Moreover, the program shall clearly specify whether training is carried out in a classroom (off-the-job) or in an equipment room (on- the-job).

In the Syllabus, reference shall be made to -at least- the following:

- The title of the training course and the goals of the subject course;
- The content of the training course or the goals included in the Annex;
- The location where training courses shall be carried out and/or the relevant Annex;
- Training methods.

The methods to monitor the progress of training shall refer to the following:

- Theoretical examination
- Practical examination
- Progress reports.

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The training goals, as regards the achievement of the minimum permissible level by the trainee, shall be specified by the Contractor for each position of the trainee, including the trainers under training. The Contractor shall develop PASS/FAIL criteria for each person under training in his field. It shall be the Contractor's responsibility to ensure the most satisfactory training for the participants.

Throughout the typical training in theory and in practice, the Contractor shall ensure that the initial 65 persons to be made available, who, subsequently, shall be utilized for the training of the remaining personnel, shall have the appropriate qualifications.

The organization of the training for the operation and maintenance includes, inter alia, the following:

- Training of the Operation and Maintenance personnel at a sufficient level in order to ensure the safe and effective operation of the Metro system;
- Training of the technical personnel in maintenance and failure repair related issues;
- Training as regards the manuals for the equipment concerning the installation, operation and maintenance of the system;
- Configuration and maintenance of the area engaged for practical training (where required);
- Provision and maintenance of the entire necessary documentation, ensuring the required consistency, of all drawings, diagrams, flow charts, manuals, procedures and other supporting data related to the operation, maintenance, problem identification, modification and development of the Metro system.
- If required by AM, provision of training to himself and/or to his associates as regards operation and maintenance.

It is stressed that the contractors of the Base Project and the Extension to Kalamaria have the obligation to train, based on the relevant documentation and the required equipment, the 20 initial employees of AM and the 65 employees of the Contractor at a sufficient level in order to ensure the safe and effective operation and maintenance of the Metro system.

Especially as regards the training for the Extension to Kalamaria, this shall concern training by six (6) individual construction contractors (see paragraph 1.4) on the E/M systems and the new rolling stock Series (Series II). The personnel to be trained by the aforesaid contractors shall include the 20 persons of AM and the first 65 persons of the Contractor (as the case is for the Base Project) and, even the more so, the option shall be given for the training of additional personnel of the Contractor, as required, to cover the personnel of the Operation Control Centre (OCC), the Station Masters, the Surveillance Technicians, the System Engineers and all those requiring training in technical and operational issues, depending on the duties they have assumed and whose work duties is differentiated due to the integration of the Extension to Kalamaria into the system (e.g. the OCC personnel, who have already been trained in the Operation of the Base Project, shall receive further training, so as to cover the needs of the operation and maintenance control requirements of the Extension to Kalamaria).

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More specifically, the obligation related to the aforementioned initial training by the Construction Contractors concerns the following personnel:

<u>SPECIALTIES</u>	CONTRACTOR's PERSONNEL	AM's PERSONNEL
<u>CONTROL CENTRE</u>		
<u>OPERATION CONTROLLERS</u>	4	
<u>LINE CONTROLLERS</u>	2	
<u>SYSTEM CONTROLLERS</u>	3	
<u>TOTAL</u>	9	2
<u>TRACKWORK</u>		
<u>HEAD</u>	1	
<u>SUPERVISOR</u>	2	
<u>TECHNICIANS</u>	2	
<u>TOTAL</u>	5	1
<u>ELECTROMECHANICAL ISSUES RELATED TO TRACKWORK</u>		
<u>HEAD</u>	2	
<u>SUPERVISOR</u>	2	
<u>A/C AND HVAC TECHNICIANS</u>	2	
<u>BACS EXPERTS</u>	2	
<u>ESCALATORS & LIFTS TECHNICIANS</u>	2	
<u>FIRE DETECTION AND FIRE FIGHTING TECHNICIANS</u>	2	
<u>PUMP TECHNICIANS</u>	2	
<u>LIGHTING, EARTHING AND LOW VOLTAGE DISTRIBUTION TECHNICIANS</u>	2	
<u>TOTAL</u>	16	6
<u>ROLLING STOCK</u>		
<u>HEAD</u>	2	
<u>SUPERVISOR</u>	2	
<u>TECHNICIANS</u>	6	
<u>TOTAL</u>	10	3
<u>TRAIN SUPERVISORS</u>	6	1
<u>STATION SUPERVISORS</u>	3	1
<u>HEAD OF SAFETY</u>	2	1
<u>ELECTROMECHANICAL SYSTEMS</u>		
<u>HEAD</u>	2	
<u>SUPERVISOR</u>	2	
<u>SIGNALING TECHNICIANS</u>	2	
<u>TELECOMMUNICATION TECHNICIANS</u>	2	
<u>CCTV&PA TECHNICIANS</u>	2	
<u>SCADA TECHNICIANS</u>	2	
<u>TRACTION POWER TECHNICIANS</u>	2	
<u>TOTAL</u>	14	5
<u>GRAND TOTAL</u>	65	20

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Table 2 – Personnel of AM and the Contractor to be trained by the Contractors responsible for construction works, systems and the rolling stock of the Base Project and of the Extension to Kalamaria Project

2.8.5 Existing Project Management Information System (PMIS)**2.8.5.1 General**

The PMIS is a current (in Thessaloniki Metro Projects) web-based electronic data base for the management of technical and engineering documents/texts (development, control, acknowledgement, access etc.) and the interface with third parties. The system includes the overall documentation of the works (designs, drawings, materials, procedures, tests, manuals, etc.), it has been developed by the contractors responsible for the construction of the works who manage and deliver same to AM upon expiry of every construction contract.

The Contractor shall have access to the archives and data of the current Project Management Information System (PMIS) that relates or concerns – in any way whatsoever – this Operation and Maintenance Contract. In the framework, as deemed appropriate and for the purpose of facilitating his work, he shall use the PMIS and its sections (from different construction contracts). This system has already been used for the input of all data of the Base Project and the Extension to Kalamaria (drawings, designs, calculations, materials, correspondence, construction procedures, test procedures, etc.).

This chapter describes the current PMIS system, since (as mentioned below) this will be required to be connected, operation-wise, to the new IT – ERP information system that will be procured and installed by the Contractor, who, in this context, must continue to support the operation of the PMIS up to the central data base of the works, and use and integrate same into his procedures to the extent he will select so, in view of achieving the optimum support to the overall works and services he will provide in the framework of this Operation and Maintenance Contract.

If modifications are made to the works, to existing structures or systems, or if new systems or sub-systems are installed, the Contractor shall be under the obligation to update the PMIS. Upon expiry of this Operation and Maintenance Contract, the Contractor shall hand over back to AM the PMIS system updated and complemented, as required.

2.8.5.2 Usages and Characteristics of the existing PMIS

The main usages and characteristics of the subject system, currently, shall be as follows:

- All technical and administrative documents, which have been or are created by any contractor responsible for the construction and are transmitted to AM shall be organized and stored within a safe electronic data base to be used by all parties involved in the implementation of the Project, either on the part of the Contractor, or on the part of AM. User-friendly access to the system shall be ensured.

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- The “AS BUILT” drawings and other files and reports have been centrally recorded and can be made available via the data transmission system and the telecommunications – structured cabling network installed in all parts and sections of the system (station rooms, technical rooms, depot, etc.) to be retrieved and used by the personnel responsible for the operation and maintenance of the system, as well as in any spot of the project required (via Ethernet ports, in every area to which maintenance and repair personnel, etc., can be connected). The Contractor can make use of this PMIS system option for the purpose of facilitating the execution of his works.
- Access to the system shall be controlled by various levels of hierarchy and via access control, as required. Protection shall be provided to all documents of the data base against non-approved modifications.
- The system shall have a primary and supportive electronic storage function, which shall be updated on a daily basis.
- Until the present date, the system is managed by each construction contractor (i.e. the contractor of the Base Project, the main contractor of the Extension to Kalamaria, etc.), who are also responsible for its proper operation (each contractor is responsible for his own section and scope of works). Upon completion of each construction contract, the respective PMIS section is accepted by AM for further use.
- The documents’ codification shall be in accordance with the Drawing Office Manual, the Structural Analysis of the Project Works and the Equipment Codification of AM for the project in Thessaloniki Metro and shall be provided to the Contractor upon signing of the Contract.
- The PMIS System is used and updated on a daily basis for the Base Project and the Extension to Kalamaria. As regards the remaining contracts of the Extension to Kalamaria, the information data of these contracts shall be entered into the system by AM in a different storage area.

2.8.5.3 Content of the existing PMIS Data Base

The Data Base of the PMIS, in its sections organized per construction contract, shall include at least the following data:

- All contract documents and specifications of all projects and contracts of the Base Project and the Extension to Kalamaria
- All designs of all levels (Preliminary, General Final, Detailed Final Designs) of each project and contract of Thessaloniki Metro
- All drawings (plan views, sections, single-line diagrams, etc.) of all design levels for all individual projects and construction contracts covering all Civil Works, Electromechanical Works, Railway Systems and Rolling Stock
- All Material Submission Sheets (MSSs) for all materials and items of equipment that have been integrated into the works and the rolling stock
- Procedures related to the construction of civil works

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- Procedures for all tests' phases (FAT, SAT, SIT, SPT) for all systems and rolling stock
- Results of all aforementioned tests
- Bill of Quantities
- Spare Parts and special tools' Lists
- Operation and Maintenance Manuals for every electromechanical and railway system and sub-system
- Training materials (manuals) and procedures by the construction contractors related to the operation and maintenance of the Electromechanical and Railway systems and Rolling Stock
- Technical Deviations and Non-Conformance Report from/with the initial specifications and contract provisions
- Train history book for every train
- Document Control Comments and Responses to the Document Control Comments.
- Individual and Overall Time Schedules
- Monthly reports for every project/contract
- Correspondence between all construction contractors and AM.

The data base and all recordings shall be either in Greek or in English and the title with the subject of each document shall be recorded in both languages.

The minimum level of information accompanying every document, through which "search" and "recovery" for use can be made, includes at least the following:

- Title of the scope of the document
- Code number of the document, including the revision status (the codification shall be agreed upon between the Contractor and AM)
- The document status code (i.e. "submitted", "approved", "for information" etc.)
- Document type (which in the PMIS system, is shown indirectly in the document's code number that follows the codification of sections or systems of the works)
- Author (company or individual)
- Date
- Engineer/employee responsible for the document.

Similar information to accompany a document must be entered, as a minimum, in the new IT-ERP system, to be procured and installed by the Contractor (see articles 2.8.7 and 4.6).

2.8.6 Project Log

AM has received, or shall receive prior to the expiry of the relevant construction contracts, the Project Logs by the Contractors mentioned in §1.4 Contractors of Projects

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and Systems for the Base Project and the Extension to Kalamaria. All data concerning Projects, Systems, Rolling Stock, Infrastructures etc., shall be available to the Contractor.

The Contractor's obligations shall also include the updating of the projects Log should they be subject to relevant modifications or additions (to Operation and Maintenance manuals, drawings, equipment, etc.) and their submission to their revised version to AM upon the expiry of the Contract.

Schematically, the Project Log to be received by AM upon expiry of the Operation and Maintenance Contract shall include all initially stored information, any revisions to projects and documents, performed during the execution of this Contract, and any addition effected by the Contractor as new data.

Schematically, the final overall Project Log is the following:

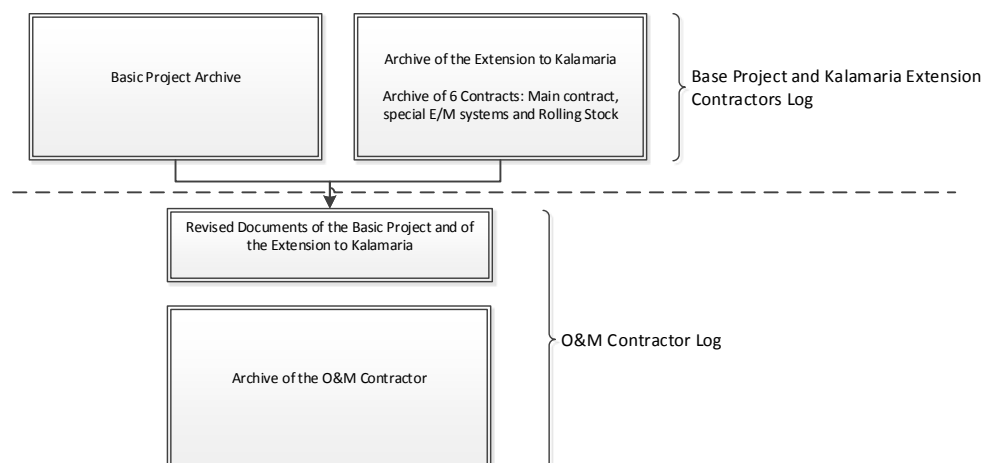


Figure 3 – Project Log

The projects' logs exist (they are developed – structured on a daily basis as the projects progress) in printed and digital format, they include all data referred to in paragraph 2.8.5.3 and they are stored in the PMIS system.

2.8.7 Information Technology Infrastructure – IT-ERP Information System

As regards the execution of the Operation and Maintenance Services, the Contractor shall design and install a new computer network in all areas wherefrom the Services to be provided by the Contractor shall be executed. The relevant equipment shall include, as a minimum, a system/network of computers with servers, switches, terminals, software, licenses, support, hierarchy, access to all Depot buildings, e-access to all computers in the Depot buildings, the Management building and each station, if required, for the overall management of the operation, income-outcome, spare parts, payroll etc. The Contractor shall have access to the above and shall use them accordingly. The aforementioned obligation of the Contractor shall be recorded in detail in paragraph 4.6.

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Subsequently, as mentioned in article 4.6, the Contractor shall procure, install and commission new software (ERP) in order to support the administrative operation of the Thessaloniki Metro.

In this framework, the Contractor shall connect operation-wise the new IT-ERP system with the existing PMIS system, ensuring mainly the extraction of information from the PMIS as well as, in general, the exchange of information as required for the smooth operation and maintenance of the Thessaloniki Metro. All technical data of the PMIS that concern the Contractor's work (designs, drawings, diagrams, manuals, procedures etc.) shall be available to the Contractor through the relevant codes and access permits at the PMIS software platform.

The IT-ERP system shall be also connected to AM information system which is installed at the Depot and satisfies its corporate – management needs. This is required in order to implement – to the extent possible – a “paperless” exchange of documents between AM and the Contractor, when the new IT-ERP system is set and becomes functional.

Along with his new system, the Contractor is obligated to maintain the PMIS system to keep it functional. If he wishes so, the Contractor can propose the unification –in terms of operation- of the PMIS and of the new IT-ERP system, so that both can operate under the same platform –application.

2.8.8 FRACAS Failure Reporting Analysis and Corrective Actions System

The FRACAS procedure consists in a closed cycle of activities aiming at constantly improving the reliability and maintainability of each sub-system forming the overall System. The purpose of the aforementioned activities is to develop a manageable and effective total of activities ensuring that:

- Hardware and software failures are officially reported and recorded.
- Failures are analyzed to the extent that the cause of failure is understandable.
- Positive corrective actions are identified, implemented and verified to avoid any further re-appearance or failure.

FRACAS procedures constitute the main tool for the determination of the corrective actions to improve the performance of the systems/sub-systems.

FRACAS system is the tool for the implementation of the FRACAS procedure provided for by the construction contractors. The system consists in the required hardware (server, PC etc.) and the proper software to record and statistically process all failures, damage, corrective actions, time periods out of operation, damage repair and, in general, all indicators/parameters related to the Reliability, Availability, Maintainability and Safety of each subsystem.

FRACAS system produces reliable reports that confirm or not the Reliability, Availability, Maintainability and Safety (RAMS) performances of the sub-systems and of the overall system, based on which the system was designed.

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In particular, as regards the signalling system, FRACAS system provides a real time interface for the automatic recording of damage and data concerning the operation and performance of the Signalling system and the trains of the Project. After the statistical processing of data, all quality indicators (SPIs) of the system (the entire Project) shall be calculated, as set by AM in the Specifications of the construction projects about the operation of the Signalling system and the trains (for example, train service accuracy, achievability of train services, train performances etc.)

The basic performance indicators to be monitored through FRACAS system are as follows:

- Train delivery
- Train trips accuracy
- Availability of core systems
- Availability of non core systems
- Reliability
- Train performances.

All data for the calculation of the aforementioned indicators shall be recorded during the following Project phases:

- During the first semester of operation, through a weekly report by the construction contractor with the Contractor's assistance. This is the period of "light problems" for the Project, which shall be settled by the construction contractors.
- During the confirmation/demonstration period of RAMS objectives of the contracts of the construction contractors, through monthly reports for a period of 2 years after the first semester of operation, by the construction contractors with the assistance of the Operation and Maintenance Contractor.
- Until 20 years of revenue service are completed, at first by the Operation and Maintenance Contractor, based on this Contract for the first 10 years and then for any company or entity is to undertake the operation of the Thessaloniki Metro for the next 10 years.

The aforementioned system, which has been initially implemented for the Base Project and which shall then cover the Extension to Kalamaria, shall be fully available to the Contractor to facilitate him in the execution of his works and duties, in particular as regards the recording of RAMS objectives, which he must comply with during the operation of the network (Base Project and Extension to Kalamaria).

2.8.9 Requirements concerning the Expiry of the Contract

The Contractor shall have the following responsibilities as regards the Expiry of the Contract:

- Participation in the evaluation of the group of employees to form the staff of the new (Public or Private) O&M agency that shall follow upon expiry of this Contract.

TECHNICAL DESCRIPTION AND SPECIFICATIONS

- Participation in the coordination of the procedure for the staffing of the next Contractor
- Provision of access to the next Contractor
- Provision of information to be used in the next tender to be announced by AM for the appointment of the Operation and Maintenance Contractor or any part thereof
- Participation in Inspections and in the Delivery Procedure
- Review and delivery of all assets, spare parts, consumables and special tools.

Moreover, once the contractual period is completed, the Contractor shall hand over the Project back to AM, while the following actions should be completed:

1. The Contractor shall hand over back to AM the Project Log, filled in and revised, as required
2. The Contractor shall replace all systems provided for in paragraph 5.13 with new ones.
3. AM, assisted by the Contractor, shall carry out a thorough check in the entire Project, in order to record in detail all items, which could cause problems to the Project in terms of Civil Works (in stations, tunnels, shafts, crossovers, turnouts, Depot), in all E/M and railway systems in the entire Project and in the entire fleet. In stations, architectural finishes, panels, floor and wall tiles, false ceilings, false floors etc. shall be checked, while in the Depot, the maintenance and repairs equipment shall be also checked. Checking shall be carried out in the presence of representatives of AM and the Contractor, while it shall be organized by AM per geographic unit, room, area and system, while each subsystem of each train shall be checked respectively. During checking, all points that have been worn or destroyed, as well as and system operations that have been suspended or whose performance has been reduced to a level beyond the expected one due to the daily use for a 10-year period. This procedure shall take place 3 months prior to the expiry of the Contractor's Contract and shall be organized so as to last for 1 month, as a maximum. The Contractor shall have to restore at his care all items found as required to be restored, based on the requirements of this Contract. Should he fail to do so, AM shall assign the required repair/remedy to a third party and the relevant cost shall be borne by the Contractor.
4. The Contractor shall have to deliver spare parts for all E/M, railway systems and trains capable of fully supporting the operation of the Project for 1 year. The exact number of the spare parts shall be based on the maintenance related data from the 10-year operation of the Project and the items described in Annex A.

TECHNICAL DESCRIPTION AND SPECIFICATIONS**3. AM DELIVERABLES TO THE CONTRACTOR - DOCUMENTS, INSTALLATIONS AND INFRASTRUCTURE-RELATED DATA****3.1 General**

In the framework of this Contract, together with the Project Log, AM shall provide the Contractor (see § 2.8.6 and article 2.8.5.3 related to the contents of the PMIS system – data base) with the documents, designs, drawings, materials, procedures and, in general, with all data related to stations, tunnels, shafts, branchings, crossovers, the Depot and the electromechanical and railway systems and facilities existing therein for use during the contractual duration of the Contractor's Services.

It is noted that the documents and data concerning facilities and infrastructures are available for review by the Bidders, as recorded in paragraph 2.1.5 of the Invitation.

The main items of the works, the structures, the systems, the Depot and the rolling stock are described in summary below.

3.2 Project alignment

The operating Line 1 is approximately 9.6 km long and includes 13 stations. The line's Terminal Stations are the New Railway Station on the west and NEA ELVETIA Station on the east of the line. The connection with the Depot is also ensured in this location. The distance between the train stabling area in the Depot and the first train arrival platform in NEA ELVETIA Station is approximately 1400 meters. The Line starts from the northwest of the city where the NEW RAILWAY STATION is located, in front of OSE (Hellenic Railways Organization) Station, and continues up to NEA ELVETIA Terminal Station, located at the southeast of the city. The Line mainly follows Monastiriou, Egnatias, N. Egnatias, Delfon and Solonos Streets before terminating at NEA ELVETIA Terminal Station.

The Thessaloniki Metro Extension to Kalamaria is an approximately 4.8km long underground line. Civil works start from K.P. 0+091.9 (track 1*, being the K.P. reference track) and terminate at K.P. 4+737.8 at the end of the Forestation of MICRA Station. Trackwork starts from K.P. 0+00 inside the trumpet shaft of 25 MARTIOU Station, Thessaloniki Base Project station, at the end of the existing turnout and terminates at the end of the Forestation at K.P. 4+736.8. The Line starts by following Solonos Street, past 25 MARTIOU Station, while by extending mainly to the south, it follows Kritis, Moschonission, Mitropoliti Kydonion and Pontou Street, where it terminates just before the stormwater drainage channel at the junction of Pontou and Ikaron Streets which mark the end of the Project.

The alignment of both the Base Line and the Extension to Kalamaria (plan view drawings and longitudinal profile drawings) shall be made available to the Bidders.

3.3 Stations

The Thessaloniki Metro stations have been designed in a uniform and standardized layout. Nevertheless, they differ depending on:

TECHNICAL DESCRIPTION AND SPECIFICATIONS

- the ridership load,
- the location of the station in the city,
- the alignment of the line and the depth of the platforms from the overlaying soil.

Base Project:

As a result, three types of base stations are featured:

- Type 1: Stations featuring a platform of a 10.00m useful width and two sets of escalators, each escalator of either set moving upwards and downwards to enter and exit the station (Seven Stations: DIMOKRATIAS SQUARE, VENIZELOU, AGHIAS SOFIAS, SYNTRIVANI, PANEPISTIMIO, EFKLIDIS, VOULGARI).
- Type 2: Stations featuring a platform of an 8.10m useful width and one set of escalators moving upwards and downwards to enter and exit the station (Three Stations: PAPAFI, FLEMING, 25 MARTIOU).
- Type 3: Stations featuring a platform of a 6.00m useful width in contact with a crossover trench, and one set of escalators moving upwards and downwards to enter and exit the station; in this type of station, escalators are installed outside the specified platform length (Three stations: NEW RAILWAY STATION, ANALIPSEOS, NEA ELVETIA).

Extension to Kalamaria:

Stations have a standard platform useful width of 8.25m (four stations: NOMARCHIA, KALAMARIA, ARETSOU and NEA KRINI). MICRA Station is not included in the base type stations and has a platform useful width of 6.15m (in contact with a crossover trench and a forestation).

Stations feature:

- a central platform to ensure optimum passenger service and to minimize the number of escalators and lifts. The characteristic feature of the stations is that a central core enabling passenger circulation is formed, which includes the concourse level, the platform level, the staircases and the lift.
- Platform Screen Doors (PSD) to maximize passenger safety, increase the useful width of the platforms and cable routing areas, reduce the needs for ventilation and smoke extraction, increase the performance of the Public Announcement System and ensure the possibility for air-conditioning in all public areas of each station.

Station Levels

Base Project:

Stations are developed in the following levels:

Street level

Concourse level

TECHNICAL DESCRIPTION AND SPECIFICATIONS

One or two Mechanical floors

Platform level.

Extension to Kalamaria:

Stations are developed in the following levels:

A. As two-level stations:

Street level

Concourse and Mechanical Floor level

Platform level

B. As three-level stations:

Street level

Concourse and Mechanical Floor level

Mechanical Floor level

Platform level

3.4 Tunnels

The Metro tunnels extending between the NEW RAILWAY STATION and NEA ELVETIA Station are twin tunnels (two single-track tunnels) constructed with TBM. The stations' minimum nominal internal diameter is 5.30m.

The tunnel approaching the Depot between NEA ELVETIA Station and the Depot is a double-track tunnel constructed with the C/C method, while one 69.95m long tunnel section at the junction with Nea Egnatia Street (K.P. 8+947.295 ÷ 9+017,242) has been constructed using the NATM method.

The Metro tunnels extending between the beginning of the Kalamaria Extension Project in 25 MARTIOU Crossover and the first Crossover of MICRA Station are twin tunnels (two single-track tunnels), which have been constructed using the TBM. The minimum nominal internal diameter of the tunnels is the one used in the Base Project, i.e. 5.30m. The double-track tunnel (forestation) from the 2nd Crossover of MICRA Station up to the end of the line was constructed using the C/C method.

3.5 Shafts

The minimum characteristics of the shafts are as follows:

- They shall have a free ventilation opening of approx. 22÷25 m² ensuring free ventilation of the two tunnels of the forestations during normal operation.
- They shall be equipped with a roller shutter/ diaphragm, which isolates the tunnel from the street level in case of emergency, as required.
- They shall be equipped with an emergency exit staircase, which terminates in a small structure with the necessary doors at street level.

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- They shall be equipped with the necessary electromechanical equipment, such as lighting, roller shutter/diaphragm control system, stormwater drainage, etc.
- Kritis shaft, which is located between the Base Project and the Extension to Kalamaria, shall be especially equipped with tunnel ventilation fans.

Moreover:

- Ventilation shafts shall be equipped with galvanized grids, steel galvanized ladders with a safety cage or stairs with a protective balustrade.
- At the station blast and ventilation shafts, grids shall be equipped with the appropriate locks to ensure accessibility only from inside the station for safety reasons.
- In the ventilation intershafts, grids shall be equipped with the appropriate locks to ensure accessibility only from street-level. The keys shall be made available to the Contractor and the Brigade Service responsible for the project area.
- Emergency exits shall be protected by safety bollards and shall be equipped with waterproof hatches with panic bars and a hydraulic hinge system.
- Accesses or entrances in all stations shall be raised, where necessary, by at least two steps (providing only one step should be avoided for the safe circulation of the pedestrians), while they shall feature a riser of an adequate length of 4-5m with a maximum cant of 5% for flood protection.
- At street level, the openings of the lift doors shall be raised and oriented downstream the wider area for flood protection. In any case, the cant of the ramp shall be $\leq 5\%$.

3.6 Depot

3.6.1 General

Pylea Depot, as part of the Thessaloniki Metro long-term network, includes all necessary facilities which support the operation of the Metro during its first and second operation phase, namely in the Base Project and the Extension to Kalamaria.

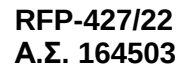
Rolling Stock maintenance and repair facilities shall serve a fleet of up to 50 trains.

3.6.2 Other requirements

The Depot layout includes three (3) special areas indented for the operation of the trains. Namely:

- (a) Automatic train operation area
- (b) Manual train operation area
- (c) Intermediate area connecting areas (a) and (b).

The layout of the Depot tracks is shown in the following **Figure 4**



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3.6.3 Summary Description of the Depot Operations and Facilities

Pylea Depot includes several infrastructures to serve the operation, administration and maintenance needs of the Thessaloniki Metro, such as:

- Depot track infrastructure consisting of:
 - Automatic train stabling tracks
 - Maintenance tracks
 - Test tracks
 - Access and connection tracks, including the train washing track.
- Building infrastructure of the Depot consisting of:
 - A main workshop
 - A maintenance workshop
 - Depot technical and administrative services offices
 - Staff rooms and meeting rooms
 - Technical rooms for the power supply and control facilities of the Depot.
- Depot areas (offices and workshops) intended for the maintenance of systems other than train sets, such as:
 - Track maintenance
 - Signaling maintenance
 - Telecommunications and radio maintenance
 - Information technologies
 - Power supply equipment maintenance
 - Automatic fare collection machinery maintenance
 - Mechanical installations
 - Other.
- Warehouses intended for:
 - Operation materials
 - Basic spare parts for all systems
 - Consumable spare parts
 - Other.

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- Depot technical rooms for the power supply and control systems of the Depot, such as:
 - Rectifier substation
 - MVP 20 KV for Depot power supply
 - Lighting and Auxiliary Substation (LAS)
 - Signaling equipment
 - Telecommunications equipment
 - Heating and cooling
- Other facilities
 - Guard houses
 - Waste discharge areas
 - Inflammable material store

In addition, the depot area also includes the following infrastructures:

- Administration Building:

All services related to the operation of the Thessaloniki Metro shall be housed in the Administration Building. This building is located within the Depot area and includes structures meeting the administrative needs of the Metro and the operation personnel, such as:

 - Offices
 - Meeting rooms
 - Technical rooms
 - Training rooms
 - Assembly rooms
- Operation Control Center consisting of:
 - Operator's rooms
 - Technical rooms
 - Staff rooms
 - Assembly rooms
 - Diesel generator room housed in a separate area
- Cash counting room consisting of:
 - cash counting area
 - cash storage area – highly protected area

TECHNICAL DESCRIPTION AND SPECIFICATIONS

- empty coin boxes storage area
- staff room
- Assembly rooms

The Operation Control Centre (OCC) and the Cash Counting Area (CCA) are integrated in the Train Stabling/Administration Building Complex.

In brief, the Depot includes the following structures:

- Perimeter fencing of the entire Depot
- Perimeter retaining wall
- Railway infrastructure and systems
- Bridge crossing a public road over the flood protection trench, the north access and the train washing plant
- Access – service roads inside the Depot
- Pedestrian bridge connecting the Repair Workshop with the Train Stabling Area and the Administration Building
- Complex 1 – Maintenance and Repair Building
 - Two-storey underground parking facility
 - Bogies storage area
 - Heating and Cooling Facility
 - Electromechanical rooms (LAS, RS, Fire protection, etc.)
 - Train Washing Plant
 - Power Supply Substation
 - Waste collection area
 - Large vehicles parking facility
 - Underground corridor to be used as emergency exit
 - 4 emergency staircases
 - 4 lifts
 - 3 freight lifts
 - Main Workshop
 - Repair Workshop
 - Transverser
 - Painting Plant
 - Main Entrance
 - 3 gantry cranes
 - Main Warehouse (two levels)

TECHNICAL DESCRIPTION AND SPECIFICATIONS

- Offices
 - Laboratories
 - Sanitary areas
 - Locker rooms with cabinets
 - Mess room
 - Small rooftop structure for open air activities.
- Complex 2 – Stabling Area for 20 Trains and Administration Building
 - Heating and Cooling Facilities
 - E/M rooms (LAS, Fire protection, Signaling, Telecommunications, etc.)
 - 7 platforms
 - Four (4) staircases and 8 lifts
 - Permanent Facilities Laboratories
 - Sanitary areas, locker rooms, kitchens
 - Train Stabling Area Main Entrance
 - Cash Counting Area
 - Offices of the Permanent Facilities Laboratories Building
 - Administration Offices
 - Operation Control Center
 - 2 train bridges
 - Pedestrian bridge connecting the Administration Building with the train shunting area
 - Track Maintenance Building
 - Administration Building Main Entrance
 - Emergency Exit to the Testing Workshop Pit
 - Mess room
 - 4 small rooftop structures for open air activities
 - Other secondary buildings of the Depot
 - Fire-fighting Tower
 - Large Vehicles Parking Area
 - Outdoor parking facility for employees
 - East guard house
 - North guard house

TECHNICAL DESCRIPTION AND SPECIFICATIONS

- Inflammable Materials Store
- Access tunnel entrance cover
- Testing Workshop Pit
- Planted area.

The aforementioned structures of the Depot shall be served by the following E/M systems:

- Interior and exterior lighting
- Earthing and lightning protection
- Power supply sockets
- Telephones
- Drainage – sewage, including pumping stations
- Fire-fighting networks and systems
- Water-supply network
- Irrigation network
- Natural gas supply
- Connection with the Public Utility Organization networks.

3.6.4 Spare parts, consumables and special tools

The Contractor shall take delivery of all spare parts and special tools foreseen to be made available by the construction, systems and rolling stock contractors (list of spare parts, as recorded in Annex A of this document). Spare parts, consumables and special tools shall be handled by the Contractor in line with the specifications of paragraph 2.8.2.

3.7 Rolling Stock

The Contractors of both the Base Project and the Extension to Kalamaria have ensured the design, construction, procurement, testing and commissioning of the following Rolling Stock items, namely:

- 18 trains – 4 car-sets, (Series I) (*Delivered and tested in Thessaloniki*)
- 15 new Trains – 4 car-sets (Series II) (*Tendering process in progress*)

and the supply of their necessary spare parts.

The rolling stock necessary for the operation of the line provides for a driverless and fully automated train operation, as well as for operation with train attendants, if required.

TECHNICAL DESCRIPTION AND SPECIFICATIONS**3.8 Electromechanical and Railway Systems**

As described in more detail in paragraph 1.2 and 1.3, the scope of the works of the Base Project and the Extension to Kalamaria included the design, procurement, installation, testing and commissioning, as well as the procurement of spare parts and special maintenance tools for the following Electromechanical and Railway Systems:

1. Ventilation
2. Heating / Ventilation / Air Conditioning (HVAC)
3. 750 VDC Traction Power System
4. 20 kV AC Power Supply System
5. Low voltage distribution system (400/230VAC)
6. Lighting
7. Fire fighting / Fire detection
8. Escalators
9. Lifts
10. Earthing and stray-current protection
11. Lightning Protection
12. Power Supply, Irrigation
13. Drainage, Sewage
14. Pumping Stations
15. Control and Supervision System of the Rectifier Substation traction power equipment in the Station Master Room (SMR)
16. 110V DC Auxiliary Power Supply System
17. Release system of the Rectifier Substation in emergencies
18. Intertripping system along the Line
19. Signaling (Systems: Automatic Train Control (ATC), Automatic Train Supervision (ATS), Automatic Train Protection (ATP), Automatic Train Operation (ATO), Electronic Interlocking (EIXL), Positive Train Identification (PTI))
20. Passenger Information System (PIS)
21. Platform Screen Doors
22. Wireless Telecommunications (TETRA)
23. Automatic and Direct Telephones
24. Closed Circuit Television (CCTV) System
25. Public Announcements (PA)
26. Clocks and Time Distribution System
27. Internal Structured Cabling for Digital Data Transmission

TECHNICAL DESCRIPTION AND SPECIFICATIONS

28. Safety Management System (SMS) (Access Control System (ACC), Intrusion Detection System (IDS))
29. Intercommunication Systems
30. Fare Collection System
31. Uninterruptible Power Supply Systems (UPS) - Batteries
32. Building Automation Control System (BACS)
33. Power Remote Control System (PRCS)
34. Cable and Fiber Optics Networks
35. Data Transmission System (DTS)
36. Trackwork
37. Clocks system
38. Signalling
39. Integrated Communications Control System (ICCS).

3.9 Two-storey Parking Facility

In Complex 1 of the Depot a two-storey Parking Facility has been constructed, which consists of:

- 320 parking spaces for vehicles
- 100 parking spaces for motorbikes.

These parking spaces shall be available for use by the employees of the Contractor, AM and the Transport Authority of Thessaloniki (THETA).

3.10 Connections with PUO networks

All facilities and the relevant PUOs required, including without however being limited to, the connections with PUO networks, and in particular, the connection with DEDDIE – Hellenic Electricity Distribution Operator for 20kV MV supply, with Thessaloniki Water Supply Company EYATH for water supply and sewerage services, with EPA - Natural Gas Company for natural gas supply (at the Depot), as well as the telephone connections with the telephone services provider (OTE or other) ensuring telephone and Internet connection in the furnished offices.

3.11 PUOs Expenses

Expenses resulting from PUO bills (DEDDIE – Hellenic Electricity Distribution Operator, Thessaloniki Water Supply Company EYATH, telephone providers, etc.) for any consumption made by the Contractor in the framework of the execution of the Services, shall be borne by the Contractor. As regards PUO supplies used by AM and THETA personnel to work in the Depot area, an independent calculation of the bills will be made, and the relevant expenses shall be borne by AM and THETA respectively (see para. 9.10).

TECHNICAL DESCRIPTION AND SPECIFICATIONS

3.12 Office Locations

With regard to the locations of the offices which will have been constructed at the Depot by the Base Project Contractor, please refer to § 5.2.7.

With regard to the foreseen locations of the offices, already constructed by the Base Project Contractor, it is likely that these shall be as follows:

Complex 1 shall extend over 3 levels:

- 40 workspaces for technicians of the Contractor
- 110 workspaces for the Thessaloniki Metro Department and AM Management.

Complex 2 shall include the following workspaces:

- 10 workspaces at the Operation Control Centre of the Administration Building
- 120 other workspaces in the Administration Building
- 200 workspaces at the perimeter of the train stabling area out of which 90 workspaces shall be used by the Transport Authority of Thessaloniki (THETA).
- 18 workspaces at the track equipment workshop
- 10 workspaces under the offices of THETA
- 5 workspaces at the kinder garden
- 2 workspaces at the guard house
- 10 workspaces for the technicians at platform level
- 10 workspaces at the cash counting areas/AFCS.

More information on the obligations of the Contractor related to the office locations are provided in § 5.2.7.

3.13 Furniture

The furniture in the Station Master Rooms, the OCC, the Emergency Control Room (ECR), the ticket offices, the Emergency Room, the Meeting Room, the OCC training room, etc., as described in detail in the furniture designs of the Base Project and the Extension to Kalamaria, shall be made available to the Contractor for use. In the OCC and the ECR, ergonomical, high-quality furniture shall be provided, especially manufactured for Operation Control Center, which shall be perfectly blended in terms of architecture into the office areas. Furniture designs shall be made available to the Contractor together with the Project Log (see §2.8.6). In case of natural wear, AM shall replace the existing furniture.

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3.14 Restaurant

Provision has been made for the operation of a restaurant in the Depot area.

3.15 Kinder Garden

Provision has been made for the operation of a Kinder Garden in the Depot area.

3.16 Inventory of existing features

Before being settled in the Metro network areas, the Contractor shall proceed with the inventory of existing features for the areas delivered by AM. In the framework of this process, drawings, descriptions, tables, quantities, photographs, etc. shall be recorded, while reference shall be made to all the existing facilities, rolling stock, systems, etc. The delivery/acceptance of all facilities, systems, rolling stock, equipment, spare parts, consumables and special tools for each of the two Operation Phases must have been completed before the expiry of the trial running.

TECHNICAL DESCRIPTION AND SPECIFICATIONS

4. OPERATION

4.1 General

In the framework of this Contract, the Thessaloniki Metro includes the following Line Sections. More precisely:

- The line section extending from the NEW RAILWAY STATION to NEA ELVETIA and its connection with the Depot,
- The extension from 25 MARTIOU Station up to Kalamaria.

The approach for the operation of the Thessaloniki Metro trains is presented below, that the Contractor is encouraged to follow.

As shown in detail in the following **Figure 5**, the central section of the two Lines is common between the NEW RAILWAY STATION and 25 MARTIOU Station. The first loop, the Depot included, is the Base Project. The connection of the Base Project with the Lines leading to Stavroupoli and Kalamaria is the “Extension”. The second loop is the Extension to Kalamaria. As shown in the following Figure, in the central common section of the two different itineraries loops, a headway of 90 seconds is ensured.

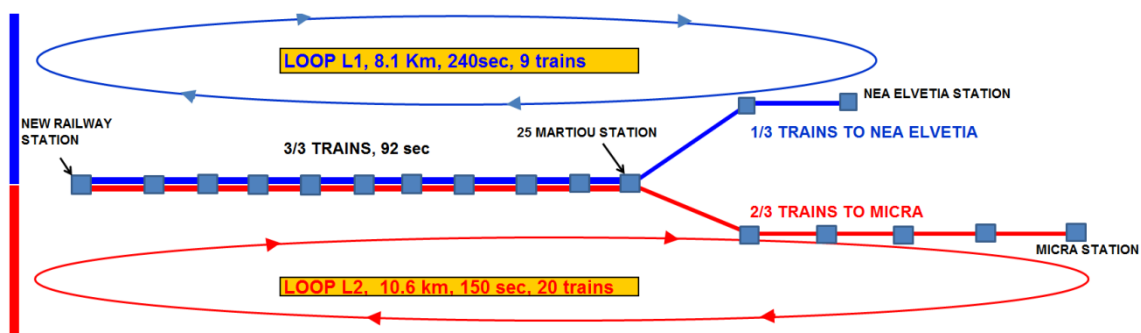


Figure 5 – Train operation in the Base Project and the Extension to Kalamaria

During the commencement of Operation Phase A, when only the Base Line shall operate, the network shall include only the loop from the NEW RAILWAY STATION up to NEA ELVETIA Station.

During the commencement of Operation Phase B, when the Extension to Kalamaria shall also operate, the loop from the New Railway Station to Micra Station shall be added to the network.

The passenger demand volume shall be modified further to the introduction of the second loop, while the need shall arise for greater passenger capacity in the central (common) section of the network.

It is stated that:

TECHNICAL DESCRIPTION AND SPECIFICATIONS

1. trains shall circulate with a 150 sec headway during the initial phase of Phase A Operation, during rush hours; in the short-term, this headway is expected to be reduced to 90 seconds in the central section of the line (NEW RAILWAY STATION – 25 MARTIOU Station).
2. During operation phase B and during rush hours the headway shall be 90 sec in the central common section of the line while trains shall be allocated as follows: every 3 trains, 2 trains shall be directed to Micra and 1 train to Nea Elvetia. The above shall be ensured through 2 different trips carried out simultaneously in the following tunnel sections, namely New Railway Station – Nea Elvetia (240 sec headway) and New Railway Station – Micra (150 sec headway). The Contractor may also suggest other trip combinations ensuring the required headway and meeting passenger needs subject to the approval of AM.

Further extensions are anticipated in the future from the NEW RAILWAY STATION to the west of the city of Thessaloniki and from Kalamaria to the Airport.

The operation method and all system designs shall allow the commissioning of new line sections (e.g. Extension to the Airport), provided that are completed within the validity period of this Contract. In this case, the Contractor, in communication with AM, shall grant access rights to the person that AM will indicate and for the locations required (e.g. in the OCC, ECR and in the Line continuation points).

4.1.1 General Operation Method

The operation of the Thessaloniki Metro that the Contractor is called upon to adhere to is a fully automated driverless system during normal operation. However, an attendant can be present on every train with passengers when the train is in operation in order to guide and assist passengers in case of an emergency or in case of train evacuation and in order to prevent any hazardous events which may occur inside the trains. In any case, however, during the first 12 months of the operation and in both operation phases, there will be one attendant in every train. Then, during the next year, the number of the attendants present on the train may be modified further to the submission of the pertinent justified request by the Contractor and the relevant approval of AM.

The requirements on the Organizational Structure of the Contractor are described in §2.8.3.

4.1.2 Control and Supervision of Revenue Service (OCC)

The Contactor shall control and supervise the entire metro system from the Operation Control Centre (OCC) in the Depot. Auxiliary systems for decentralized control and supervision systems shall be made available in view of addressing emergencies (e.g. BACS system, local traction control system in the Station Master Room areas, etc.). The supervision and control of all the operations of the Thessaloniki Metro system shall be ensured by the Operation Control Centre, which shall also be used for all future extensions. The OCC shall provide remote control and operation services for trains. When operation cannot be ensured by the OCC, it shall be ensured by the Emergency Control Room (ECR), which is in hot stand-by. Under normal operation, the control

TECHNICAL DESCRIPTION AND SPECIFICATIONS

system shall operate in fully automated mode. However, the system shall allow for the manual operation of the trains by an attendant or by another driver in the event of system failure or emergency.

4.1.3 Train Movement Control and Supervision in the Depot

The Contractor shall be responsible for the management of the train stabling area in the Depot, including the access tracks to/from the main line and the test track, which shall be ensured, the above being part of the main line, from the OCC as an automated operation zone. The remaining section of the Depot, namely the Maintenance and Repair areas, shall be considered as a non-automated section where a driver shall be onboard the trains; this section will be controlled and supervised by a Depot Controller.

4.1.4 Provisions on Ridership

The ridership of the Base Project and the Extension to Kalamaria, when commissioned, is anticipated to reach 15,600 passengers per hour per direction (pphpd). The capacity of each train shall be 450 passengers minimum (5 standing passengers/m² and 25% seated passengers, 75% standing passengers). The foreseen number of trains suffices to cover the aforementioned ridership, while the system's maximum capacity is 18000 pphpd. The ridership provisions per station are stated in paragraph 1.5 of this document.

4.1.5 Headways

In the framework of the Thessaloniki Base Project, the system has been designed and constructed in a way so that a 90 sec operational headway is ensured under ATC/ATO conditions. This entails a design headway of 90sec for the traction power system in continuous operation and a 60 sec headway for two (2) hours, while a 60sec headway without stops and 90sec with stops is foreseen for the signaling system.

In the framework of the Extension to Kalamaria, the design operational headway shall be 90 sec in the main section of the line, in view of meeting the anticipated ridership of 18,000 passengers per hour per direction (pphpd). This is anticipated to be ensured under ATC/ATO conditions (see paragraph 4.1).

The design headway of the signalling system and of the traction power system for the Kalamaria Extension shall correspond to the one of the Base Project.

The ATS system shall regulate the train distances, so as to ensure that only one train passes through a tunnel section, except for the cases of tunnel sections formed by more than one ventilation sections.

In 25 MARTIOU branching, the two branches of the line shall meet; one branch shall be headed towards Nea Elvetia and the other one towards Kalamaria. Given the length of the line which includes 2 stations in the branch to Nea Elvetia and the length of the line which includes 5 stations in the branch to Kalamaria, the initial approach provides for a train circulation ratio of 2:1 at the main section of the line. In other words, in the event of three successive trains moving with a headway of 90 seconds, the first two trains shall

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be moving towards the branch of the Kalamaria Extension and the third train towards the branch to Nea Elvetia. The ATS system shall regulate the locations of the trains and their headways in order to ensure a smooth combination between the trains from/to the two branches.

During the commencement of the Project operation, the Contractor shall implement a 150sec headway (for rush hours 07:30 – 09:30, 12:30 – 15:30, 18:30-21:30) in the main section of the Line, which, however, in agreement with AM, shall be reduced to 90 sec upon the delivery of the 15 new trains of the Kalamaria Extension and the increase of the ridership, and then the Contractor shall adhere to the following Daily Operation Time Schedule.

Starting hour	Ending hour	Working day, except Fridays	Friday	Saturday	Sunday	Holiday
		Headway (minutes)	Headway (minutes)	Headway (minutes)	Headway (minutes)	Headway (minute)
05:30	07:30	5	5	10	10	10
07:30	09:30	1,5	1,5	2,5	5	5
09:30	12:30	2,5	2,5	5	5	5
12:30	15:30	1,5	1,5	2,5	5	5
15:30	18:30	2,5	2,5	5	5	5
18:30	21:30	1,5	1,5	2,5	5	5
21:30	00:30	5	5	10	10	10
00:30	02:00	-	15	15	-	-

Table 3 – Daily Time Schedule for the central common section of the two timetable loops

The delivery of the 15 trains is a necessary precondition to ensure the reduction of the operational headway during rush hour time periods (07:30 – 09:30, 12:30 – 15:30, 18:30-21:30) to 90 seconds. Each new train to be accepted and delivered (after the completion of the required dynamic tests) by AM to the Contractor shall be put into service until all new trains are integrated in the operation of the system and the headways are as referred to in Table 3 above.

The following are also applicable:

1. Upon delivery of the 15 new trains (to be delivered in parts) and based on the aforementioned table 3, if during various intervals throughout a day, it is required to reduce the headways as compared to the ones presented above (e.g. reduction from 2.5 minutes to 1.5 minute from 09:30 – 12:30 during working days) due to increased ridership, the Contractor shall implement these reduced headways for the transportation needs of the passengers to be met.
2. The aforementioned headways shall be adhered to with punctuality to the extent possible due to the operational/ time restriction imposed by the 1:2 train allocation ratio to Nea Elvetia and to Kalamaria, as presented in Table 3.

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3. In special cases (sports events, concerts, etc.) where the ridership load is expected to rise as compared to the normal load, the Contractor shall change the basic headways stated in the aforementioned Table 3 from one hour before and up to one hour after the scheduled event further to AM's concurrence.
4. At the commencement and end of the shift (i.e. daily from 05:30 – 6:00 and 00:00 – 00:30) and if the ridership proves to be particularly limited, the Contractor may propose increased headways from 5 to 10 minutes.
5. During summer months (i.e. in August or during certain days in August) and if the ridership is reduced, the Contractor may propose for approval by AM modified trips and reduce the overall daily vehicle/kilometres up to 40%.

4.2 Metro System Operation

4.2.1 Terms and abbreviations

Terms Description

- **Delay**

A train trip is delayed if the actual time of the travel exceeds the scheduled travel time (applicable in normal Operation conditions and in downgraded operation conditions) by the seconds corresponding to the operational headway in the terminal station. Delays shall be noted only for commenced train trips.

Any accidental or intentional bad use does not constitute an Operation Failure leading to a delay in the sense described in this document.

- **Failure**

Failure means the interruption of the operation of a system which lasts longer than the duration of the operational headway. Any accidental or intentional bad use by the personal does not constitute a "failure" in the sense of the term described in this document.

- **Mean Cycle Between Failures (MCBF)**

(Number of operation cycles per reporting period)/(Number of failures per reporting period).

- **Mean Time Between Failures (MTBF)**

(Number of hours of operation per reporting period)/(Number of failures per reporting period).

- **Mean Time To Repair (MTTR)**

The Mean Time To Repair is the mean active repair time required upon the arrival of the maintenance crew to identify and isolate the fault, to execute repair works and to carry out the operational control in order to verify that the system has reverted to a fully operational mode.

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- **Failed Trip**

Failed trip is a trip which has not commenced by the scheduled departure time of the next trip (failure in the commencement of the train trip) or a trip which is terminated before 75% of the trip has been completed (Withdrawal from Service).

- **Trip**

A trip is the journey of an operating train from its scheduled starting position to the specified terminal station based on the scheduled trips.

The other Abbreviations, Definitions, General Technical Terms and Management Terms of the Project, stated in the paragraphs of this document, are explained in Annex C – Glossary.

4.2.2 Submission of the Operation Program

As part of the Project Log (see §2.8.6), AM shall provide the Contractor with the approved Operation Programs concerning the Rolling Stock, the Systems and, in general, the Infrastructures of both the Base Project and the Extension to Kalamaria. The Contractor is under the obligation to create and submit for approval to AM within two hundred and forty (240) calendar days from the signing of the Contract an Operation Program for the Base Project of Thessaloniki Metro and an Operation Program for the entire Thessaloniki Metro that will also include the Extension to Kalamaria within three hundred (300) calendar days.

The Operation Program shall cover the Rolling Stock, the Systems and the Infrastructures, including as a minimum the requirements and the foreseen Performance, Availability and Reliability levels stated in the Programs referred to in the document with the RAMS Requirements, which will be made available to the Contractor in more detail with the Project Log (see §2.8.6.2.8.6) and which concern the rolling stock and every single system. The Contractor shall update and resubmit the Operation Program for approval at the commencement of each phase of revenue service, if required, taking into consideration the time schedules after Trial Running, and whenever required by AM.

The Metro operation shall be ensured by the Contractor in line with the approved Unified Operation Program, which must have been approved before the end of the Trial Running of each Operation phase, and which shall comply with the quality requirements, the Legislation, while it shall be executed by properly trained and approved personnel of the Contractor.

4.3 Operation Modes

The Contractor shall ensure the operation of the Thessaloniki Metro based on the operation modes described herebelow. Namely:

- Normal Operation
- Downgraded Operation Mode
- Emergency Operation Mode.

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The system supports three different train operation modes, as described in summary below:

- Automatic Mode (AM) under Automatic Train Control (ATC) conditions,
- Supervised Manual Mode (SMM) under ATC conditions, and
- Manual Mode with Automatic Permissive Mode (ATP)/ Permissive Mode (PM).

Operation Control Centre (OCC)

The OCC is located in the Administration Building of Pylea Depot. The Contractor shall supervise and control all the operations of the Thessaloniki Metro System from the OCC. In the event of OCC failure, operation management shall be transferred to the Emergency Control Room (ECR), located in another building inside Pylea Depot. In this case, the personnel of the OCC shall be transferred from the OCC to ECR.

Train central control, remote control, operation and services related to the operation of all electromechanical and railway systems of the Project are ensured in the OCC. Under normal conditions, the control system operates on a fully automated basis. However, the system allows for manual train operation by an attendant or by another driver in the event of system failure or in the event of emergency. The control of system sections or of the entire line can be ensured from the OCC or the ECR where the signaling, BACS, PRCS, etc. equipment is installed.

The Operation Control Center of Pylea Depot includes:

- The network operation management and the Automatic Train Control (ATC) facilities
- The control and management of the safety and protection of the network
- The Building Automation Control Systems (BACS) of the Line and of the Depot (locally)
- The Power Remote Control Systems (PRCS)
- The Integrated Communication Control Systems (ICCS).

The operator's room in the OCC also includes facilities for the control of the Depot. The circulation and the modes of operation of the trains inside the Depot shall be controlled by the Contractor through the Depot Operations Controller, located at the operator's room inside the OCC.

Access to the Operation Control Centre

Even though located inside the Administration Building, the OCC shall be set up by the Contractor as a distinct area, access to which shall be strictly controlled by a separate system. Access doors to the Operation Control Centre shall operate automatically through the card readers access system with the cards being held by authorized personnel only or when the relevant permit is granted by the Safety Controller from the

TECHNICAL DESCRIPTION AND SPECIFICATIONS

OCC. The Security Controller and the visitor shall communicate through an intercom system equipped with a camera and a monitor.

Station Master

The Contractor shall man all Stations with a Station Master to be positioned at a central location in the Concourse Area. The Station Master's duties shall include supervision of the smooth and safe operation of the station, daily execution of the required actions and controls at the commencement of the operation of the station (operation of lighting, escalators, lifts, access doors, etc.) and at the closing of the station (opposite actions than the ones carried out during the commencement of the operation, ensuring safe access for the cleaning crews, maintenance technicians, etc.), so that the station is ready and secure for use by the passengers, but also execution of the foreseen actions in the event of emergency. In order to perform his duties, the Station Master shall use the following systems, as required:

- CCTV
- PA
- Fire detection
- Fire fighting
- Lifts
- Escalators
- Lighting
- Ticket validation doors and
- Automatic Ticket Issuing Machines (ATIM).

The Station Master shall follow the approved procedures with regard to the safe access of the station personnel, the subcontractor, AM personnel, eventual visitors, etc. depending on the authorization held for accessing several areas through the access control system and the special master key system. Respectively, an approved procedure shall be also followed in the event of special visit by third parties (e.g. photographing/ video recording/ research purposes, school visits, etc.).

In special cases, the Station Master shall also manually open the ticket validation doors. The Communication and the Closed Circuit Television Systems shall meet this requirement.

Other systems, such as the Building Automation and Control System (BACS), a power supply workstation, etc. shall be installed at the Station Master Room.

The responsibilities of the Station Master of the Contractor shall not prevent him from leaving the Station Master Room, if required, for a given time period in order to perform his duties, i.e. check the smooth operation of the doors at platform level, guide Persons with Special Needs, solve problems in ticket validation doors, address emergencies, if any, etc. The personnel shall be able to communicate with the Station Master from any location inside the station area through wireless telephony and wifi.

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Train attendants

Train attendants shall fall within the organizational structure of the Contractor and shall work at various shifts during a 24-hour service. Train attendants shall be properly trained so as to carry out all the duties of train drivers.

The number of the Train Attendants shall be at all times equal, as a minimum, to the number of the running trains during the first twelve months of the operation for each of the two commissioning phases (Base Project and Integration of the Kalamaria Extension). Then, in the next year, their number could be reduced further to the relevant recommendation of the Contractor and the approval of AM.

After the first twelve months, the personnel in question shall be available as a resource of the Contractor that will intervene in the event of emergencies in stations or trains.

It is important to point out that all E/M and railway systems have been properly planned and implemented so that operation is also ensured without Train Attendants (GOA4).

Additional information related to the operation of the system shall be made available to the Contractor through the approved designs and operation procedures of the Base Project and the Extension to Kalamaria - to the extent required – included in the Project Log (see §2.8.6).

4.3.1 Normal Operation

The Thessaloniki Metro shall be considered to be in normal operation when it will be operated by the Contractor based on headways without presenting any failure whatsoever or with no downgraded operation and when the Contractor personnel shall carry out its normal duties.

During normal operation, the personnel of the Contractor is still under the obligation to carry out specific duties, in order to ensure high-level customer services. There are also specific duties that the Contractor personnel must carry out during normal operation aimed at ensuring that systems operate properly and meet the expectations of the passengers.

During operation under Supervised Manual Mode (SMM) and Permissive Mode (PM), the train attendant must be present inside the train and ready to assume the manual operation of the train from the active Emergency Driving Position. The mode related to the readiness of the driver shall remain active during the activation of the SMM and the PM.

An additional special mode (Washing Mode - WM) at the entrance of the Depot shall be provided for trains passing automatically from the washing facility. The WM operation is an automatic mode under limited speed. It can be either a separate mode or a sub-mode of the Automatic Mode (AM).

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Train movement on the main lines and towards the train stabling area inside the Depot under normal Operation conditions shall be executed by the Contractor in Automatic Mode.

The ATS and ATP systems, as well as the telecommunications, train diagnostics, power supply and transmission systems shall support these train operation modes.

Under normal operation conditions between 05:30 ÷ 00:30, the Contractor shall operate the trains in loops, as described in paragraph 4.1.

The activities carried out by the Contractor during normal operation mode are described in the following paragraphs.

4.3.1.1 Normal operation procedures

Normal operation procedures:

- All available information and designs that will enable the Contractor to proceed with the preparation of the Operation Procedures shall be made available by AM to the Contractor with the Project Log (see §2.8.6).
- shall be revised by the Contractor when required and shall be resubmitted to AM for approval.
- shall be implemented upon their approval.
- shall be established, if it becomes obvious that they function properly and that they meet all the requirements.

In the framework of the normal operating mode, these Procedures are aimed at informing/advising the personnel of the Contractor on the method of carrying out its daily duties in a safe and effective manner, so that high-standard services are provided to the clients. To this end, in the framework of normal operation, many duties may seem simple and obvious; however, the purpose of the Procedures is to ensure that all personnel works in a consistent manner. In the framework of ensuring customer satisfaction, it is of vital importance that a consistent and clear approach is adopted by all members of the Metro Operations personnel when contacted by customers.

A non-exhaustive list of the normal operation sections for which specific procedures will be developed by the Contractor for the entirety of the line (Base Project and Extension to Kalamaria), in line with the requirements of paragraph 9.1 Quality Management, is presented here below.

- Crowd control in stations during rush hours,
- Light cleaning of trains and stations during operating hours,
- Dealing with perturbations,
- Transportation of revenue from fare collection,
- Management duties,

TECHNICAL DESCRIPTION AND SPECIFICATIONS

- Trains on revenue service,
- Trains off revenue service,
- Train washing and heavy cleaning.

The operation scenarios in normal operating mode that the Contractor must follow are described herebelow. The details of the scenarios and the subsequent actions are described in separate documents, which will be made available to the Contractor together with the Project Log (see § 2.8.6). Once assessed, the Contractor shall correct them, if required, and shall submit them to AM in line with paragraph 9.1.

Scenario Code	Scenario Title	Description
MN1	Commencement of Revenue Service	This scenario describes the procedure for the reactivation of the System upon deactivation, as well as the relevant subsystem operations required for the reactivation of the System.
MN2	System Deactivation and Closure of the Station	This scenario describes the System deactivation procedure further to a scheduled interruption of its operation (e.g. for scheduled works).
MN3	Implementation of the Daily Timetable	This scenario describes the procedure for the uploading and implementation of the daily timetable. This scenario can be used in combination with the scenario “MN1 – Commencement of Revenue Service” for the rebooting of the System.
MN4	Train Commissioning from the Depot for Revenue Service	This scenario describes the procedure for the commencement of the train revenue service from the Depot in Nea Elvetia, which is the first station of the revenue service.
MN5	Transition between Timetables	This scenario describes the procedure followed during revenue service for the transition between a timetable implemented in revenue service to a new timetable. This scenario examines the case of a non-systematic daily timetable transition. Thus, this transition should not be dealt as a change of the daily timetable. This transition may be required due to special conditions, such as unprecedented passenger demand, need for readjustment due to a significant delay or for

TECHNICAL DESCRIPTION AND SPECIFICATIONS

Scenario Code	Scenario Title	Description
		operational reasons.
MN6	Automatic Train Operation Between Stations	This scenario describes the actions of a train between its scheduled departure from a station and its arrival to the next station, including dwell time.
MN7	Automatic Operation in the framework of the Timetable Setup	This scenario describes the procedure related to the system operation in the framework of the Timetable Setup (arrival/ departure of train from stations based on times preset on a timetable).
MN8	Automatic Operation in Regulated Headway	This scenario describes the System operation procedure in the framework of a non-scheduled operation, which is based on a Regulated Headway (the headway between trains remains stable). This operation mode is very useful for restoring smooth passenger service after major service disruption.
MN9	Train off Revenue Service	This scenario describes the standard procedure for trains leaving revenue service and heading to the Depot. This procedure is used in order to reduce trains in service during off-peak hours. This scenario defines the station from which the train leaves revenue service and describes the subsequent train control procedure to verify that there are no passengers inside the train when trains leave revenue service.
MN10	Timetable Changes during Revenue Service	This scenario describes the procedure for implementing temporary changes to the applicable timetable during revenue service. Such changes are required in the event of operational needs, such as unexpected ridership, unavailability of trains or readjustment due to delay or failure conditions.
MN11	Train Addition during Revenue Service	This scenario describes the procedure for the addition of trains to the applicable train timetable (either by implementing the timetable or the regulated headway) in order to address unprecedented ridership.

TECHNICAL DESCRIPTION AND SPECIFICATIONS

Scenario Code	Scenario Title	Description
DN1	Passing through the Washing Plant without any Washing Process being implemented	This scenario describes the entrance of a train in the Depot and its passage through the Washing Plant without undergoing any washing process (the train washing plant is located at the entrance of the Depot).
DN2	Regular External Cleaning (including Cleaning underneath the Train Bogie Frame – Selection of Static Mode)	This scenario describes the case when a train enters the Washing Plant and, while crossing it, is subject to the process of Regular External Cleaning. This scenario allows for quick train movements inside the washing plant and, thus, causes fewer problems to the trains waiting outside the Depot.
DN3	Intensive External Cleaning (including Cleaning underneath the Train Bogie Frame – Selection of Static Mode)	This scenario describes the case when a train enters the Washing Plant and, while crossing it, is subject to the process of Intensive Exterior Cleaning. This scenario entails slower train movements inside the washing plant and, thus, greater problems to the trains waiting outside the Depot (advisable for reduced passenger service conditions).
DN4	Cleaning underneath the Train Bogie Frame	This scenario describes the Cleaning procedure underneath the Train Bogie Frame, a preliminary procedure with regard to the remaining maintenance procedures.
DN5	Withdrawal of a Train from Revenue Service and Routing towards the Train Stabling Area	Under Normal Operating conditions, a Train is withdrawn from revenue service when the number of the trains in revenue service must be reduced (e.g. off-peak hours). Once the train is in standstill in the terminal station, the Train is routed towards the Train Stabling Area where it will undergo cleaning/maintenance processes. From this position, the Train can be then routed e.g. back to the Main Line or to the Maintenance and Repair Workshop Facilities of the Depot.

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Scenario Code	Scenario Title	Description
DN6	Shunting of Train Entering and Exiting the Maintenance and the Repair Workshop Facilities of the Depot	This scenario describes the procedure for the safe movement of Trains Entering and Exiting the Maintenance and the Repair Workshop Facilities (including safe connection of the special stinger plug) in the Rails equipped with a special stinger plug.
DN7	Train off the Test Procedure in the Test Track and Routed to Revenue Service / towards the Train Stabling Area / towards the Maintenance Workshop	This scenario describes the procedure for the execution of specific Train tests at the Test Track and the return to revenue service or at the Train Stabling Area or at the Maintenance Facilities and the Repair Workshop, depending on the train's condition.
DN8	Shunting of Trailing Cars	This scenario describes the procedure for the safe operation of the trailing cars in the Main Line (in parallel with the Trains in revenue service) and the Depot area. This scenario covers the cases for the routing of the trailing cars from the Depot (non-automated area) to the line, from the line to the Depot (non-automated area) or to the Depot (automated area).
DN9	Train Shunting Inside or Outside the Maintenance Facilities with a Trailing Car	This scenario describes the procedure for safe Train shunting inside or outside the Facilities with a Trailing Car.
DN10	Train Shunting From/To the Wheel-Set Diagnostic System	This scenario describes the Entrance and the Exit of a Train To/From the Wheel-Set Diagnostic System. This system identifies the Train codification number as the Train approaches and verifies the track conditions as the train moves at a low speed.

Table 4 – Operation scenarios in normal operation mode

TECHNICAL DESCRIPTION AND SPECIFICATIONS

4.3.1.2 Line Operation

The operation of the Main Line shall be fully automated from the phase when trains leave the train stabling area (train “awakening”) until the time they reach the stabling track anew (train “inertia”) without the need for the intervention of an operator through the personnel onboard the train (train attendant) during normal operation.

4.3.1.3 Line setting and direction of movement

Headed towards the trip direction, trains shall be normally moving on the right track. The system has been designed so as to also operate in reverse direction. Trips in reverse direction shall not be scheduled during normal operation, except in the event of special cases, such as in the event of a track connecting to the Depot.

4.3.1.4 Train reversing

Train trips on the line shall normally commence from the right track at the terminal station. Returning trains having executed trips on the line, shall change track at the forestation of the terminal station or in front of the terminal station.

In train reversing in front of the station, the train attendant shall remain inside the train.

In train reversing through the forestation, during passenger alighting, the train attendant may also disembark from the train and wait at the platform until the train returns.

In the NEW RAILWAY STATION, in NEA ELVETIA Station and in MICRA Station, train reversing during peak hours shall be effected through the forestation. During off-peak hours and night hours, train reversing may be also effected in the area in front of the station.

Automatic reversing movements shall be carried out at the locations described herebelow:

NEW RAILWAY STATION

The reversing scenarios that allow a train to complete the reversing process at the NEW RAILWAY STATION are as follows:

TECHNICAL DESCRIPTION AND SPECIFICATIONS

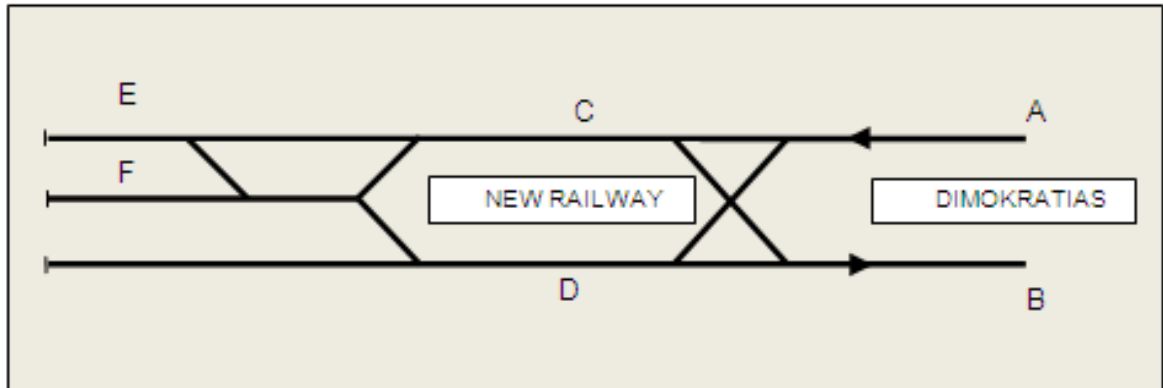


Figure 6 – Reversing scenarios in the NEW RAILWAY STATION

In the next paragraphs the following reversing scenarios with regard to the Automatic Train Control (ATC) Plan of the Base Line will be analyzed:

1. A-C-E-D-B;
2. A-C-F-D-B;
3. A-D-B=A-C-B.

A-C-E-D-B Reversing

In this specific reversing, the train reverses during peak hours at the Forestation. The subject scenario describes the movements of two vehicles, so that it is proven that there is no interference between trains during reversing, assuming a 90s headway and a dwell time of 25s in stations.

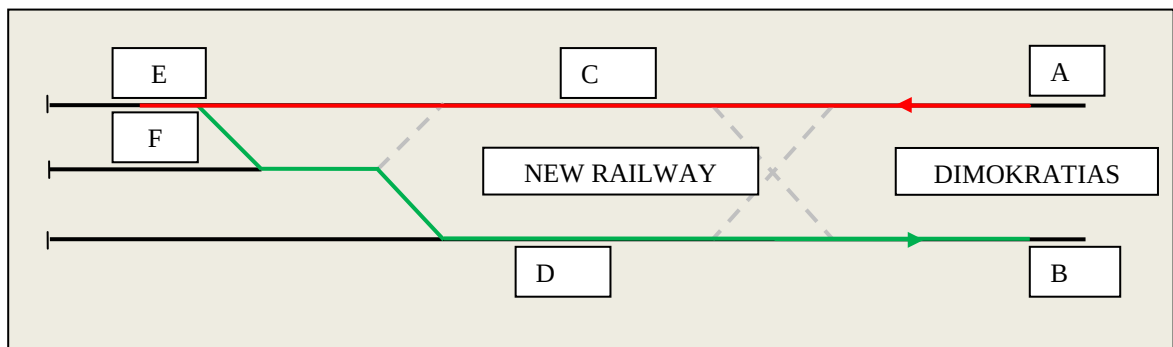


Figure 7 – ACEDB reversing in the NEW RAILWAY STATION

A-C-F-D-B Reversing

In this specific reversing, the train reverses during peak hours at the Forestation. The subject scenario describes the movements of two vehicles, so that it is proven that there is no interference between trains during reversing, assuming a 90s headway and a dwell time of 25s in stations.

TECHNICAL DESCRIPTION AND SPECIFICATIONS

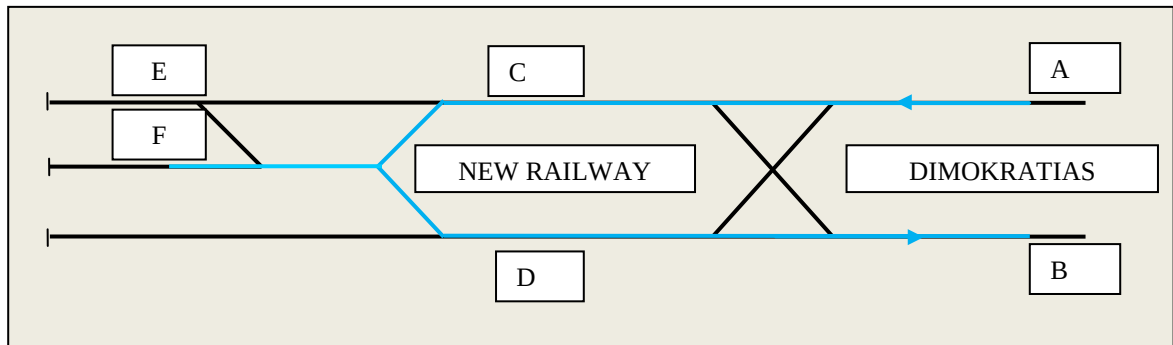


Figure 8 – ACFDB Reversing in the NEW RAILWAY STATION

A-D-B Reversing

In this specific reversing, the train reverses during off-peak and night hours in front of the station.

The subject scenario describes the movements of two vehicles, so that it is proven that there is no interference between trains during reversing, assuming a >150s headway and a dwell time of 25s in stations.

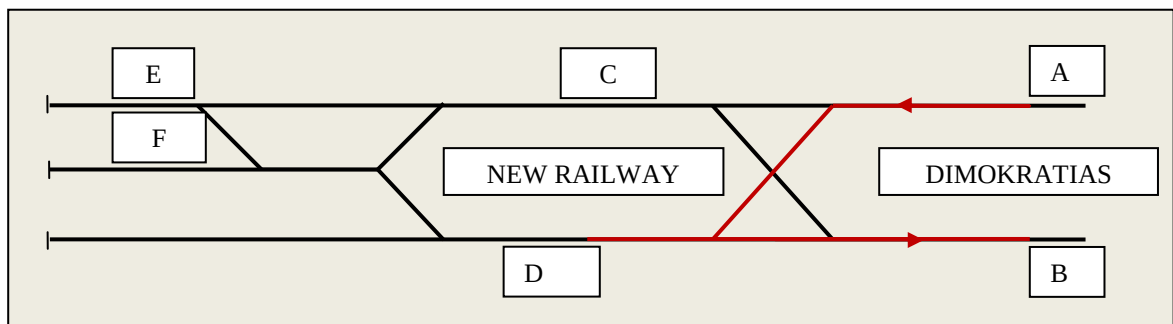


Figure 9 – ADB reversing in the NEW RAILWAY STATION

Analysis of the Reversing Procedure in NEA ELVETIA Station

This paragraph includes a description of the reversing scenarios allowing a train to complete the reversing procedure in NEA ELVETIA Station.

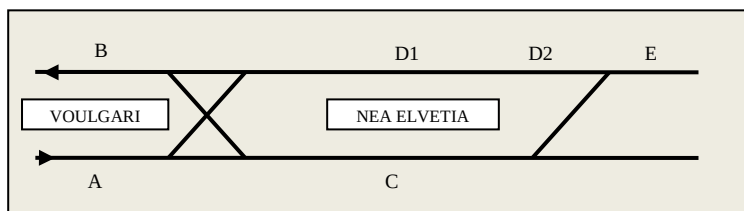


Figure 10 – Reversing scenarios in NEA ELVETIA Station

In the next paragraphs the following reversing scenarios with regard to the Automatic Train Control (ATC) Plan of the Base Line will be analyzed:

1. A-C-B;

TECHNICAL DESCRIPTION AND SPECIFICATIONS

2. A-D1-B;
3. A-C-E-D2-D1-B;
4. A-C-B/A-D1-B/A-C-B.

A-C-B Reversing

In this specific reversing, the train reverses in front of the station.

The subject scenario describes the movements of two vehicles, so that it is proven that there is no interference between trains during reversing and in order to assess the minimum headway assuming a dwell time of 25s in stations.

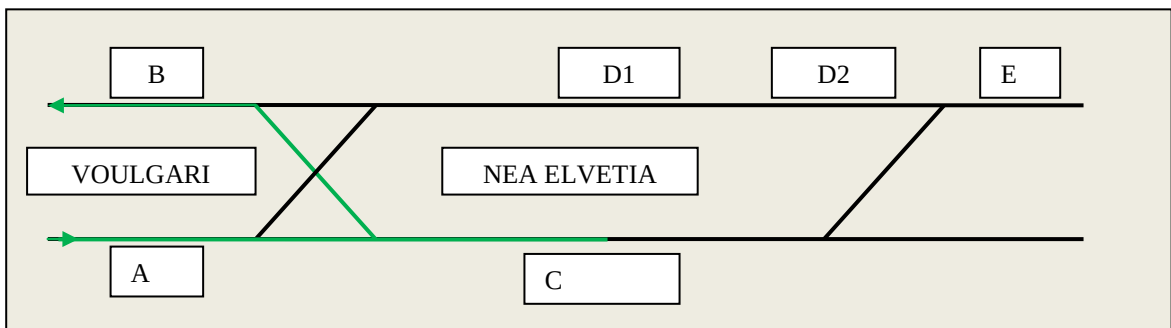


Figure 11 – ACB reversing in NEA ELVETIA Station

A-D1-B reversing

In this specific reversing, the train reverses in front of the station.

The subject scenario describes the movements of two vehicles, so that it is proven that there is no interference between trains during reversing and in order to assess the minimum headway assuming a dwell time of 25s in stations.

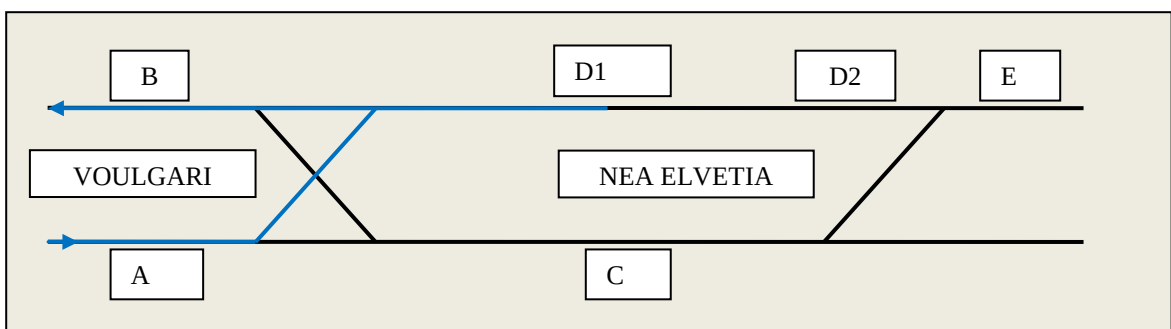


Figure 12 – AD1B reversing in NEA ELVETIA Station

A-C-E-D2-D1-B reversing

In this specific reversing, the train reverses at the Forestation.

The subject scenario describes the movements of two vehicles, so that it is proven that there is no interference between trains during reversing and in order to assess the minimum headway assuming a dwell time of 25s in stations.

TECHNICAL DESCRIPTION AND SPECIFICATIONS

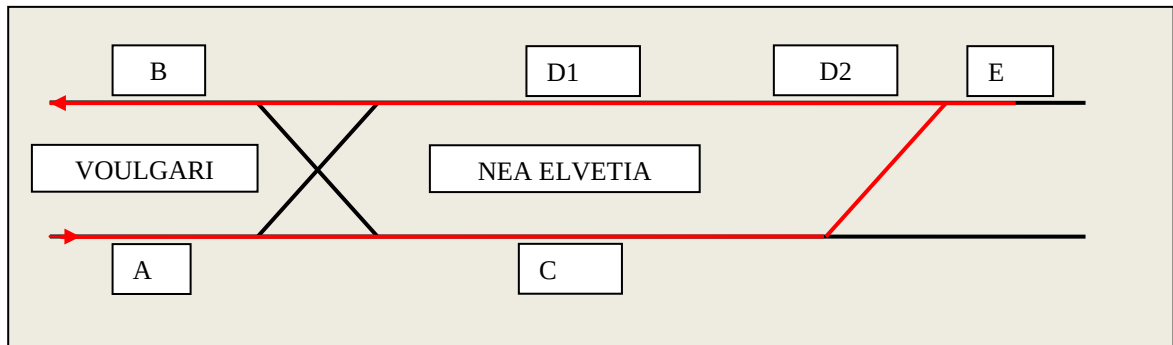


Figure 13 – ACED2D1B reversing in NEA ELVETIA Station

A-C-B/A-D1-B/A-C-B reversing

In this specific reversing, the train reverses in front of the station during peak hours. The subject scenario describes the movements of five vehicles, so that it is proven that there is no interference between trains during reversing, assuming a 90s headway and a dwell time of 25s in stations.

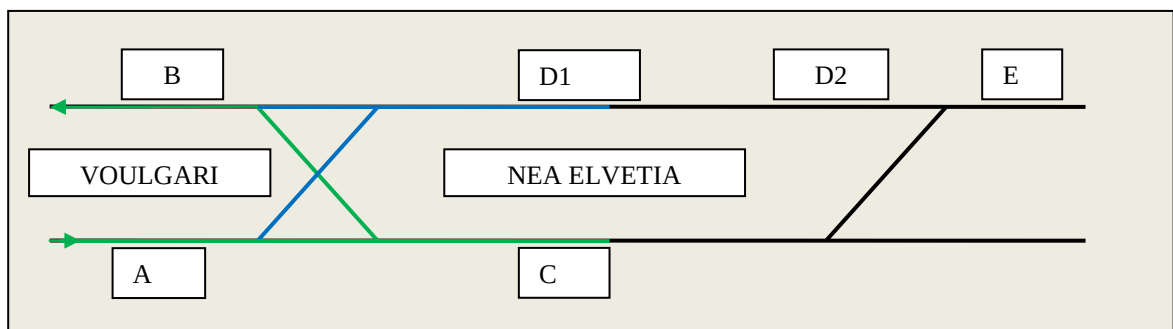


Figure 14 – ACB/AD1B/ACB reversing in NEA ELVETIA Station

MICRA Station

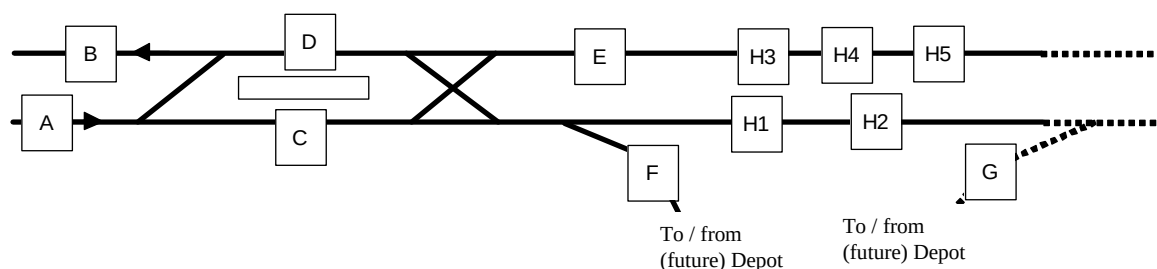


Figure 15 – Schematic layout of MICRA Station

Automatic reversing movements are foreseen as follows:

1. A-C-E-D-B
2. A-D-B
3. Other movements supported by the corresponding line sections.

TECHNICAL DESCRIPTION AND SPECIFICATIONS

Automatic movements shall be foreseen to/from Micra future Depot (C-F; D-F; F-D).

Stabling positions shall be provided as follows:

Off-peak hours: H1 to H5

Downtime (additional positions): C, E.

Trains shall automatically enter all stabling positions.

It shall be possible to activate the train's automatic operation mode from any stabling position.

The system allows for the implementation of all possible scenarios involving ridership increase and headway reduction.

4.3.1.5 Commencement and End of Services

During the commencement of the revenue service in the morning and in order for the headways to be modified, trains shall be moving automatically, without the train attendant being present on board the train, on the Automatic Operation (AO) mode from the train stabling area in the Depot or from any other stabling position scheduled by the Contractor on the line up to the departure track of the first terminal station. If a train cannot be "awakened" by the system or if it is proven during revenue service tests that the train is not suitable for operation, then another train shall be automatically selected in order to execute the mission. The same procedure shall be followed in the framework of revenue service change, i.e. from off-peak hours to peak hours and from night operation to operation in off-peak hours.

In the morning and prior to the commencement of the revenue service in each line, a control train shall be moving on the track for testing reasons.

Passenger service shall commence from the terminal station in the morning at 05:30 with the first train, while the last train shall commence at 00:30. Respectively, passenger service in intermediate stations shall commence later and shall end earlier. Train operation shall continue during night hours until 02:00 in weekends (Friday and Saturday night) or if special events take place.

Train stabling shall be effected through a fully automated system without the need for proceeding with the final adjustment of the position manually. A sufficient track length for the safety and train impact zones shall be ensured. Safe access walkways for train attendants and the Contractor operation personnel under an energized 3rd rail up to stabled trains shall be provided.

It will be possible to safely prevent automatic train mobilization in any stabling or stop position as the Metro personnel approaches or boards the train.

The train timetables are described in detail in para. 4.4.1.

TECHNICAL DESCRIPTION AND SPECIFICATIONS**4.3.1.6 Back-up trains**

The Contractor shall see that a train is permanently stabled in the Train Stabling Area of the Depot as a back-up train that will be used in the event of train failure. Moreover, stabled trains during off-peak hours shall be used as back-up trains for service during off-peak hours. Back-up trains shall be clearly defined by the Contractor in the daily timetable. Back-up trains shall have undergone cleaning and shall automatically undergo tests on a daily basis to ensure their suitability for operation. If back-up trains are utilized to support revenue service, then the manual operation operator may be required to intervene in order to handle and position additional back-up trains.

4.3.1.7 Trips with service trains and/or auxiliary vehicles on the Lines

Trips with service trains and/or auxiliary vehicles for operation reasons shall be normally effected beyond normal operating hours (engineering hours). Service trains and/or auxiliary vehicles shall be equipped with ATP devices similar to the ones intended for passenger trains. Service trains and/or auxiliary vehicles shall be possible to safely operate in Supervised Manual Mode (SMM) between two passenger trains in ATO during normal operation hours.

4.3.1.8 Station operations

The supervision of the station and the monitoring of the station's surrounding area by the Contractor constitute significant operations in relation to passenger safety. Supervision must be automated to the greatest extent. The Closed Circuit Television System shall support the monitoring of the surrounding area of the station. For passenger information purposes, clocks, information boards and loudspeakers have been installed in the platform. For more information concerning the operation of the station, see the Project Log § 2.8.6.

Platform Screen Doors (PSD)

For safety reasons, reasons related to passenger service and for increased network operability, Platform Screen Doors separate the area of the tracks from the platform area. Trains and PSD have the same door opening span. The train front cab is located at the end of the platform in such a way so that the train doors are fully harmonized with the location of the PSDs. The maximum tolerance in the stopping accuracy between the opening of the PSDs and the train doors is $\pm 0.3\text{m}$.

All train doors operate simultaneously and are synchronized with the PSD system. As soon as the train stops at the required position, door opening is activated and train doors and the PSDs open in full synchronization. Door closing is simultaneous. An acoustic and visual warning for passenger safety shall be emitted. If an obstacle is present in any of the doors, the relevant doors shall remain open until the obstacle is removed.

If a train door must remain locked to prevent its use, the corresponding doors of the PSD system in the Stations shall be also automatically removed. In the event of PSD system door failure, the corresponding train door will not also operate automatically.

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An emergency control panel has been installed in all platforms to ensure manual control and PSD supervision in the event of train control system failure. Doors at platform ends ensure protection against tunnel access. Any unauthorized tunnel access through the doors at the platform ends or any platform door opening in the event of emergency shall activate the IDS alarm system in the OCC. Train entrance in platform sections or train departure from the station platform is automatically prevented when the alarm at the doors at the platform ends or at the doors in platforms in emergency condition has been activated. The OCC is capable of ignoring these alarms and proceed with the operation of the trains.

Platforms

The platform length in underground stations is 60m. Every platform shall be equipped with central Emergency Consolidated Units (ECU) with communication features for communication between the passengers and the Station Master Room or the Emergency Control Room (ECR). These units are also equipped with buttons for train stoppage in the event of emergency. When passengers make a call, the corresponding screen of the Closed Circuit Television System in the OCC is automatically activated ensuring views of the platform. An automatic telephone, a traction power off button and an intrusion detection system for the doors at the platform end are also installed at the platform ends for use by the personnel.

Station opening and closing

Approximately 30 minutes before passenger entrance in stations is allowed, the Contractor station personnel shall check the station equipment operations. At the end of the revenue service of the system, stations shall be checked by the Contractor to ensure that no passengers are inside the trains before the station personnel closes the station for the public. Roller shutters shall operate both from the inside and from the outside of the station. The aforementioned operations shall be available 24 hours, 7 days a week. However, these operations shall be available for the public during the operation hours.

Ticket Office

In all stations, provision is made for a manual ticket sales counter (ticket office – room 2.2) with a locking door. Security devices and cash drawers shall be provided. Ticket offices in all stations shall be manned by the Contractor on a daily basis (7 days a week) between 07:00 to 19:00, while it shall be possible for AM to change their opening hours. The appropriate security devices shall be made available, such as intrusion detection devices, intrusion alarms and Closed Circuit Television System.

Fare Collection

Fare Collection shall be carried out at the care of the Contractor (see chapter 8). Stations shall be equipped with an Automatic Fare Collection System (AFC) that will accept cash and smart cards for issuing a ticket.

In all stations full cash boxes and cash cassettes shall be stored in vaults in a guarded room, usually in the Automatic Ticket Issuing Machine (ATIM) room. Cash vaults shall be transferred in the cash counting room of the Administration Building at the Depot and shall be emptied there.

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Automatic Cash Counting Equipment has been installed providing cash sorting and counting, arrangement in bags and coin preparation for transportation to the Bank. Cash cassettes shall be kept separately from the coins in a highly protected area. Cash counting shall be carried out without human intervention, with no contact whatsoever between operators and coins.

The Contractor shall organize safe transportation of the collected fare from the cash counting area to the Bank using vehicles.

The Contractor shall incorporate in the Annual Review Report remarks and suggestions on the fare policy.

4.3.2 Downgraded Operation Mode

4.3.2.1 General

The Downgraded Operation Mode is defined as “any deviation from normal operation due to sudden incidents or from scheduled railway activities” and aims at maintaining the required capacity and at ensuring fast and reliable information for the passengers.

The Contractor shall receive together with the Project Log (see §2.8.6) all the available information and the relevant documents concerning the Downgraded Mode of Operation, in order to prepare the corresponding Downgraded Mode of Operation Procedures, as required, and to proceed with their submission for approval. Further to their approval, the above shall be implemented and established, if it is ascertained that they operate properly and that they meet all the requirements.

These procedures shall be utilized in order to advise the personnel in relation to the actions required for tracing, managing and reinstating established failure cases that may arise, in line with the stipulations of para. 9.1 Quality Management. The Downgraded Operation Mode shall describe in detail the fault management philosophy that the Contractor will follow in the event that downgraded operation has been noted. Moreover, detailed description shall be made of specific plans which must be used when downgraded operation modes have lead to the closure of a line section, including the use of bus lines.

In the following sections the basic principles that the Contractor will apply in the revision, resubmission, implementation upon approval and in the establishment of both the Procedures and the Downgraded Operation Plan are described.

4.3.2.2 Failures and line blocking

Common incidents and events which can be considered as downgraded modes of operation are presented here below, without however being limited to them:

- Train does not stop at the right position,
- Train does not depart from the station,
- Train blocked in the line due to train failure,

TECHNICAL DESCRIPTION AND SPECIFICATIONS

- Train blocked in the line due to unsuitable passenger action,
- Failure of the Automatic Train Control (ATC) equipment (Central, Wayside or On Board),
- Traction power failure.

In the event of a fault, the Metro system has been properly designed so as to immediately react to any interruption of the provided Services by specifying alternative service scenarios (e.g. closure of a line section, reduction of train speed, reduced number of trains on the line, single track operation).

It shall be the responsibility of the operators in the Operators Room to use the tools provided by the control systems, so that it is ensured that, where possible, services will continue to be provided.

Together with the Project Log (see §2.8.6), the Contractor shall take delivery of the Procedures, which he shall revise, if required, shall develop new ones, shall resubmit them to AM for approval, shall implement and establish the Procedures required, so as to ensure the analysis of responsibilities and actions which will allow his personnel to address all the identified cases of failure. In certain cases, these types of Procedures entail special operation safety issues, which shall be integrated and softened in the framework of the Procedure.

4.3.2.3 Unavailability of the Automatic Train Protection (ATP) System

In the event of failure of the signaling system and unavailability of the ATP system even in “Permissive Mode”, the train attendant shall bypass the ATP system and shall activate the “Manual Forward Movement Mode”. This mode does not affect the signaling system, while it shall not be possible to release the braking system in the event of emergency through the ATP system. The train propulsion system shall limit the train speed at 15 km/hour.

4.3.2.4 Reduced Performance Modes

If track sections are not available or trains are not in a position to move, the Contractor shall implement reduced performance modes. Depending on the case, preset trips with the relevant driving strategies shall ensure optimum passenger service. These trips, which replace standard trips are set and described in the Operation Designs, which will be made available to the Contractor with the Project Log (see §2.8.6). The Contractor shall review them again and shall submit them for approval.

In the framework of the Reduced Performance Modes, it will be possible to proceed with the following actions. More precisely:

- Reverse in any crossover on the line and
- Operate in single track (see § 4.3.3.4).

Reduced Performance Modes shall be applied in Automatic Mode and in Supervised Manual Mode (SMM).

TECHNICAL DESCRIPTION AND SPECIFICATIONS**4.3.2.5 Single Track Mode**

In this operation mode, trains move only towards one direction in a specific network section, usually between turnouts. The Single Track Mode shall be activated in the event of maintenance or occurrence of an incident on the tunnels. This operation mode covers the case when line sections are not available due to immobilized trains, switches out of operation or due to other unexpected service interruptions. In these cases, all trains shall operate in single track until they receive a new instruction from the OCC.

4.3.2.6 Downgraded Operation Mode and emergency operation mode strategies

The basic philosophy that the Contractor shall apply in fault management is presented herebelow:

- Train attendants and Station Masters shall be responsible to manage faults on site, under the guidance of the operators in the Operators Room;
- The operators in the Operators Room shall be responsible to centrally manage downgraded modes of operation;
- Technicians shall be responsible to handle the calls from the Operators Room in order to monitor failures and restore failed equipment;
- Procedures shall guide the personnel on failure management;
- The Downgraded Operation Mode Plan shall provide advice to the Line Controller on alternative services or on any other eventualities which might arise due to a blocked line section;
- Train operation management on the entire System in the event of failure lies within the responsibility of the Operations Superintendent in the Operators Room.

The Contractor shall develop detailed Procedures which provide guidance to the personnel in the execution of the required actions to address specific failures and emergencies in a safe and efficient manner. However, due to the fact that Procedures are generally focused on the actions related to a specific incident, they do not offer guidance in relation to the actions required for the continuation of the provided services in the non-affected sections of the System. In this way, the correct application of the Procedure per se shall ensure that the incident shall be safely addressed, however, passenger transportation could be seriously disturbed. The Downgraded Operation Mode Plan provides guidance to the Line Controller on alternative services or eventual actions which could be undertaken in the event of blocked line section. The Line Controller may also make several settings using the Automatic Train Control (ATC) equipment. Thus, in the event of a delay or failure, the above personnel is expected to address the situation by utilizing the experience and the knowledge acquired by the System and the Downgraded Operation Mode Plan.

For the management of the entire Metro system, the Automatic Train Control (ATC) system offers the Operators in the Operators Room the equipment which ensures train management in the event of a delay and resuming of train operation once the delay has

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been restored. However, not all failures are identical and there are often many alternatives as to how an Operator in the Operators Room can react in order to address a delay. In addition to the above, it should be noted that high frequency automated trains require Operators to react in a safe, quick and efficient manner in order to prevent the escalation of a delay.

4.3.2.7 Downgraded Operation Mode Plan

Together with the Project Log (see §2.8.6), the Contractor shall also take delivery of the Downgraded Operation Mode Plan that he will revise, if required. The Contractor shall resubmit it to AM for approval, while he is required to implement it and ensure its establishment. The Downgraded Operation Mode Plan shall include the following information, which is used as training exercises and as directions for the persons in charge in the event of failure:

- Scheduled alternative services which must work during downgraded mode of operation,
- Scheduled response to address crowded stations,
- Information flow to passengers using central control equipment and all the resources of the outdoor modes of transport,
- Requirement for the submission of reports or request for the provision of assistance by third resources/ authorities.

4.3.2.8 Emergency Incidents

Failure Management

An Emergency Plan has been prepared for the Base Project as part of the System Operation Design to address the eventuality of failures and to ensure the implementation of measures aimed at eliminating any impact on revenue service. This Plan shall be made available to the Operator together with the Project Log. The Operator shall revise and modify it, while he shall extend its scope of application to that of the entire project (Base Project and Extension to Kalamaria) and resubmit to AM.

The Emergency Plan provides detailed information with regard to the most efficient ways available for setting the Metro System back to normal operation due to failures causing problems to automatic revenue service. The Plan examines not only alternative operation scenarios but also the possibility for manual intervention, which may be deemed necessary prior to or in combination with the alternative operation mode to be implemented.

The Plan also states in detail the procedures, means and/or alternatives to be used for safe passenger evacuation for trains stopped between stations. The Plan presents train evacuation conditions in supervision mode when the life of the passengers is not in danger, as well as evacuation conditions in supervision and in non-supervision mode when the life of the passengers is in danger.

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Finally, the Plan includes a risk assessment, in order to assess the eventuality and the consequences of the various possible failure conditions identified.

The time period required for switching between the system's failure condition to a fully automated operation mode shall not exceed 30 minutes upon repair.

In the event of an incident, a major or minor one, AM shall be advised immediately and shall assess the need to create an Incident Investigation Committee to investigate the incident. The subject Committee shall be comprised of AM employees, employees of the Contractor and any associated third parties (e.g. THeTA). The Committee shall submit its report to the management of AM and to the Contractor for the eventual introduction of measures or actions.

Passenger Trains Pulling/ Evacuation

In the event of a failed train, the next train will pull or push the train based on the approved procedures and method statements. During Phase A Operation, i.e. during the operation of the Base Line only, the train driver of the train to push or pull the train shall be guided by the instructions of the Line Controller given through the radio system. The defective train shall be pushed to the next shunting track. Passengers shall have to evacuate the train in the next platform.

In the event of passenger train evacuation, the double-length train must stop twice in the next platform; once for the train that has suffered damage and once for the train pulling or pushing the train.

In the event of the evacuation of trains stopped inside a tunnel between stations, all operations on the lines where passengers can walk must stop. Before train evacuation inside the tunnels starts, the traction power must be cut, the 3rd rail must be earthed either through a portable short circuiting device or through a short circuiting device on the train, while a blocking device on the point machines must be placed.

The methodology developed for the evacuation of passengers from tunnels and stations shall be made available to the Contractor through the Project Log for revision, if required, and then for resubmission to AM for approval.

Automatic Train Operation (ATO) Failure

During Operation Phase A, i.e. during the operation of the Base Line only, if the driverless ATO fails, the train attendant shall communicate with the Line Controller, who will instruct him on whether the train can continue its journey in ATP mode (supervised manual operation) or in Permissive Mode and on how far it can go.

During Operation Phase B, when Kalamaria Extension will be commissioned and when an Automatic Coupling System is anticipated to be installed in the 15 new trains, the Automatic Train Coupling System shall respectively be extended also to the 18 trains of the Base Project, and thus coupling shall be ensured for the entire network of the Thessaloniki Metro.

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Traction Power Failures

In the event of traction power failures, all operation stages shall be coordinated by the Operation Supervisor, the Line Controller, the Technical Installations Controller and the Train Attendant of the Contractor.

Basic information related to the affected track section and the anticipated duration of the failure are deemed necessary for determining further operation steps.

In the event of traction power failure, the Contractor must block the affected tunnel sections. The train attendant shall advise the passengers on the failure through the train announcement system.

If the train cannot approach the next platform, the train attendant shall make sure that no one leaves the train until the Operation Supervisor instructs activation of the evacuation procedure.

Closure of the entire Line

In the unlikely event that the entire Line needs to be closed, the Contractor shall cooperate with AM in order to ensure passenger transportation with buses to the extent possible.

In the event of scheduled line closure, the Contractor shall inform passengers on time through the appropriate means on the closure of the Line and on the alternative travel options. In the event that the closure of the Line was not scheduled but was rather imposed due to reasons of force majeure, the situation shall be addressed as provided for in the approved procedures.

4.3.2.9 Investigation of incident

The operation scenarios – as regards the downgraded operation mode – that the Contractor should follow are presented here-below. The details of the subject scenarios and the consequent actions are recorded in separate documents, which shall be delivered to the Contractor through the Project Log. Having assessed same, he will proceed to corrections – if any – and will submit them to AM, in line with paragraph 9.1.

Scenario Code	Scenario Title	Description
MF1	Program Reset after an Extensive Delay	This scenario describes the System reset related procedure, after an extensive delay. The subject procedure includes the resetting of the proper distance between trains and the programming of trains' resetting in operation.
MF2	Failure in the Operation Control Centre	This scenario describes the actions that have to be undertaken in case the Operation Control Center fails to communicate with the Line, due to several reasons.
MF3	Point Machine Failure	This scenario addresses the case in which any point machine of the Signaling system fails.

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Scenario Code	Scenario Title	Description
MF4	Failure in the TETRA Radio Communication System	The scenario addresses the case in which the Radio Communication System (TETRA) fails. Such an incident would result in communications loss.
MF5	Train Salvation by a Tractor Vehicle	This scenario describes the procedures for the salvation of a train by a tractor vehicle in case the subject train has stopped along the Track.
MF6	Track Circuit Failure	This scenario describes the procedures followed in case there is a report about a circuit occupation along the Track (e.g. a track circuit is shown occupied, but there is not any identifiable train number (identity) within the same section of the track). Note: This scenario also includes the case in which there is a Train not identifiable in the area of the circuit shown as occupied.
MF7	Reset after a Zone Controller (ZC) failure	This scenario describes the procedure for addressing a total failure (double failure to the existing system of architecture 2 out of 3) of the zone controller (which means that all trains in the section of the Line controlled by the Controller of the Zone that failed will come to a standstill).
DF1	Salvation of a Train that Failed within the Depot	This scenario addresses the case in which a Failed Train within the Depot is identified.

Table 5 – Operation scenarios under a downgraded operation mode

In all cases, in which a switching to the downgraded mode of operation is effected, the Contractor shall proceed to an incident investigation in view of:

- Seeking the cause that led to the aforesaid switching.
- Identifying the consequences on the passengers and the system and ascertaining whether the incident has been addressed in an appropriate manner and whether the procedures to address that incident were followed in such a way so as to cause the least damage possible;
- Determining the preventive actions so as to avoid re-occurrence of a similar incident or to limit the deriving negative consequences.

4.3.3 Emergency Operation

4.3.3.1 General

An emergency situation can be characterized as an incident, leading to personnel or passengers injuries or – in extreme cases – even to death. Emergency situations shall

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be addressed by the Incident Management Person in Charge on the part of the Contractor and shall require the presence of external emergency services / authorities, while they may result in the closing of a part or of the entire metro system.

The Emergency Operation shall involve planning and management of failures by the Contractor, including the performance of extensive drills to be attended by multiple agencies in an effort to address emergency incidents involving trains.

Incidents deemed to be falling under emergency situations are as follows:

- Fire;
- Collision of trains;
- Derailment;
- Electrocution;
- Person involved in an incident concerning trains/passengers;
- Building / Structural breakdown;
- Explosion;
- Terrorist action / threat;
- Floods and other critical adverse weather conditions;
- Serious attack on Personnel or Passengers.

The personnel shall be trained in order to address emergency situations, through practice in related courses and emergency drills.

The Contractor shall develop the Emergency Plan and the related Procedures for all recognized emergencies, which shall be submitted for approval AMAM prior to the Revenue Operation of the Base Project and, subsequently, prior to the Revenue Service of the Extension to Kalamaria, in case they need to be revised.

4.3.3.2 Contacts with Emergency Services

During emergencies, the Person in Charge of Incident Management shall inform AM immediately and then, he shall communicate and request assistance, as required, from the following external emergency services / authorities:

- Fire Department;
- Police, Special Antiterrorist Unit (EKAM – Greece);
- Rescue Services, Special Unit for Disasters (EMAK - Greece);
- National Services;
- Hospitals, National Emergency Aid Center (EKAV – Greece);
- General Secretariat for Civil Protection;

TECHNICAL DESCRIPTION AND SPECIFICATIONS**4.3.3.3 Addressing Emergencies**

The general Strategy for Emergencies to be compiled by the Contractor shall be adopted in compliance with the scheduled response procedures used by the current external emergency services already. The scheduled response to emergencies involving the metro system shall be developed by the Contractor in coordination with the external emergency services and shall be described in detail in the Emergency Plan through Rules / Regulations and Procedures concerning train attendants and the persons responsible for the entire Operation Control Center, that will be prepared by the Contractor in coordination with the external emergency services.

The OCC shall constitute the central point of emergencies' management and control for the Contractor. Train attendants shall provide their assistance to the emergency services on site the project in the framework of managing emergency situations. The Plan, Rules / Regulations and Procedures shall clearly define the responsibilities' and instructions' lines prior to the arrival of the external emergency services.

The emergency plans for any alternative services - that may operate in case of an emergency - shall be developed by the Contractor in the framework of the emergency procedures and plans.

The provision of regular training courses by the Contractor, using the Automatic Train control (ATC) simulator, shall secure that his personnel will acquire the experience and knowledge required for them to address any emergency situation. Emergency drills shall also be performed on a regular basis again with the participation of the emergency services.

The following operation scenario shall be implemented by the Contractor in emergencies in the automatic operation mode:

- Option for alternative train reversing at the terminal stations;
- Reversing in the middle of the railway line between the New Railway Station and every reversing point of the line (Sintrivani and Analipsi) by using both tracks;
- Reversing in the middle of the railway line and at any point of the crossovers where the option for train reversing is provided (Sintrivani, Analipsi, Nomarchia) by using both tracks;
- Single Line Running in each track between the following crossover points:
 - New Railway Station and Sintrivani
 - Panepistimio and Analipsi
 - 25th Martiou and Nea Elvetia
- Other operation scenario, where deemed necessary, e.g. Shuttle Service in a single line running mode.

In emergencies, if a failure occurs in the automatic operation system, the train shall run manually from the Driving Mode to the Emergency Mode in lines where the Supervised Manual Mode (SMM) is used. A train under the SSM mode of operation shall

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accomplish its mission only up to the next terminal station. A back-up train shall replace the failed train. Passengers are allowed to remain within the train running under the SMM mode until it reaches the Terminal Station.

Under the SMM mode of operation, the train driver must manually control both the acceleration and braking and give the commands about the train doors' opening and closing. In addition, the train driver shall take command of the operation of the driver's alertness control device. However, the doors' unlocking shall be safely carried out through the ATP system.

4.3.3.4 Single Line Running Mode

It concerns the mode of Operation in which trains are running only towards one direction in a specific section of the network, usually between railway crossovers. It shall apply in case of maintenance or of an incident within tunnels. The subject mode of operation applies in sections of the line that are not available due to stationary trains, due to failed switches or other non-anticipated operation failures. In these cases all trains shall run in a single line until they receive a new command from the OCC.

4.3.3.5 Emergency Incidents

As regards **Failure Management** and **Towing (Pushing Forward) / Evacuation of Passenger Trains** see relevant paragraphs in § 4.3.2.8 of this document.

Incidents in a Station

The Signaling Emergency Push Buttons (SEP) existing in every platform shall modify the Automatic Train Protection System, so that the close-by trains can safely come to a standstill, if so required. If this system is used, the alarm shall be activated in the Line Controller Console, in the workstation of the local controller and in the Station Master Room, where the Signaling Emergency Push Button (SEP) has been set in operation. The system operates in such a way so that, after setting in operation the Alarm Mechanism of the Signalling System, the train applies the brakes through the normal braking system, if the distance from the platform allows the train to safely stop before the platform, or through the emergency braking system if the train is at a very close distance from the platform.

Emergency Alarm within Trains

Trains are equipped with emergency alarms within their vehicle compartments. If a passenger sets the pertinent device in operation, the communication with the OCC's Stations' and Trains' Controller shall commence automatically and the CCTV images for this specific vehicle compartment shall be transmitted to the Station and Train Supervisor.

If the train is under a downgraded operation mode and the Emergency Driving Position (EDP) has been activated, the communication shall be carried out through the activated EDP. However, the OCC shall receive the alarm signal and shall be able to have an audio communication too.

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Station and Tunnel Evacuation

Removing passengers from one or more stations can be deemed necessary for several reasons, such as fire in a train or on a platform or during the train's arrival at the platform, bomb threat, power failure, dangerous materials that place passengers at risk, etc. Evacuation plans and related procedures have been compiled for the Base Project and the Extension to Kalamaria for each Metro Station and each tunnel section and shall be provided to the Contractor along with the Project's Log (see §2.8.6) for revision purposes – if required – and re-submission to AM.

If a fire breaks out in a train, the fire detection system within the train gives the pertinent indication to the OCC about the side of the train that has been put on fire. Based on this information, the fire scenario of the ventilation system shall be automatically selected by the BACS central system. The removal of passengers through the tunnel and the instructions for the evacuation shall be given by the Train Superintendent further to the relevant communication with the OCC. The tunnel walkway shall be utilized as the primary evacuation route, along with the track bed. Secured shall be the safe access from the trains to the walkway and the track bed, as well as the safe access from the track bed and the tunnel walkway to the station platform.

As soon as the necessity to evacuate the station is ascertained, the Station Master shall close all doors and make announcements via the public address system about the station closure and the need for the removal of passengers. The Line Controller shall suspend all trains service passing by the subject station. All emergency announcements shall have been pre-recorded by the Contractor in Greek and in English.

In order to expedite the passengers' evacuation, the Station Master shall stop the operation of all escalators leading into the station and shall reverse their direction in view of assisting the evacuation. Persons wishing to enter the station using the escalators shall be informed by the Contractor's personnel and their entrance into the station shall be prevented. In case passengers "have been trapped" due to blocking of the escape routes, the Station Master, via the public address system, shall give instructions about the closest emergency exits.

Once the incident is addressed, this information shall be communicated by the Contractor to the passengers and the personnel through the right channels. The Contractor shall assess if it is necessary for certain arrangements to be made for the personnel service sheets to be revised and for the rolling stock to be re-distributed.

In view of the passengers' exiting the trains and their moving into the tunnel, they should be at first informed by the emergency lighting systems into the tunnel and the public address system of each train about the direction they should follow and the details of the evacuation process and, subsequently, they shall be directed to the selected station or to the connecting points of the tunnel with the shafts, which might be closer (e.g. Kritis shaft or Pontou shaft), probably with the assistance of the Contractor personnel.

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4.3.3.6 Incident investigation

The following table includes the operation scenarios that the Contractor should follow in case of emergency. The details of the scenarios and the consequent actions are recorded in separate documents, which shall be delivered to the Contractor. Having evaluated same, the Contractor shall make corrections, if required, and shall submit them to AM, in line with paragraph 9.1.

Scenario Code	Scenario Title	Description
ME1	Tracking Unit Failure (CC)	This scenario deals with the Tracking Unit overall failure (double failure in the architecture's system 2 out of 3).
ME2	Activation of the Emergency Brake Handle on-board the Train	This scenario describes the procedure that follows the activation of the Emergency Brake Handle on-board the Train.
ME3	Activation of the Emergency Door Opening Handle on-board the Train	This scenario describes the procedure that follows the activation of the Emergency Door Opening Handle on-board the Train.
ME4	Evacuation along the Main Line and a Station	This scenario describes the evacuation procedure that shall be followed in case the train has been stopped between two stations along the main line or at a station in case of an emergency or after a critical failure. All procedures shall be configured in such a way so as to ensure passengers' protection against train movements and electrocution during the evacuation process, as well as the system's reset further to the evacuation of the train positioned in a section of the line between two stations.
ME5	Fire or smoke Detection	This scenario describes the response of the System in case an alarm is reported to the fire detection system due to smoke or fire in a Station or on-board a Train.
ME6	Activation of TCR Devices along the Line	This scenario describes the evacuation procedure that shall be followed in case of activation of the TCR Devices on a Station Platform or along the Main Line (in this case the emergency-exit shafts along the tunnel are also included).
ME7	Reduced Performance of Traction Power Supply or Total Failure of the Traction Power Supply System	This scenario deals with the total failure of the traction power supply system, due to several causes. In these cases, the traction power supply system can ensure reduced operation of the system, within certain limits.
ME8	Giving Access to Operators and Maintenance	This scenario describes the actions that must be followed by trained operators and maintenance personnel in view of ensuring the permit to access the

TECHNICAL DESCRIPTION AND SPECIFICATIONS

Scenario Code	Scenario Title	Description
	Personnel to the Track Area in case of Emergency (Permit to Access the Track Area)	Track and move to the location where an emergency / failure or a need for maintenance emerges.
ME 9	Detection of Non-Scheduled PSD Door Opening and Failure of PSD Doors	This scenario deals with the non-scheduled PSD doors opening in case of the train's standing in a station at the anticipated standing point along the platform. Note: This scenario also includes the cases in which the Train enters the platform, it leaves the platform or it is outside the platform area.
ME10	Operation Control Centre Evacuation	This scenario describes the evacuation procedure that has to be followed in case of an incident in the Operation Control Center.
ME11	Train Salvation Operation	This scenario describes the procedure followed by a Train for the salvation of a Train that has failed along the Line; the first train shall either push or pull the failed train to the Depot for it to be repaired.
ME12	Intrusion Detection System (IDS) in the Tunnel	This scenario describes the procedure that comes as a result from the detection on non-authorized access (intrusion) to the tunnel, likely through a certain station.
DE1	Fire incident in the Depot	This scenario describes the procedure to be followed to deal with the smoke or fire reporting in the Depot by the fire detection system. This scenario describes the steps to be followed for the subject area to be evacuated and for ensuring that the necessary measures have been introduced.
DE2	Activation of the Emergency Power Cut-Off Devices in the Depot	This scenario describes the procedure that comes as a result from the Activation of the emergency power cut-off devices in the Depot. The activation of the subject leads to the power cut-off and to the immobilization of the trains located in the subject area.

Table 6 – Emergency Operation Scenarios

For all cases in which the need arises for emergency operation, the Contractor shall proceed to incident investigation in order:

- To seek the causes that led to the switching to emergency operation.
- To identify the consequences for both passengers and the system and to examine whether the method followed to deal with the incident was the appropriate and whether the procedures implemented to this end resulted in the least possible damage.
- To identify the preventive actions, so that no similar incident happens again and that the negative consequences that may derive can be limited.

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In the event of an incident, a major or minor one, AM shall be advised immediately and shall assess the need to create an Incident Investigation Committee to investigate the incident. The subject Committee shall be comprised of AM employees, employees of the Contractor and any associated third parties (e.g. THETA). The Committee shall submit its report to the management of AM and to the Contractor for the eventual introduction of measures or actions.

4.3.3.7 Resuming of normal operation

Once the necessity for emergency operation ceases, the Contractor shall notify AM on the fact that normal operation of the system can be resumed. Resetting the system under normal operation mode shall be effected once AM provides its pertinent written release.

4.4 Service Scheduling and Fleet Size

4.4.1 Timetable for Trains

The Contractor shall set the trains in operation for about 19 hours per day. A normal day of operation shall consist in several levels of trains in service, so that adequate headways be ensured and the passengers requirements be met within a specific time period in the daily train service. The Daily Service Timetable is included in **Table 3**.

Within the prescribed parameters concerning headways, the Contractor shall be responsible to draft the schedule of operation hours.

The actual train service timetable, including departures from all platforms, is mainly required for the ATC system, so that the latter may perform automatic train control functions ensuring that trains are evenly allocated in headways and regulate trains arriving earlier or with delay.

Passengers shall be informed by the Platform Information System about the time they have to wait for the next train to arrive. The waiting time shall be automatically calculated by the ATC, depending on the location and speed of the trains, so that the passengers are at all times informed about the frequency of the trains at a specific point of time.

Increasing and decreasing the number of trains in service for the provision of the required headway shall be referred to as operational mode transition. The transition is determined in such a way that the required headway ensures entry of trains in the line within the time required. Thus, the transition is always effected prior to the time determined for decreasing headway and after the time determined for increasing headway.

At the initial phase of commencement, the operation of trains shall be conducted by the Contractor with a reduced frequency.

TECHNICAL DESCRIPTION AND SPECIFICATIONS**4.4.2 Determination of trains timetable**

A fixed timetable for trains' is required for the ATC system to conduct automatic train control functions. The fixed timetable will include trains' interstations running time, their staying at stations, their reversing and the hours trains are in service and out of service. These parameters can be set either by the trains' timetable or by the OCC Responsible staff when trains are in service.

All trains' timetables will be selected by the Contractor and will be integrated into the operation with the use of the existing software.

Processing of the current software will produce a data record that will be free of syntax and execution time errors. In addition, the subject software must trace overlapping travels (trips) that will have to be resolved prior to the creation of the data record. Once the Contractor ascertains that the new trains' timetable is free of errors - and only then – the pertinent authorization will be provided for it to be used for the system's operation.

For errors to be resolved in an expedient way, changes in the trains' timetable will be categorized in "Minor" and "Critical" changes.

Minor changes

This category will include a revision (modification) of the trains' timetable that will not significantly affect any of the existing passenger travels (trips). These minor changes will mainly consist in a small-scale coordination of the trains timetable, which could include the following:

- Trains identity
- Trains in service or out of service transition periods
- Changes in the waiting time in individual stations.

Critical changes

This category will include a revision (modification) of the trains' timetable that will significantly affect all existing passenger travels (trips). These changes could include the following:

- Increase or decrease of service headways at all times during the day
- Scheduled closures or temporary changes in the trains' timetable due to maintenance activities. Usually, this will affect the system's operation during night-hours or over the weekend
- Headway reduction in special circumstances (e.g. sports, music concerts events, etc.), in which it is anticipated that passenger loads would be increased, as compared to the usual ones, from one hour before the event up to one hour after the scheduled event.

Failures and consequences to derive from each one of the changes categories will be presented in indicators. (see §9.4).

TECHNICAL DESCRIPTION AND SPECIFICATIONS**4.4.3 Passenger Capacity of the System**

The calculations for the headway between trains at a given time of the day are based on the anticipated passengers' volumes.

The prediction for the initial phase of the line commissioning is 15,600 passengers per hour per direction (pphpd), the maximum capacity being 18,000 pphpd.

The minimum required headway during the initial commissioning phase of the Base Project Line is 150 seconds (use of 18 trains). Moreover, the system is capable to achieve a minimum operational headway of 90 seconds, as required by the Specifications of the Contract, further to the delivery of 15 additional trains.

Based on the provisions of the project specifications and the provisions of document entitled "Analysis of the Viable Operational Strategies" (document number 1G00GE410A703), the passenger capacity of the system is respectively as follows:

- Headway: 150 seconds, maximum capacity 10,800pphd
- Headway: 90 seconds, minimum capacity 18,000pphd.

4.4.4 Failure Repair Time Schedules

In order to deal with certain small delays of short duration in operation, changes will be effected in the time schedule while trains are "in service" by the Operation Controllers of the Contractor in the OCC Controllers' Room. These changes may include the following:

- Change of the train destination or use of alternative routes
- Short turn
- Non-automated routing
- Addition of extra trains
- Expansion of Services
- Normal Operation
- Temporary change of the dwell time in station
- Temporary change of the trains' performance level.

In case of a major delay, the Operation Superintendents will be capable to make manual changes in the trains' timetable so that train service may continue unobstructedly. However, the Contractor should also develop a limited number of train trips for repairing faults and dealing with failures in certain critical areas of the metro system. These train trips for repairing failures should be available for use by the Operation Superintendents in the OCC, so that train service may continue during a major delay. This way, the Operation Superintendents will be capable to manage certain faults, with the requirement for manual input of data being reduced.

TECHNICAL DESCRIPTION AND SPECIFICATIONS**4.4.5 Service hours, Travel Time and Dwell Time in Station****Service Hours**

The system is scheduled to operate for 19 hours/day, from 05:30 to 00:30 on a daily basis throughout the year, and from 05:30 to 02:00 during weekends (Friday and Saturday night). It will be possible for the system to operate on a 24-hour basis for at least three (3) days a week per week and for a time period of 2 consecutive weeks. The maintenance method will allow this kind of operation.

Time Table

The Daily Service Timetable shall differ among working days, except for Friday, Saturday, Sunday, Holidays and times when special events take place. The Daily Operation Plan is presented in para. 4.1.5.

When compiling the Timetable, the Contractor should take into consideration the layout of the two loops of the system (see paragraph 4.1). Determining the switching with return, for each train on a daily basis, should be effected in such a way so covered can be a similar length of the railway network per train and maintenance cycle.

As already pointed out in para. 4.1.5, during summer months and if the ridership is reduced, the Contractor may propose for approval by AM modified trips and keep the same vehicle/kilometres or a reduction to the payment-related availability may be effected for the specific month.

Time of trip

Annex E of this document presents the Speed – K.P. diagrams for the Thessaloniki Base Project and the Extension to Kalamaria.

The respective data lists will be provided along with the Project's Log by the Contractor (see paragraph 2.8.6), who will develop the respective unified detailed diagram for the entire Thessaloniki Metro system and submit same to AM for approval.

Dwell Time in Stations

The dwell time in a Station means the time that elapsed as of the moment the wheels of the train ceased their movement up to the moment they started moving again.

As regards the initial operation (service), the dwell time of the trains will be defined to 25 seconds in all passenger stations in both directions. The subject dwell time provides about 18 seconds for passengers' embarkation / disembarkation, along with the time required for the train and station PSD doors operation sequence.

In New Railway Station, Nea Elvetia and Micra terminal stations, the dwell time will be extended, as compared to the waiting time, which will be set based on the precise timing of each train and by the safety limit integrated into the operation time schedule.

During the trial run and at initial commissioning phase, the minimum and maximum waiting time in stations will be adjusted anew by the Contractor, taking into account the

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uneven distribution of passengers within the trains and in the platform areas, causing difficulties in the embarkation/disembarkation process.

Reversing Time

The precise reversing time of a train (paragraph 4.3.1.4) will be determined by the Contractor. It is stressed that the system is capable of supporting a 90-second operation.

4.4.6 Trains speeds

The average train service speed includes the embarkation and waiting time in stations, except the train reversing time in terminal stations. The commercial service speed of trains will be equal to or over 30 km/h for train circulation without time redundancy and 25 seconds of dwell time to both directions.

The maximum speed on line in operation under the ATC mode will be 80 km/h.

The maximum over-speed limit, for design preparation reasons concerning trains and equipment, will be 90 km/h.

The speed in the worst case scenario, i.e. the speed that a train can reach for a short time period, can exceed 90km/h and will be set by the ATC system.

The right speed restrictions in turns, crossovers or on special trackwork will be provided by the Contractor to AM along with the Project Log (see paragraph 2.8.6).

For train trips on track with a driver and without the ATP system in operation or for trains entering track sections leading to dead-ends without the ATP system in operation, the speed limit is 15km/h.

The speed limit for train stabling facilities and repair workshops is again 15 km/h.

The allowable speed limit of trains passing a station without stopping, with the Platform Screen Doors (PSD) – controlled by the CCTV - at platform level being closed, is 40 km/h.

4.4.7 Size of Fleet

Throughout the operation / cycle of operation of the system, trains composition will remain as is, i.e. 4-car trains.

Both ends of trains are equipped with an emergency driving position and automatic couplers. No train driver's cab is foreseen. The coupling procedure must be handled by the pertinent personnel (there is no Grade of Automation 4 Systems).

The Base Project train fleet (18 trains), combined with the 15 new additional trains, which are currently at the manufacturing stage, for the Extension to Kalamaria, will cover the required initial transfer capability, taking into account at least 450 passengers per train (5 standees/m²) at any point along the Line.

TECHNICAL DESCRIPTION AND SPECIFICATIONS**4.4.8 Vehicle/kilometers**

The overall vehicle/kilometers covered by each train and the average kilometers per train will be recorded and evaluated by the Contractor, who will regularly draft a relevant statistic report. In addition, an indicator has been compiled for monitoring the percentage in which vehicle/kilometers are covered (para. 9.4.3).

4.5 Operation of all E/M and Railway Systems of the Line

It is stressed that the Contractor is obliged to adhere to the minimum operational requirements of all systems, as these systems were approved by the construction and systems' contractors and handed over to the Contractor through the Project Log (see paragraph 2.8.6).

4.5.1 Ventilation

The ventilation systems of Tunnels and Stations include the following:

- Fans' facilities in the ventilation shafts of each station. There are two ventilation shafts in each station (one shaft at each end of the station); therefore, there are 26 ventilation facilities in all 13 stations. Each facility includes two tunnel fan configurations, along with the required motorized dampers intended to select air flow movement, either via free air-flow to the atmosphere or via forced air-flow through the fans from/to the one single-track tunnel or from/to both single-track tunnels.
- Exhaust air fans facilities (OTE) over each track in each station contributing to the tunnels' and stations' ventilation.
- Intake air fans facilities (SAF) in each platform of each station providing ventilation to the public areas of stations.
- Intake and/or exhaust air fans facilities providing ventilation to the technical rooms of each station, shaft or recess of the tunnel.
- Jet fan facilities required on the roofs of the tunnels and, especially, at the points where the two single tunnels are unified to form one tunnel for the installation of the railway turnouts, as well as at the tunnels of the eastern and western forestations.
- Intake and/or exhaust air fans facilities providing ventilation to the personnel areas of each station.

The systems are fully coordinated with the BACS system and operate under both normal and emergency conditions.

4.5.2 Heating / Ventilation / Air-Conditioning (HVAC)

The systems provide heating, ventilation and air-conditioning (HVAC) in personnel areas and in special technical rooms in stations and in the depot buildings, in the Operation Control Center (OCC) and the administration building. The HVAC systems ensure the

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required temperature, the fresh air intake, as well as the noise levels during operation, etc.

In special areas within the depot (e.g. Operation Control Center (OCC) – central room, electronics workshop room), except temperature control, humidity control is also ensured.

The HVAC facilities include fans, air-conditioning units, chillers, heat pumps, heating plants producing hot water, local fan coil units (FCU), the bases for all above items (either concrete or metal bases), motorized dampers, sound attenuators, air-ducts, air-duct supports, flexible couplers, fasteners, curves, air-duct insulations, trays, louvers, inlets, air-filters, return dampers, air flow control dampers, fire dampers, electrical panels for fans and power supply and control cabling layouts. The subject facilities also include chilled water or air-conditioning fluids pumps, expansion tanks, pipes' buffer tanks, pipes and tanks insulations, water treatment (via chemical process) systems, provisions and drainage piping configurations, heating sensors, thermostats, and other fittings.

These systems are fully coordinated with the BACS system.

4.5.3 750 V DC Traction Power System

The traction power system is based on rectifier substations of 750 V DC output rated voltage that feed the line through the 3rd rail. The substations, installed in stations, are fed with 20KV by the city's electric power network, through independent supplies feeding each sub-station. The system shall cover in full the rolling stock fleet using an air conditioning system at the specified headways.

The rolling stock is fed via the 3rd rail. The third rail is a bimetallic structure made of aluminum which is in the main current conductor, while the lower part of the third rail head cross-section is made of stainless steel in order to minimize wear.

Along the line, there are tunnel recesses accommodating circuit breakers' equipment, according to the line electrical sectionalization design and based on the points where the main line crosses eventual branches of its future extensions.

The traction current removal (TCR) system can cut off the traction current at a local level, in case of fire or other emergencies. Each station accommodates a TCR system with a TCR button installed on the headwalls of each platform (4 per station) and a button installed in the SMR. The traction current removal units in locations within tunnels are installed every 100 meters. In the boundaries between two third rail sections and in crossovers, there are separate units, one next to the other, in order to remove current in separate sections of the third rail.

A "General Release" (GR) System has been also installed to cut off the 20kV supply from the OCC to all Traction Substations of the Metro Line, if so required.

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4.5.4 20 kV AC Power Supply

20 KV medium voltage systems supply power to the train traction systems and to the power distribution systems for all remaining electric consumptions of the network.

The 20kV medium voltage network of the Public Power Corporation (PPC) feeds the Line and the Depot via independent supplies for the network of Lighting and Auxiliary Substations (LAS) and the Rectifier Substations (RS).

LAS network is fed by the PPC via two independent 20kV supplies, each at each end of the line, which provide power under normal operation. Moreover, there is an additional supply in the middle of the Line, which is triggered in case one out of the two supplies or in case both main supplies fail. Automatic re-feeding of the network by the redundant supply is effected within 5 seconds.

Each rectifier substation is fed by an independent PPC supply. All measures are introduced so that two neighboring rectifier substations be fed by a different 150/20kV PPC substation.

In the design of the 20 KV network, the redundancy of the system has been optimized as concerns the 150 KV central supplies that feed the 20 KV Metro substations which are independent, to the extent possible.

In the design of the Metro 20 kV network there is a provision for the future power supply of the extensions branches to Kalamaria and Stavroupoli, Eleftherio Kordelio, Airport.

4.5.5 Low voltage power distribution (400/230V AC)

The 400/230 V power distribution systems fed by the 20 KV loop through 20 / 0.40 KV Transformers provide the required 400/230 V power to various consumptions in stations, shafts, tunnels and the depot.

The system is served by two 20 kV open loops that feed the MV switchboard in the LAS substation and, via this substation, the two 20 / 0.40 kV Transformers. Each Transformer serves the full load of the LAS substation (100% redundancy).

The transformers are connected to the General Low Voltage Switchboard (GLVS). The main LV bus bars are divided in two sections, one for each Transformer and are interconnected through an automatic bus-tie breaker, which, under normal circumstances, remains open.

The General Low Voltage Switchboard (GLVS) gives the option for each Transformer to be utilized in case of emergency in order to feed all loads fed by the LAS Substation.

Especially for the Depot, there is a central 20 kV Substation distributing the 20kV voltage to the LAS Substations.

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4.5.6 Lighting

The lighting systems cover the needs for general lighting, emergency and safety lighting in stations, tunnels, shafts and recesses, in all indoor and outdoor areas of the depot, as well as the needs related to illuminated signs and advertising panels.

General lighting covers public areas in stations, personnel areas and areas accommodating items of equipment, supplementary areas, areas housing technical equipment of shafts and recesses, lighting accesses leading to street level and lighting of tunnels.

Emergency lighting provides a lighting level lower than the level required by the general lighting; in case of power failure, emergency lighting is fed by a special uninterruptible power supply system (UPS).

Safety lighting provides the required lighting level through batteries installed within lighting fixtures and in the exit and escape signs; it serves public areas, personnel areas and the technical rooms in Stations, Tunnels, Shafts and Recesses.

In tunnels, lighting is provided through the use of fluorescent lamps, installed in lighting fixtures suitable for damp areas.

The lighting systems in stations, tunnels, shafts and recesses are controlled and activated / de-activated either locally via switches or manually / automatically by the central control system (BACS) located in each Station Master Room, covering each station, the adjacent tunnels, shafts and recesses. There is no remote operation and control of the lighting system from the OCC.

Lighting of the outdoor areas is controlled via photoelectric cells or timers connected to the lighting switchboards and the BACS system.

4.5.7 Firefighting / Fire detection

Firefighting and fire detection systems are installed in all stations, shafts, tunnels and in the depot.

The Automatic Fire Detection System, which is also equipped with Manual Call Points (MCP) – operating once the glass is broken - is installed at selected points in all stations.

The Fire alarm Panel (FAP) is located in the room intended for storing the automatic fire extinguishing gas and is interconnected with the Fire Alarm Management (FAM) System in the Station Master Room (SMR). The FAM system is interconnected to the BACS system of each station.

The fire detectors have been installed in public areas, personnel areas and in the technical rooms of the stations, taking into account the fire protection and fire compartmentation zones.

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There are detectors (of several types), MCPs, sirens, optic signs, cabling, the Fire alarm Panel (FAP), the Fire Alarm Management (FAM) system and the connections with the BACS control system.

The fire protection systems include the following items:

- Fire hydrants and hose reels for stations and tunnels, based on the dry-type firefighting system.
- Portable fire extinguishers for public areas, personnel and equipment rooms.
- Automatic fire extinguishing system for rooms accommodating electrical equipment.

The necessary water supplies are installed in the Fire Department room in each station. Electrical valves are used, which are controlled by the BACS system.

Fire and smoke emission control – necessary for all stations – is achieved through compartmentation of the areas, smoke exhaust and smoke emission control and containment. The fire rated periods (FRP) of the areas comply with the magnitude of the fire heat load and the grade of protection required by the adjacent stations. Fire protection is based on passive fire protection of each station, in combination with the operation of the ventilation system and shafts exhaust system, as well as the firefighting systems, which are activated further to the pertinent procedures that must be carefully followed. All insertions of pipes, cables trays, etc., in the masonry walls from one area to the other are sealed using fire-rated materials.

A dry-type firefighting system has been installed in stations and tunnels for fire extinguishing purposes. The firefighting water supply network of the city supplies the aforesaid system. Firefighting hose cabinets (FHC) have been installed at the concourse and platform levels of each station.

The dry-type firefighting system of the tunnel is fed from both its ends (the respective stations of each end) and accommodates inlets, as required by the Fire Department.

Portable fire extinguishers are installed in all public areas and technical rooms.

An automatic fire suppression system using eco-friendly gas (e.g. INERGEN) has been installed in the substations (Rectifier Substations and LAS), in the rooms accommodating Telecommunications and Signalling equipment, in the rooms controlling the Platform Screen Doors (PSD) systems and in the rooms housing the Uninterruptible Power Supply (UPS) equipment. The installations contain galvanized heavy-duty gas cylinders of suitable cross-section, whose dimensions depend on the rooms' volume, nozzles, detectors, cabling, and the activation system via the Fire alarm Panel (FAP) and the BACS system.

4.5.8 Escalators

All stations are equipped with two-directional escalators connecting the street level to the concourse, transfer and platform levels and, eventually, to other intermediate levels

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in very deep stations. All fixed staircases are complemented by ascending and descending escalators.

The escalators are of compact type, suitable for operation in the Thessaloniki Metro system environment. The escalators can operate in reverse mode; they can operate in both directions or be utilized as fixed staircases under full loading.

The escalators are monitored and controlled by the BACS system, which provides indications for malfunction or any other warning.

Upon expiry of the scheduled maintenance, effected by the construction and systems' Contractors, the Contractor will see to the performance of the annual inspection of all escalators of the Thessaloniki Metro network by an independent agency's third party and to the integration of all relevant certificates into the Maintenance Management System.

4.5.9 Lifts

All stations and depot buildings are equipped with hydraulic or electric passenger lifts. The lifts are suitable for use by people with special needs (PSN) and connect all levels of the stations' public areas to the street level.

The capacity of all station lifts is 13 persons and 1000kgr; they are of heavy type and require the minimum maintenance activities.

The monitoring and control of the lift operation is conducted in the Station Master Room by the BACS system installed therein, which is capable to monitor and control, among other activities, the main functions and alarms of all lifts.

Upon expiry of the scheduled maintenance, effected by the construction and systems' Contractors, the Contractor will see to the performance of the annual inspection of all lifts of the Thessaloniki Metro network by an independent agency's third party and to the integration of all relevant certificates into the Maintenance Management System.

4.5.10 Earthing and Protection against stray current

Thessaloniki Metro system comprises an earthing system for the overall electromechanical equipment of the stations, shafts, recesses, tunnels and all facilities of the Depot, the Operation Control Center, the Emergency Control Room and the administration building.

Each technical room in a station, shaft, recess, tunnel or the depot is fitted with a local earthing bar, which is connected to a central earthing bar in each station or other building. In each Metro building, where Medium Voltage related equipment is located, a structure earthing electrode is configured in the form of a loop made of bare copper conductor with minimum cross section 95mm², to be installed in the ground under the raft of each station.

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The two ends of the above structure earth electrode are connected to the central earthing bar of the station.

The central earthing bars of all stations and shafts are interconnected by means of a bare copper conductor with a minimum cross section of 95mm² which runs along the tunnel. Especially, as regards the Depot, in each building accommodating a Substation, a structure earthing has been constructed which is connected to an earthing bar in the respective Substation. All these independent earthing bars are interconnected to a loop through a bare copper conductor with minimum cross section 95mm², routed to an accessible channel.

Inside every technical room equipped with MV equipment (MVP, LAS, RS), a false floor offering insulation against step voltage has been installed for the protection of the personnel.

At the tunnels, there is an under track stray current collection system with conductors, which are connected at regular distances with a copper conductor to be routed along the tunnels of the project. The stray current collection system is independent from the reinforcement of the permanent lining of the tunnel.

All exposed metal objects in stations such as doors, balustrades, escalators exterior decking (where fitted), lifts, air-ducts, piping, cable trays etc. will be earthed.

4.5.11 Lightning Protection

Lightning protection, properly designed based on the existing earthing system, will be provided to all depot buildings. Moreover, lightning protection will also be provided to the equipment of the Depot systems. The lighting poles shall have independent earthing for protection against lightning strike.

As concerns underground stations and shafts, there will be lightning protection only for the equipment adjacent to areas exposed to lightning strikes.

4.5.12 Water supply, Irrigation

The Thessaloniki Metro system comprises water supply installations in public areas, personnel rooms and technical rooms of the stations, as well as in all buildings of the Depot.

For ensuring water supply from the city's network, each station comprises a manhole with a water meter device of the Water Supply Company (EYATH) on the nearest sidewalk.

The water supply pipe feeds:

- Sanitary plumbing items in personnel areas in stations and shafts;
- Electric boilers in toilets;
- Supplies for cleaning floors;

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- Pipes for irrigation purposes;
- Pumping stations, water supply to the ventilation / air cooling units' rooms.

4.5.13 Drainage, sewage

All stations, shafts and the depot comprise the necessary provisions for the drainage of clean water / sewage of foul water, as required. The drainage pipes are routed to pumping stations and, finally, to the drainage network of the city.

Pumping stations are the points where rain water and foul water are collected, through gravity, from stations, tunnels, shafts and the depot areas. Both clean and foul water, once collected in special tanks, they are pumped into the drainage and sewage network of the city. Clean water and foul water are collected in separate tanks.

4.5.14 Pumping Stations

The stations, tunnels and the depot are equipped with pumping stations, as required, that comprise the following:

- Two submersible pumps and a rainwater sump for each system
- Two submersible pumps and a sewage sump for each system
- Discharge pipings and auxiliary fittings of pumps and connection of the above to the rainwater and sewage discharge networks of the Municipality of Thessaloniki.
- Auxiliary fittings for the installation and maintenance of the pumps, such as steel guiding rails to the sumps, steel access ladders, covers of access holes, etc.
- Equipment panels and cablings for power supply and control of the pumps. Monitoring and control of the operation of the pumps shall be performed through the BACS control system.
- Sump ventilation systems to avoid the creation of smell.
- Each station comprises a pumping station for rain water and a pumping station for foul water.
- In tunnels, the minimum elevation points shall be equipped with a rainwater pumping station.
- The depot accommodates all necessary facilities for draining, collecting and pumping rain water. These facilities concern both the depot and its buildings.

4.5.15 Control and Monitoring System of the Rectifier Substation traction equipment in the Station Master Room (SMR)

A system for the control and monitoring of the 750V DC equipment is installed in each Station Master Room (SMR) in each Station accommodating a Rectifier Substation. The system has been integrated into the overall design of the SMR equipment.

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The aforementioned system is based on an industrial type computer system of high availability equipped with a terminal screen and sufficient memory capacity. This system will serve the “Man-Machine-Interface” (MMI) for the control and monitoring requirements of the 750V DC equipment in the Rectifier Substation (RS).

The Station Master shall execute all required operations with the mouse or the keyboards.

The purpose for this system is to serve the need for the back-up control and monitoring of the main 750VDC switchgear equipment from the SMR room, in case of any failure in the Power Remote Control System (PRCS) in the Operation Control Centre (OCC), resulting in partial or total loss of the Rectifier Substation (RS).

The control hierarchy for the Rectifier Substation equipment that can be locally / remotely controlled is as following (in decreasing priority):

1. Operation by the control systems installed locally on each Switchboard;
2. Operation by the control systems installed on the 750Vdc Switchboard in RS room;
3. Operation by the control and monitoring system installed in the SMR room;
4. Control by the Power Controller in the OCC.

These control levels are independent one to another, so that a failure at one control level results in no loss of control at the higher hierarchy levels.

4.5.16 110V DC auxiliary Power Supply System

A fully operational, properly dimensioned and reliable 110V DC auxiliary uninterruptible power supply system, composing of batteries' charger and Ni-Cd batteries set, has been installed for it to be used for equipment control and monitoring purposes in the following locations:

- In every Rectifier Substation (RS),
- In every traction recess,
- In every LAS Substation,
- In every Medium Voltage terminal supply (MVP – 20 KV) for the LAS substations network,
- The 110VDC system also ensures the required uninterruptible auxiliary power supply for controlling and monitoring the Traction Power and Lighting and Auxiliary supply systems' equipment.

The aforesaid controlling and monitoring operations concern the following, without being limited to it; namely:

- Setting on / off the 750V DC switches, the 20KV MV switches, Transformers, and 400V/230V AC Power Supply Switchboards,

TECHNICAL DESCRIPTION AND SPECIFICATIONS

- Status, failures and alarms announcement systems featuring special monitors on the equipment,
- Power supply for the operation of RTU units,
- Triggering the local and general release systems and the interlocking system,
- Automation operations in Traction, Medium Voltage and Distribution systems.

4.5.17 Release System of the Rectifier Substation, in case of emergency

In the rectifier / DC switches areas, in specific locations, an emergency red mushroom push button has been installed leading to setting the AC switch - that feeds the rectifier unit - to the OFF position and setting the rectifier off. These buttons are properly protected to avoid any accidental control of theirs.

4.5.18 Intertripping system along the Line

An intertripping system has been installed, which in case of fault of the third rail, transmits an intertripping command to the power switches of all adjacent Rectifier Substations powering the same zone. The intertripping devices between substations are interconnected via buses in the Base Project and via pilot wires in the Kalamaria Extension. Failure or fault of the pilot wire is announced to the OCC.

4.5.19 Signaling (Systems: Automatic Train Control (ATC), Automatic Train Supervision (ATS), Automatic Train Protection (ATP), Automatic Train Operation (ATO), Electrical Interlocking (E-IXL), Positive Train Identification (PTI))

The signaling system includes the following sub-systems:

- Automatic Train Supervision (ATS) System
- Automatic Train Protection (ATP) System
- Automatic Train Operation (ATO) System
- Interlocking System (E-IXL)
- Wireless Data Communication System (DCS) between Line and trains
- Trackside Equipment (point machines, signals, etc.)
- Trainborne Automatic Train Control (ATC) System for driverless operation (automatic operation)
- Depot Signalling System – similar to the above systems in the areas of automatic train operation

The aforementioned systems shall be supported by equipment installed in signaling equipment technical rooms in the Depot, while they shall be supervised and controlled by the Operation Control Centre and the ECR through the operator work stations, which ensure control, supervision and management of the entire line and of the train stabling area in the Depot. Control facilities are not available in other operator's rooms inside the stations.

TECHNICAL DESCRIPTION AND SPECIFICATIONS

The supervision and control of the signaling systems shall be also supported by the following items:

- Large, state of the art screens, displaying information related to the traffic and the status of the third rail
- Uninterruptible Power Supply for the central systems supported by batteries
- Workstation for training in ATS simulations
- Peripheral equipment such as, printers, recorders, etc.
- Interfaces with other systems, such as Passenger Information System (PIS), Platform Screen Doors (PSD), Clock System, Digital Wireless Communication System, Intrusion Detection System, Data Transmission System.

Local Signaling Equipment

Signaling/interlocking equipment is installed in the technical rooms of the following stations as follows:

- New Railway Station, Panepistimio, Analipsi and Nea Elvetia in the Base Project and in Nomarchia crossover and in Micra Station in the Extension to Kalamaria
- In the Depot.

The Depot Signaling system consists of the following items:

- The central electronic interlocking (e-ixl),
- Interfaces with the trackside equipment
- Automatic Train Control Systems (ATP/ATO) in the Train Stabling Area
- Data Transmission System
- Operator emergency workstation in the Controllers Room in the Depot
- Printers, recorders and diagnostic equipment.

Trackside Signalling Equipment

The trackside equipment consists as a minimum of the following items:

- Point Machines
- Transceivers – signal antennas of the CBTC system along the tunnel, as required for data transmission
- Track circuits, as auxiliary signalling system
- Point indicators and Depot signals
- Switches and sockets
- Passive Balise Transmission Systems.

TECHNICAL DESCRIPTION AND SPECIFICATIONS

Trainborne Systems

The trainborne equipment consists at least of the following items:

- Trainborne ATC devices,
- Man/Machine Interface at the Emergency Driving Position (EDP),
- Equipment for the interface between ATC and Rolling Stock,
- Data Transmission System enabling continuous communication between the train and the line signalling systems.

A special requirement for the signaling system consists in ensuring the yearly control of the radio coverage level of the wireless DCS system in tunnels. On the basis of these measurements, the data transmission equipment in tunnels shall be cleaned every 3 years as a minimum or earlier, if dictated by the indications of the measurements.

4.5.20 Passenger Information System (PIS)

Each station's platform comprises a Passenger Information System, along with its foreseen illuminated panels.

The central control unit of the passenger information system is installed in the communications technical room in the Operation Control Center (OCC).

The system is supported by UPSs with a 4-hour battery autonomy.

A passenger information system is placed within trains.

4.5.21 Platform Screen Doors System (PSD)

Each station shall be equipped with a Platform Screen Door System (PSD).

The system includes the closed panels (opening on the side of the tracks), the moving panels (doors), their supports, the rolling mechanisms, the normal and auxiliary power supply system, the control system, the emergency operation system, the interfaces and interlocking with the required trainborne systems, the signaling and communications systems, the safety provisions and all cabling and interconnections required among the above systems.

4.5.22 Radio Telecommunications (TETRA)

A digital radio communications system has been installed in the Thessaloniki Metro System. This communication network is based on the TETRA standards, and provides the necessary communication among the Metro operation personnel, the maintenance personnel, the OCC personnel, the Police, the Fire Brigade, etc., as well as among their respective rooms.

TECHNICAL DESCRIPTION AND SPECIFICATIONS

The pertinent scope includes the following:

- A fully functional radio communication station at the Operation Control Center,
- Uninterrupted Power Supply (UPS) for each radio communication system, with a battery autonomy of 8 hours. The batteries are common with the batteries of the remaining telecommunication systems,
- Radio coverage is provided in all areas of the stations, including station accesses and shafts, through the use of separate antennae,
- Radio coverage is provided in all technical rooms of stations/shafts via a leaky co-axial cable (LCX),
- In the tunnels there is a leaky co-axial cable (LCX), which constitutes a continuous antenna, fixed on the roof of the tunnel,
- Radio coverage is provided in all areas of the depot, through the use of separate antennae or leaky co-axial cable,
- The Metro network personnel working in various areas uses portable units with automatic switching to selected channels, as required by the users,
- The equipment of the radio communication system in each station is installed in the telecommunications room and in the station mater room (SMR). Equipment for the base system is installed in the Operation Control Centre (OCC).

4.5.23 Automatic and direct telephones

An automatic telephones system is installed in the Thessaloniki Metro system. The system is used by the operation and maintenance personnel situated in the stations, shafts, the Depot and Operation Control Center and the administration building.

The system includes:

- A fully operational automatic telephone system in each station, using technology and communication protocols TCP/IP (Voice over IP) and which is linked to the PST Network through an ADSL connection at the stations and the Depot – Operation Control Center. The above redundancy provides the possibility for telephone communications in case of failure to the FO Transmission System,
- Vo.IP automatic telephone sets at selected locations in stations, shafts, the depot, the Operation Control Center and the administration building,
- Uninterrupted Power Supply (UPS) for each automatic telephone system, with battery autonomy of 8 hours. The batteries are common with the batteries of the remaining telecommunication systems,
- Automatic Telephone Sets in the station master room at each station,
- The automatic telephone equipment in each station which is installed in the telecommunications room and in the SMR,

TECHNICAL DESCRIPTION AND SPECIFICATIONS

- The cabling running from the user terminals up to the central communication units within the stations, shafts, the OCC and the depot and the administration building, which are part of the central cabling systems for telecommunications,
- The link between the units of the telephone system and the data transmission system.

Moreover, the Thessaloniki Metro is equipped with a direct telephones system independent from the automatic telephones systems. The system is used by the operation and maintenance personnel situated in the stations, the shafts, the Depot and Operation Control Center.

The system includes:

- A fully operational direct line telephone system in the OCC,
- Direct line telephone sets in the stations of the Base Line. Telephone sets shall be interconnected to the central direct line telephone system in the OCC via the Digital Data Transmission System,
- A fully operational direct line telephone system in all stations of the Kalamaria Extension. The independent direct line telephone systems of the stations of the Kalamaria Extension shall be interconnected with the central direct line telephone system of the Base Line,
- Combined direct line telephone/TCR units in all the locations where Traction Current Removal equipment is required,
- Special direct line telephone sets with enhanced features in the Station Master Room (SMR) in each station,
- Uninterrupted Power Supply (UPS) for each direct telephone system, with a battery autonomy of 8 hours. The batteries are common with the batteries of the remaining telecommunication systems.

4.5.24 Closed Circuit Television (CCTV)

The Thessaloniki Metro System is equipped with a Closed Circuit Television System - IP technology which utilizes the Digital Data Transmission and IT Infrastructure Systems of the stations and the Depot and of the ICCS in the OCC. The system includes the following items:

- A fully functional CCTV system covering every station, the depot, the Operation Control Center (OCC), the cash counting room and the administration building,
- Uninterrupted Power Supply (UPS) for each CCTV system, with battery autonomy of 8 hours. The batteries are common with the batteries of the remaining telecommunication systems,
- Full coverage through the installation of a trainborne CCTV system,

TECHNICAL DESCRIPTION AND SPECIFICATIONS

- CCTV workstations installed in the Station Master Rooms (SMR) in stations, in the Operation Control Center to ensure central control of the entire system, in the Safety & Security Manager room, as well as in the guardhouses of the depot,
- CCTV equipment in each station, installed in the telecommunication rooms and in the SMR.

The Contractor shall submit the design required by the General Data Protection Regulation (GDPR) one hundred and twenty (120) days prior to the commissioning of each phase.

4.5.25 Public Announcement System (PA)

The Thessaloniki Metro System is equipped with a Public Announcement System which utilizes the Digital Data Transmission systems of the stations and the Depot. The system includes the following items:

- A fully functional public address system in the stations. The announcements from this system are heard in all public areas, as well as in the public restrooms. Each station is divided in separate zones. The messages can be local originating from the Station Master Room, or central originating from the OCC. There are station announcement points (2 on each platform), wherefrom the Metro personnel is able to make announcements. There are also automated computer controlled announcements,
- Installation of sufficient number of loudspeakers in the stations, so as clearly audible announcement to the passengers be provided,
- Items of equipment and the central units of the public address system in every station, which is installed in the telecommunications rooms and in the SMR,
- Uninterrupted Power Supply (UPS) for each PA system, with battery autonomy of 8 hours. The batteries are common with the batteries of the remaining telecommunication systems,
- Central control of the PA system through the PA equipment in the OCC,
- Trainborne PA System / Equipment, to render possible announcement from the OCC.

4.5.26 Clock and Time distribution system

The Thessaloniki Metro System is equipped with a Clock and Time Distribution system which includes:

- A fully functional Clock and Time Distribution System in every station from a master clock connected to a GPS antenna, installed in the administration building in Pylea Depot. The master clock is connected, through the common TCP/IP network, to the stations' sub-master clocks, which, in turn, synchronize the remaining slave clocks of the stations. The Clock and Time Distribution System shall also be installed in the depot, the OCC and at selected locations of the administration building,

TECHNICAL DESCRIPTION AND SPECIFICATIONS

- This system ensures the synchronization between all E/M and railway systems, as well as between the signaling system and the automatic train operation, the PRCS system, ventilation control, Air Conditioning and other E/M systems (BACS), the recording equipment, the digital data transmission system, etc.,
- Items of equipment and the central units of the clock and time distribution system in every station which are installed in the telecommunications rooms and in the SMR,
- Uninterrupted Power Supply (UPS) for each clock and time distribution system, with battery autonomy of 8 hours. The batteries are common with the batteries of the remaining telecommunication systems,
- Analogue clocks to display the real time in the station platform and concourse areas.

4.5.27 Inner Structured Cabling Network for the transmission of digital information

The Structured Cabling Network facilitates the physical interconnection of the Digital Transmission System with the equipment of the Telecommunications, IT and other Systems and the distribution of network services to all stations, shafts, the OCC and the ECC, to the train stabling and maintenance areas, to the maintenance building and the operation-related buildings, as well as to selected locations within tunnels.

The Structured Cabling Network comprises distributors and copper and fibre-optic cables, suitable for installation in Metro environment.

4.5.28 Safety Management System (SMS), Access Control System (ACC), Intrusion Detection System (IDS)

The safety and protection system in all stations, shafts, the OCC, the depot buildings and the administration building shall be used for the supervision, control, time coordination and real-time coordination of the telecommunication sub-systems related to the Security of the Metro. It shall include the following sub-systems:

- An Access Control System (ACC) using “smart” cards,
- An Intrusion Detection System (IDS),
- A central system ensuring unification and management of the two aforementioned systems,
- Safety and protection workstation installed in the Station Master Room (SMR) in stations ensuring messages and alarms supervision, as well as control of the following system in terms of operation, namely:
 - Access Control (ACC)
 - Intrusion Detection System (IDS)
 - Closed Circuit Television System (CCTV)
 - ATS Subsystem – Signaling System
 - Building Automation Control System (BACS)
 - Power Remote Control System (PRCS), UPS and telecommunications

TECHNICAL DESCRIPTION AND SPECIFICATIONS

- Safety and protection workstations installed in the Control Centre ensuring supervision and operation control for the safety systems in the depot buildings, the OCC and the administration building.

4.5.29 Intercom System

The intercom system ensures voice communication between the passengers and the operation personnel at specific locations in stations, such as the Station Master Room, the Ticket Office room, the ticket/card gates area, the platform area, etc.

Moreover, the system ensures voice communication among the maintenance personnel at special locations, such as local control points for lifts.

The system has been installed in other selected locations in the OCC, the Cash Counting Room and the guardhouses of the depot.

The integration of the system in the Direct Telephone Line System has been selected as the preferred implementation method.

4.5.30 Automatic Fare Collection System (AFC)

The Thessaloniki Metro System is equipped with an Automatic Fare Collection (AFC) which is based on the use of an electronic/smart ticket. The ATC system includes the following:

- Base Line Management Centre and Kalamaria Extension Control Centre,
- Stations Management Centres – Station Computers,
- Station PC Units,
- Workstations,
- Printers,
- Card Issuing Terminals (CIT),
- Portable Smart Card Readers,
- Automatic Ticket Issuing Machines (ATIM) for smart cards, paper contactless smart cards and loadable smart cards used in the stations,
- Gate system equipped with readers for smart tickets, smart cards, paper contactless smart cards,
- Network accessories such as switches, routers and data cables for the LAN and WAN networks of the stations,
- Power Supply, power cables, UPS, distribution switchboards for the AFC system,
- Cash counting equipment in the Cash Counting Area in the Depot.

TECHNICAL DESCRIPTION AND SPECIFICATIONS

The system also includes:

- The entire hardware and software required for the AFC system, including the development tools, the licenses for all applications and the Operating Systems' software, the communication protocols, the software source codes, etc.,
- Computer desks for all stations (as required), central computer rooms and CITs,
- Desks and chairs for operation and maintenance personnel,
- Complete list of spare parts and consumables for each unit of the AFC equipment, accompanied by the proposed frequency of replacement and the purchase details.

4.5.31 Uninterrupted Power Supply (UPS) - Batteries

Three (3) separate Uninterrupted Power Supply Systems (UPSs) serving the needs of the following systems have been installed in Thessaloniki Metro:

For the Base Project:

- Signaling (including also the Platform Screen Doors (PSD) system)/ 6-hour autonomy,
- Emergency lighting (automatic fare collection system, fire detection, BACS (ECS/BMS)/ 3-hour autonomy,
- Telecommunications, CCTV, Clocks, Public Announcement Systems, etc./ 4 or 8-hour autonomy, depending on the system,
- ECR UPS System/ 12-hour autonomy.

For the Extension to Kalamaria:

- Signaling (including also the DCS system)/ 6-hour autonomy,
- Emergency lighting (fire detection, BACS (ECS/BMS),
- Telecommunications, CCTV, Clocks, Public Announcement, Automatic Fare Collection etc. systems/ 4 or 8-hour autonomy, depending on the system,
- PSD system/ Autonomy.

The UPS systems are fed by battery sets, separate for each of the above uses.

4.5.32 Building Automation Control System (BACS)

The central building automation control system (BACS) includes all monitoring and control devices for ventilation and HVAC, as well as for the other E/M systems (pumps, lighting, fire-fighting systems electric valves, lifts, escalators, etc.) in every station, shaft or tunnel. The equipment of this system is located in the Station Master Room (SMR) in every station. Moreover, all monitoring and control devices are connected to the central BACS system in the Operation Control Center.

TECHNICAL DESCRIPTION AND SPECIFICATIONS

There is an independent BACS system, which is also centrally controlled from the OCC and which monitors and controls the above systems for the depot buildings, the Operation Control Center and the administration building, as required.

The main functions related to the extraction of smoke in the event of fire on trains within tunnels or stations are locally controlled from the Fireman Boxes (FB) in every station. Several scenarios for fire and possible fire in tunnels and stations have been developed and have fed the local and central control installations (BACS), while a strict hierarchy is followed with regard to their operation and activation.

The BACS software is upgradeable and expandable in order to include all new systems for the future extension of the Metro.

4.5.33 Power Remote Control System (PRCS)

The central Power Remote Control System (PRCS) operates through remote terminal units (RTU) and through an FO transmission system connected to the Operation Control Center. This system serves the 20 KV power supply systems, the train traction power system and the power distribution system.

The equipment of the PRCS is installed locally in stations, tunnel recesses and in the depot, while it is centrally controlled from the Operation Control Center.

As regards the Depot, a local system, which is independent from the Line monitoring and control system, has been installed to monitor the various power supply systems.

4.5.34 Central Copper Cabling and Fiber Optics networks

The central copper cabling and fiber optics networks serve all telecommunication, signaling and fare collection systems. These networks cover the needs of all the above systems, including the analogue and digital data transmission among stations, shafts, the OCC, the depot buildings and the administration building.

4.5.35 Data Transmission System (DTS)

The Full IP digital data transmission system includes the following:

- A fully functional fiber optic transmission network, capable to transfer data, voice, video, local area network (LAN) among the line's stations and tunnels, the OCC and the administration building. This is a modular system, fully redundant, expandable, re-configurable and flexible as to its input/output and interfaces.
- It serves the automatic telephone system and the direct telephone system, the CCTV system, the PA system, the Radio Communication system, the PRCS, the HVAC and BACS systems, the fare collection system, the safety and security system, the digital data transmission system, as well as the Ethernet network. The backbone bandwidth is at least 2.5 Gbps.

TECHNICAL DESCRIPTION AND SPECIFICATIONS

- The system is equipped with a Network Management System, which has been installed in the Operation Control Center.
- The central units of the digital data transmission system in every station have been installed in the telecommunications room.

4.5.36 Trackwork

The Trackwork includes the following sub-systems:

In tunnels and stations:

- Tunnel invert filling
- Stray current collection system
- Collection and channeling on inflowing water towards the drainage sumps
- Walkways and cable conduits
- Tracks with resilient pads and fastening system
- Crossovers
- Buffers
- Tracks on floating slab
- Routing of cable sleeves for third rail and traction power
- 3rd rail
- Other embedded cable ducts (for signaling, TCR etc.)

In the Depot:

- Base layer
- Trackwork transition slabs between ballasted tracks and concrete tracks
- Ballasted tracks
- Special tracks in buildings (embedded, on columns, etc.) including tracks with road crossing, etc.
- Third rail / stinger system
- Cable conduits above the track foundation base

TECHNICAL DESCRIPTION AND SPECIFICATIONS**4.5.37 Keys' System**

Thessaloniki Metro System comprises a Master Key System has been installed in all areas of all stations, shafts, tunnel recesses of all buildings, including the OCC/ECC and the Repair Workshop in the Depot.

The Master Key System is substituted - to a great extent - by the Access Control System (ACC), which allows entrance into the areas only upon reading an electronic card, since it records the area in which it is used, the time of entering and exiting the subject area, as well as the name of the employee it uses same. Thus, the lockers of each area are connected to the ACC system.

Entering each room imposes the use of the electronic card, while exiting is effected by pushing a special green button located on the wall next to the exit door of each room. In addition, lockers shall feature a mechanical latch in the exiting direction that might be used in case the ACC system fails.

4.5.38 Signage

Signage has been installed in the entire Thessaloniki Metro System covering the following:

- Signage in terms of architecture – to facilitate passengers' movement. This type of signage includes directional signs, station names, schematic diagrams of Line sections with indications/station names, numbers and colors of the Metro network lines, etc. Signs can be illuminated and/or electronic, as required.
- Tunnels
 - K.P. every 100 m. in each track,
 - Tunnel gauge restriction points (if any),
 - Emergency signs (see lighting related article).
- In stations, shafts and in all buildings (Workshops, OCC, ECC) the following are installed:
 - Signs indicating the code for each room at its door entrance (different code per room, geographical position, etc.),
 - Signs indicating danger (e.g. High Voltage) on the doors of the respective rooms/ areas,
 - No smoking / No eating /No beverage, etc. signs.

4.5.39 ICCS – Integrated Communications Control System

- The ICCS system allows Operators to monitor and manage in a central and fully coordinated way from the OCC several parts of the system, such as:
 - Passenger Security and Information System (PS&IS),
 - Passenger Information system (PIS), allowing the management of the written messages displayed in the PID units in the stations areas and in trains,

TECHNICAL DESCRIPTION AND SPECIFICATIONS

- Public Announcement System (PAS), allowing the management of the audible announcements in stations, in the Depot and in trains,
- Closed Circuit Television System (CCTV) for surveillance reasons, via cameras, in stations, in the Depot and in trains,
- Direct Line Telephones System (DLT)/ Intercom System, allowing the monitoring of the official telephone calls received by the Metro personnel and the emergency calls made by passengers onboard the trains as well.
- Radio communication system, including fixed communication means and communication means onboard the trains,
- Time synchronization system.

The I3S center ensures high quality of management operations, as these are described above, as well as monitoring of alarms and faults through the appropriate interface between the hardware/software and the respective control units of each system (i.e. DLT management units, radio communication system) located either in the OCC or remotely in stations. It has also been developed to provide exchange of data with the remaining Metro control sub-systems (Automatic Train Control System - ATC, Safety Management system - SMS, etc.).

The system's architecture secures the operation related activities, in case of non-availability of the server, through the inherent management interface of any sub-system (in certain systems, DMT downgraded operation terminals) located both in the OCC and in the Station Master Room.

4.6 Information System (IT-ERP) to support the administrative operation of the Thessaloniki Metro

4.6.1 General

In the framework of the Thessaloniki Metro operation, the Contractor within one hundred and twenty days (120) from the signing of the Contract shall supply, install, test and commission an information system in order to support the administrative operation of the Thessaloniki Metro.

The subject system shall be installed by the Contractor, mainly, in the administration building of Thessaloniki Metro located into Pylea Depot, while the work positions to be supported by the subject system will be situated in each station of the Metro network. Access to the system will be feasible by third parties too, i.e. selected users, through the appropriate safe procedures.

It is stressed that this system shall be independent from the systems related to the Thessaloniki Metro operation itself, i.e. to the circulation of trains, the operation of the Electromechanical and railway systems, the operation of the maintenance and repair equipment in the depot, etc.

The system to be installed by the Contractor shall include all necessary hardware and software that will be required, except the structured cabling related equipment, which

TECHNICAL DESCRIPTION AND SPECIFICATIONS

has been installed by the contractor responsible for the construction of Thessaloniki Metro.

The Contractor shall base the entire materialization on an Enterprise Resource Planning (ERP) integrated information system. The Contractor shall ensure that such a system will offer the following advantages to the Operation of Thessaloniki Metro, namely:

- Decentralised access to the administration tools: Managers will have direct access to any data source within the company with the use of a homogenous environment and without having to depend on the Information Technology Section.
- Centralized control - IT: the centralized control supports the use of standards, data protection and integrity, scale economy and consistency as regards Information Technology practices and procedures.
- Establishment of effective operational procedures: Operational procedures are usually horizontal, i.e. they concern more than one organizational sections of the company. An integrated system allows the unified support of the basic operational procedures, by organizing these procedures in a more effective manner and by minimizing any inconsistencies in the cooperation between organizational sections.
- Sub-systems intended for the management of materials and maintenance. These sub-systems are necessary for both maintenance and spare parts scheduling and inspection. Moreover, the maintenance sub-system shall support the personnel, for the latter to strictly adhere to maintenance procedures and the specifications of the rolling stock to be purchased in the near future. One of the basic procedures supporting the management of materials is procurement, which includes all activities, starting from the submission of the procurement request until the delivery of materials in the warehouse.
- Financial Management. The implementation of this sub-system is also an issue of top priority. Apart from the typical accounting applications, such as the accounting ledger, the accounts payable and the accounts receivable, the credit control and the asset management, the Financial Management must support basic applications of economic analysis, such as analytical accounting, activities-based costing, the budget, the cash flow program and the management of the company's reserves.
- Human resources management. This sub-system can support the necessary re-organization of the policy and procedures related to Human Resources. Further to the payroll, this sub-system must also record a range of information for each employee, including work background, evaluation results, as well as information about employees' training.
- Simplification of software maintenance and promoting credibility: the complexity of the software maintenance tasks and the necessary dependence on multiple external and indoor "expert" services are reduced once the company disassociate itself from individual specialized systems. This fact contributes to the increase in the applications' credibility and the decrease of the IT long-term cost.
- Finally, the required hardware will be determined by the Contractor and the overall ERP software requirements once the sizing of needs is conducted.

TECHNICAL DESCRIPTION AND SPECIFICATIONS

- The codification for the exchange of correspondence and the various documents shall be proposed by the Contractor and shall be approved by AM.

4.6.2 Operational requirements

The system, to be procured, installed, tested and commissioned by the Contractor, will be based on an electronic platform and will support the administrative operation of the Thessaloniki Metro in all aspects. The subject platform will include all relevant technical and non-technical information, documents, drawings, procedures, etc., related to the operation, maintenance, personnel, the management of revenues deriving from ticket/card fares and other sources, the expenses, sub-contractors, cooperating companies, spare parts, several materials and items of equipment procured, any small projects that might be required, the fixed assets, PUO bills, the information provided to third parties, legal documents, etc.

In the ERP integrated information system, the Contractor must stress that his top priority is the installation of the sub-systems for the maintenance of the company's fixed assets and the management of materials. Both sub-systems are necessary in order to (a) ensure the vehicles guarantee management and (b) to support the maintenance newly-hired personnel, so that the complex and strict procedures and the maintenance guidelines be strictly adhered to and that the scheduling accompanied with the maintenance and spare parts inspection be performed in the proper manner. However, it is obvious that the installation of the sub-systems for the maintenance and the management of materials presupposes that the basic infrastructure of the system, a major part of whose comprises a part of the financial management, should have been previously installed by the Contractor.

Full implementation of the financial management and human resources management sub-systems by the Contractor is also of top priority. The major issues involved in the implementation of the subject sub-systems cover full compatibility with the Greek Code of Books and Records, full compliance with the tax regulations and the social security requirements and the development of a robust payroll system.

The platform should be easily and directly accessible by all users, based on pre-determined user authorization. In addition, it should be compatible with the existing software that has been provided either in the framework of the Thessaloniki Metro or via investments made by the Operation Company on other software and should maximize their value in the framework of integrating all Operation Company procedures.

The Thessaloniki Metro already encompasses an information system (PMIS), including all technical information of the project, such as designs, drawings, operation and maintenance manuals, procedures, etc., as well as the entire correspondence that has been and will be exchanged for the construction and implementation of the project, testing activities, commissioning. The new system has to be connected with the existing PMIS system (see paragraph 2.8.5) and will be integrated with the system to be provided by the Contractor.

The IT-ERP system shall also be connected with the existing system and network of servers and PCs of AM in the Depot. Through this connection, AM staff shall also have

TECHNICAL DESCRIPTION AND SPECIFICATIONS

access (prioritized access rights) to the IT-EPR system, while this connection will contribute in advancing towards paperless electronic correspondence management – to the extent possible- of the correspondence exchanged between AM and the Contractor.

In particular, the objectives that have to be achieved by the Contractor through the new electronic platform will be as follows:

- Operation of the system on a 24 x 7 x 365 basis
- Detailed determination/recording of the company's operation procedures, so that they can be structured based on electronic management data.
- Electronic management of all company's documents.
- Electronic management of drawings.
- Central data / documents base involving all activities of the company, with storage redundancy
- Traceability of all documents and data
- Management of work orders, roles' assignments, works and services, reporting, etc.
- Statistical analysis, presentation and graphs of operational, financial and other data and processes of the company to be managed
- Organization, automation and easy use / application of the Rule Book, Procedures, Instructions and all relevant technical manuals required for the operation and maintenance of Thessaloniki Metro
- Management of fixed assets
- Organization of supplies and consumables for the smooth operation of the Operation Company
- Connection to the spare parts management system, to be installed by the Contractor for the effective management of the payments and the spare parts' supply
- Logistics management monitoring
- Option to third parties for accessing the system, through a special procedures' application
- Hierarchy-based User authorization
- Data protection – cyber security
- Interconnection with existing software applications (e.g. Autocad)
- Configuration, customization and development of applications, as required in the information system to be provided, so as to ensure the operational flow of documents and the smooth and successful completion of the procedures of the Operation Company/Agency
- Future requirement/provision for interface with a common BIM management environment

TECHNICAL DESCRIPTION AND SPECIFICATIONS

- Provision of full documentation and manuals for the aforesaid information system and its operation
- Provision of all required software use licenses to the Operation Company/Agency along with the option to manage same
- Creation of an internal network area (Intranet) to include the operation and maintenance procedures, the various forms on workflow (e.g. work instructions), documents concerning the personnel, the Quality Management Plan, health and safety-related documentation, environmental terms which must be adhered to, incident mitigation procedures, etc.
- Implementation and adherence to the GDPR requirements and restrictions
- Internet connection for all PCs of the Contractor (see paragraph 4.6.3)
- Training of the appropriate personnel of AM and the Contractor

4.6.3 Hardware - Equipment

The operation hardware, which needs to be procured, installed, tested and commissioned by the Contractor is divided in two (2) categories, namely:

I. Personal Computers and shared printers (front-end development):

The following items will be required:

- a. 140 PCs (16GBRAM, i5 11th generation, 250GBSSD or of greater capacity) Microsoft Windows software, 11 professional or more recent version, LED (>21") displays
- b. 30 PCs (32 GBRAM, i7 11th generation, 512GB or of greater capacity), Microsoft Windows software, 11 professional or more recent version, LED (>21") displays
- c. 10 laptops with a 15" screen, (32 GB, i7 11th generation. 512GBSSD or of greater capacity), Microsoft Windows software, 11 professional or more recent version
- d. 10 printers, black/white – A4/A3
- e. 10 printers, colored – A4/A3
- f. 10 copiers / scanners / laser printers, network, A3/A4 – colored
- g. 1 colored printer for drawings of up to A0, heavy duty.

II. Central server systems (back-end development):

They will comprise of:

- a. 2n+1 (minimum 3) physical systems of new technology servers, which will host all required virtual servers, whose memory size and operating system will be determined based on the ERP needs.
- b. A storage system, to which all servers will be connected via a very high speed (>10 Gbits) independent network (Storage Area Network) with a RAID-5 protection – as a minimum – to secure data. At least 8 discs shall be provided. The minimum storage capacity will be determined based on the ERP needs; however, it shall be at least 10TB.

TECHNICAL DESCRIPTION AND SPECIFICATIONS

- c. A Back up system to cover on a daily basis the overall volume of the stored data of SANStorage.
- d. A central network equipment, to support user connection (front-end) speed of 1Gbit and minimum interconnection speed of 10 Gbits between the central backbone and servers. In addition, it will include the required routers and switches for the central and peripheral equipment interconnection through the existing structured cabling, which, if required, will be supplemented by taking also in account the arrangement of the buildings and the operation units of the Operation Company, while the necessary routers will be made available for internet connection and to support remote used through VPN. No connection with the Metro operational system and the DTS will be provided.
- e. The entire central equipment will be protected by an Uninterruptible Power Supply (UPS) of sufficient KVA to support the overall loads + 50%; 2-hour autonomy will be provided, as a minimum.
- f. The entire equipment will be covered by a 24x7 Service-level Agreement (SLA).

4.6.4 Electronic files of documents

Throughout the duration of the Contract, the following items must be retained as a minimum:

- Correspondence of the Contractor with AM and with third contracting parties (sub-contractors, suppliers, consultants, etc.)
- Contractual documents
- Contracts with Sub-Contractors
- Administrative documents
 - Personnel
 - Payroll
 - Invoices and bills
 - Public Relations
 - Training
 - Procurement
 - etc.
- Operation Parameters
- Rule Book
- Operation Procedures applicable for all operating conditions: normal, downgraded, emergency
- Maintenance Procedures, applicable to all maintenance levels and phases of all project items (Civil Works, Rolling Stock, Systems, etc.)

TECHNICAL DESCRIPTION AND SPECIFICATIONS

- Operation and Maintenance Instructions and the related Operation and Maintenance manuals of every system and subsystem and of the rolling stock, as these have been delivered by the construction contractors (and/or if they have been amended through the pertinent procedure)
- Work instructions issued by the Computerized System
- Maintenance checklists
- Documents-supporting documentation related to the purchase and use of spare parts
- Maintenance works logs and reports
- Cleaning works reports
- Security diary and reports
- Health and Safety log and reports
- Inspection Sheets
- Environmental Audit Reports
- Non-compliance Reports with operation, maintenance, cleaning, security, etc., procedures
- Photos and videos
- Anything else deemed necessary by the Contractor for the flawless operation of the works.

The Contractor shall take all necessary actions to keep electronic documents under such conditions that they are easily accessible/ available, granting prioritized access and seeing that back-up documents of the entire electronic records are properly stored.

4.6.5 Documents Records Keeping

All documents related to the Contract and, as a minimum, the documents referred to in para. 4.6.4 concerning the new information system IT-ERP must be kept throughout the duration of the Contract on site the project.

Any technical documents, drawings, designs, calculations, bills of quantities, Material Submission Sheets, procedures and test results, etc. already existing since the construction of the works shall be made available to the Contractor through the existing PMIS system, to which the Contractor shall have access to the data related to or concerning in any way whatsoever the present Operation and Maintenance Contract.

Once the IT-EPR system is installed and fully functional, AM and the Contractor shall decide which documents shall be kept in electronic form and which in hard copy – paper. Minimizing the use of paper and the transmission to a paperless management to the extent possible is desirable.

The legal views of both AM and the Contractor shall be taken into consideration when deciding on the above.

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4.7 Provision of Health and Safety Services by the Contractor

The detailed requirements on Health and Safety are presented in article 9.2.

The Contractor ought to introduce measures in order to promote health and safety issues among the personnel at work. Therefore, the Contractor is obliged to use the services of a safety engineer and of an occupational doctor, and to provide the necessary ancillary personnel, areas, facilities, devices and, in general, all means necessary for the most effective execution of their duties, along with a medical room, whose operation must be in full compliance with the applicable legislation and, more specifically, Law 3850/2010. The cost for all the above shall be borne by the Contractor.

The Contractor must submit to AM all information he will submit to the Labor Inspection Authority, foreseen by Article 9, Law 3850/2010. The Special Recommendation Log of the safety engineer and the occupational doctor will be approved by the Labor Inspection Authority, as foreseen by the Law, and will be always available to AM.

4.8 Revenues

Fare Policy

Thessaloniki Metro forms part of the public transport system in the major Thessaloniki metropolitan area.

Passengers can buy tickets or load their smart cards in the Metro Stations. In station areas, ticket fare will be collected by the use of the automatic ticket issuing machines and by the ticket offices situated in the pre-validating zone of each metro station. The Ticket Offices will be temporarily manned, on the basis of the Contractor's Operation Plan and the provisions of paragraph Ticket Office (paragraph 4.3.1.8).

An effective fare policy is under consideration for it to be adopted in the Thessaloniki Metro in the major Thessaloniki metropolitan area and in all public means of transport. Moreover, the option for a common ticketing policy for all public means of transport must be taken into account, for the Metro operation to become easier and more attractive for all passengers. In this case, the Contractor will be promptly informed about the precise manner for fare management in all public means of transport in Thessaloniki area.

Prevention of fraud

The ticket inspectors of AM/TheTA will conduct regular inspections of all travel documents of the passengers, where required. The results of the inspections shall be delivered to the Contractor for the calculation of the relevant performance indicators of the Payments Document.

4.9 Inter-communication

General

The effective inter-communication of the Contractor is of vital importance. The basic communication fields are as follows:

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- Ensuring that the personnel feel well-informed,
- Ensuring that all members of personnel can communicate one to another at all levels,
- Ensuring that the personnel can easily access the information required to execute their duties,
- Securing that the procedures used for transferring and acquiring information data can be easily followed,
- Ensuring that the personnel possess the appropriate communication tools needed for the execution of their duties,
- Ensuring that the communication procedures are in practice effective.

Metro in service

This paragraph concerns the communication among the Contractor's members of personnel, with the Metro system in operation. The communication, in this aspect, is usually the one required as a response to the alternating operation environment experienced by the personnel on duty.

The main control point for the aforesaid communication is the Operation Control Centre (OCC). The Contractor will develop the pertinent procedures in order to impose high level of discipline in this aspect of communication, in which the transmittal of messages in a clear and precise manner is of great importance.

The procedures related to the Radio Communication and Emergency Radio Communication have been especially develop in order to "guide" the personnel as to how to use the radio-system; However, these procedures will be revised by the Contractor and be submitted to AM for approval.

There will be many other systems that will be used for the in-house communication among the members of the operation personnel, namely:

- PABX telephone system,
- Central Direct Line Telephones system (DLT),
- Public Announcements,
- Emergency call points,
- e-mail.

These systems will be used, as required, by the Contractor personnel. Although there are no specific instructions for use of these communication systems, it is anticipated that the personnel will follow a professional approach and not to misuse same.

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4.10 Provision and promotion of passenger services

4.10.1 Information to the Public

The Contractor will assist AM in the information campaign to be organized and conducted prior to the commissioning of each phase of the Thessaloniki Metro network.

4.10.2 Train Trips Information

The train trips information to be provided by the Contractor to passengers, in Greek and English, concern the following:

- Information about trains' circulation in the network under abnormal conditions,
- Information in the network during travels,
- Written Information in stations,
- Customer services: Development, installation, management and manning of information desks.
- Customer satisfaction
- Terms of Travels and Terms of Services.

4.10.3 Passenger service

The Contractor will submit to AM for approval a Communication Program determining - as a minimum- the following items, as far as public is concerned. For example:

- a. External representation,
- b. Communication Strategy,
- c. Public relations: Passenger Information and Assistance, Promotion of Services, Campaigns, Obligations related to Maintenance activities entailing interruption of services, Constraints as concerns Publicity and Media, Crises Communication, Accessibility, Security and Revenue Protection Interface,
- d. Department responsible to manage third parties' visits,
- e. Cooperation with Social and State Authorities, Management of situations involving third parties, Police and prevention of crimes,
- f. Websites for Operation, Maintenance and other Metro related services provided by the Contractor,
- g. Complaints Services – Physical and electronic addresses: It is noted that any messages to be transmitted to the electronic address provided to the public for complaints will be copied immediately to AM as well so that it verifies that messages they have been recorded and settled by the Contractor,
- h. Operation of a PABX, with reference to ensuring the requirements deriving from the KPIs stipulated in paragraph 9.4.3,

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- i. Customer Service, in which information about passenger satisfaction shall be received and recorded; a complaints centre may also be integrated therein.

4.10.4 Marketing

The Contractor will submit a Marketing Plan for evaluation and monitoring, aiming at attracting and maintaining the maximum possible number of passengers and ensuring and enhancing Metro's name and reputation.

The aforesaid Plan will also include methods for calculating Passenger Satisfaction Score (SCAT). The received information about passenger satisfaction will be recorded and transmitted to the Customer Service Center, while a copy of the subject information will be transmitted to AM, if the matter concerns a construction/structural issue and, in general, an issue related to assets. The Contractor will ensure that all passengers' requests / complaints will be responded within 1 day upon their receipt, while requests/complaints shall be automatically copied to AM as well.

4.10.5 Travel Rules and Transaction Terms concerning Passengers

The Contractor will ensure that there are always updated Travel Rules and Transaction Terms concerning Passengers.

The aforesaid Rules and Terms will be developed at the recruiting phase of the Contractor; they will be lawful and be approved by AM before their use. They will be regularly updated – at least once a year – so as to incorporate all changes of the system, all amendments of the legislation and any services modifications, including any instructions on the part of AM. AM will approve any revision of theirs prior to their use.

The Travel Rules and Transaction Terms will be also posted on Thessaloniki Metro website. The Contractor shall be responsible for the Management of the website, subject to AM's approval and supervision.

4.10.6 Lost Property

The Contractor will organize, will staff and operate a Lost Property Office at Pylea Depot. The Contractor will have to inform passengers that, in case they lost any of their property items, they can address themselves to the aforesaid Office either to report the loss or the take delivery of any of their property item found. In addition, if any passenger finds any lost item, he/she should deliver same to the station personnel, regardless of location.

4.10.7 Cooperation with other Agencies of Mass Transit Modes

The Contractor, in cooperation with AM and in the framework of his responsibilities assigned to him by AM, will cooperate with the Agencies of Mass Transit Modes and will proceed to the necessary coordination actions, in view of ensuring the smooth operation of the Thessaloniki Mass Transit Modes and the provision of the optimum services to the public.

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The Contractor will participate in meetings, at regular time intervals and at least once a year, with the remaining operation agencies of the Mass Transit Modes of Thessaloniki.

In his QA Plan, the Contractor will incorporate a communication diagram and procedure with the remaining operation agencies of the Mass Transit Modes, informing AM on any of his relative action.

4.11 Commercial Advertisements

The Contractor shall provide access to AM and shall ensure all possible assistance to AM in the implementation of advertising actions in stations and trains. More specifically, the Contractor shall provide all possible assistance and freedom to AM, so that AM, may:

- Formulate the commercial and tariff policy of the Contractor, in relation to the availability of advertising spaces for utilization. The spaces intended for the display of advertisements shall be determined by means of a pertinent study that will be evaluated on the basis of architectural and operational criteria.
- Undertake the necessary actions to attract customers, to sale advertising spaces and to manage the relevant commercial – advertisement contracts making available for rental purposes the interior of trains, the advertising boards in stations and communication / advertising leaflets and brochures.
- Take care of the management of his relations with his current and potential customers, including the preparation of offers, the organization of meetings and the conclusion of contracts.
- Cooperate with AM's Technical Departments for Stations and Rolling Stock for the implementation of advertising.

The Contractor shall be under the obligation to cooperate with the advertising companies to be selected and to integrate in the areas of the Thessaloniki Metro network all advertisements that AM will may require.

4.12 Commercial Activities in Stations

The Contractor shall be under the obligation to assist AM in the event that the integration of commercial activities in stations is required. In these cases, the Contractor shall provide his assistance in the review of the requirements concerning safety, fire protection, unhindered circulation of passengers under normal operation, passengers' evacuation in emergencies and smooth operation of the station are adhered to.

4.13 Reliability, Availability, Maintainability and Safety (RAMS)

The Contractor will take delivery by AM all RAMS analyses and the corresponding System Assurance Plans (SAP) for the entire Thessaloniki Metro Project (both Base Project and Extension to Kalamaria), which have been prepared by the construction, systems and rolling stock contractors and which include all systems of the aforementioned contractors.

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The detailed requirements are included in the document including the RAMS Requirements document.

The Contractor:

- prior to the commencement of each phase of the revenue operation, will revise the SAPs, should it be required;
- will periodically check the SAPs and revise same, should it be required.

The Contractor shall take all necessary actions so as to maintain – as a minimum – during Operation and Maintenance the approved RAMS targets, as these are presented in the RAMS Requirements document (and which are expected to be confirmed by the Reliability Demonstration Tests (RDT) for all systems and rolling stock), ensuring adherence to the Systems Operation and Maintenance requirements, as these have been formulated by the construction contractors and approved by AM.

4.14 Safety

The Contractor, having taken into consideration all the documents and safety certificates related to the planning of the Project in terms of the safe operation of the rolling stock and of all electromechanical and railway systems, shall hire and mobilize an International Independent Safety Assessor that will possess the appropriate qualifications and certification, in order to prepare the Safe Operation Certificate for the Operation and Maintenance of the Thessaloniki Metro. The Contractor shall be under the obligation to submit the proposed Assessor within sixty (60) days from the signing of the Contract for approval by AM to whom he/she will report. The scopes of the independent assessor, which fall under the Contractor's liability, shall include:

1. Issuance of an "Operation Safety Validation Certificate" for the operation of the Base Project at least two (2) months before the commencement of the revenue service of the Base Project;
2. Issuance of an "Operation Safety Validation Certificate" for the entirety of the Thessaloniki Metro Network (Base Project and Extension to Kalamaria) at least two (2) months before the commencement of the revenue service of the Extension to Kalamaria.

The scope of the "independent assessor" shall be to proceed with the following actions in relation to the Project under commissioning before the commissioning of each one of the operation phases (Base Project and Extension to Kalamaria). Namely:

- Verify the detailed operation principles of the system, including all safety-related interfaces, such as verification of the adequacy and suitability of the planning and designs of the project and, in particular, of all related E/M and railway systems, rolling stock and all programmes, procedures, methods, work instructions and other documents of the Quality Management Plan for the safe Operation and Maintenance of the Base Project (including those related to the cleaning and security), while their operational coordination with the installed systems and the rolling stock shall be checked;

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- Verify the operation plan and the operation procedures in normal and emergency operation;
- Verify safety demonstration and the safety analyses prepared by the suppliers of the safety-critical systems and the related interfaces;
- Verify the passenger evacuation measures;
- Verify the fire protection measures;
- Identify any weak points, corrective actions and monitor the completion of corrective actions;
- Validate the safety and the suitability for operation of the entire system;
- Conduct additional safety tests at the worksite – if necessary.

Once the Safety Assessor expresses his consent and provides the safety certification on the operation and maintenance as a whole, AM shall proceed with the final review and approval of the procedures for use by the Contractor.

TECHNICAL DESCRIPTION AND SPECIFICATIONS**5. MAINTENANCE****5.1 General Issues**

The maintenance strategy followed for the Thessaloniki Metro Project consists in covering -at the same time- the requirements related to the operation, reliability and availability of trains and systems, as well as the maintenance related requirements by ensuring the provision of high quality services as regards safety, train service accuracy and the environmental conditions for the entire system.

5.1.1 Objectives

The main objectives related to the Maintenance of the Thessaloniki Metro are as follows:

- Ensuring the Safety of the System during operation
- Health & Safety of the public and the employees
- High level of reliability and availability of the entire system and, in particular, of each train and E/M system
- Reduction and optimization of the maintenance cost (life cycle cost effectiveness)
- Optimized maintainability of each system, sub-system or equipment
- Cleanness and attractiveness of the Metro as Mass Transportation Mode.

5.1.2 Submission of Maintenance Program

AM shall give to the Contractor the approved Maintenance Programs for Infrastructures, Systems and Rolling Stock of the Base Project and the Extension to Kalamaria along with the Project Log (see § 2.8.6), as these have been prepared by the construction contractors and have been approved by AM. Based on the above, the Contractor has the obligation to create and submit for approval to AM, within two hundred and forty (240) calendar days from the signing of the Contract, a Maintenance Program for the Base Project of the Thessaloniki Metro and a Maintenance Program for the entirety of the Thessaloniki Metro that will also include the Extension to Kalamaria within three hundred (300) calendar days.

The Maintenance Program shall include all assets, infrastructures, systems and the rolling stock of the aforementioned two projects, and shall continue to adhere –as a minimum- to the requirements and keep the levels of reliability, availability and maintainability referred to therein. The unified Maintenance Program shall be updated and re-submitted for approval by the Contractor prior to the commencement of each phase of revenue service, if required, and whenever requested by AM.

In the Maintenance Program, reference shall be made to all documents related to the maintenance of the Quality Management System (QMS) of the Contractor, as well as to the Maintenance Management System (see § 5.3.7), while all relevant issues shall be also included therein, such as the Procedure related to occupation/ reservation and

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access to areas, Work Permit Procedure, Manual for Cleaning, Training Program, Assets Management Plan (to be prepared by the Contractor) etc.

The Maintenance of the Metro network (preventive, corrective and diagnostic) shall be executed by the Contractor in accordance with the approved unified Maintenance Program, which should have been approved prior to the completion of the Trial Operation of each phase of Operation and which shall be in accordance with the quality requirements, the Law and shall be executed by properly trained and approved personnel.

The requirements concerning the Organizational Structure of the Contractor are described in § 2.8.3.

5.1.3 Access for maintenance

The Contractor shall develop an occupation/reservation and access related procedure to enter areas with access restrictions (e.g. tunnels), as these shall be foreseen in the Maintenance Program. This procedure shall adequately describe the required actions related to the planning, authorization and execution of maintenance works and the release of the area where the subject works have been executed for safe operation.

Access to areas shall be granted by the OCC and works shall be executed based on approved work permits.

5.1.4 Maintenance by the Projects, Rolling Stock and Systems' Contractors

Each one of the works, rolling stock and systems' contractors shall be responsible for the corrective maintenance of the Project that he has performed within a 36-month period from the date of issuance of the Completion Certificate for all works that he has undertaken, while for a period of 12 months from the date of issuance of the Completion Certificate only the Construction Contractor of the Base Project is responsible for the preventive (scheduled) maintenance as well.

The above shall also affect the stages of mobilization of the Contractor's personnel, as also presented in Figure 2.

5.1.5 Durability and ease of maintenance

5.1.5.1 General

In a Metro system in operation for 19h/day, durability against time and against any other cause of wear is a matter of utmost importance. The Contractor shall take into account materials that can be replaced in small parts. Repair works and standard cleaning shall be completed by the Contractor within a limited time period between the closing of the system at night and resuming of operation in the morning.

Therefore, the relevant materials and details shall meet the following requirements:

- a. They can be cleaned on a daily basis, especially in case of direct contact with passengers.

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- b. They shall not crack or be folded creating, thus, sharp edges; excluded is the use of glass or plastic thin sheets.
- c. In cases where daily maintenance is not mandatory, or where there is no access to the public (e.g. great height), materials and details shall not look worn over time and will not hold any stains, cracks, rust or other flaws of this kind.
- d. Architectural items requiring opening and closing or disassembly at regular intervals, for example roof panels, advertising panels, information signs, shall be made of such materials that any carelessness or rough handling shall not negatively affect their neat appearance, while appropriate tools shall be used for their disassembly.
- e. All exposed materials shall be resistant to vandalisms, including graffiti (materials include glass, which must have been hardened to be resistant to scratches).

5.1.5.2 Cleaning, graffiti and repair of damage caused by vandalism

Cleaning works shall be executed by the Contractor in accordance with the Cleaning and Security Services Specifications and in line with the requirements of § 6 herein.

5.1.6 Definitions of maintenance procedures

It is useful to define the following maintenance related activities and procedures:

Inspection:	The condition of critical complexes is often inspected visually or by using diagnostic tools.
Replacement:	Spare parts or materials that have failed/are worn/have expired are subject to use under specific conditions or to periodic replacement.
Post maintenance tests	Testing activities on equipment items switched into the fail-safe mode shall be carried out before setting the subject equipment ready for use (see §5.3.4).
Checks on the testing track:	Before switching back to the automatic mode, trains are checked on the testing track to verify that basic functions are properly performed. The subject test is called Dynamic Departure Test (DDT) (see §5.3.5). Switching from manual to automatic operation mode is always associated with the successful performance of the DDT, except in case of minor repairs (i.e. indoors).
Dynamic Test Program:	The maintenance program shall be constantly re-examined based on the analysis of data collected in the maintenance information system, such as inspection reports, overhaul reports, corrective maintenance reports, diagnostic system data, evaluation of RAMS parameters.

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Traceability:	All basic and main spare parts shall be traced via their Serial Number.
Management of maintenance tools:	Testing tools and equipment shall be checked based on a schedule. Non calibrated tools shall not be provided for use.
Personnel Management:	The quality of work shall be pursued via specialization, continuous training and proper resource planning.

5.1.7 Track occupation / reservation

5.1.7.1 Main Line

During maintenance, safety shall be ensured by the Contractor as a mandatory precondition for train operation. The “safe operation” of the rolling stock is closely related to its reliability and proper use.

Maintenance works on the main line shall be scheduled by the Contractor during night hours, when the line is not in operation. The scheduled and corrective maintenance works shall be allocated in a special area named “track occupation/reservation area”; the alteration of various areas shall follow a certain pattern, which shall be as systematic as possible for the sake of visibility and stability of the maintenance and operation group. Only extremely urgent corrective maintenance works shall be executed outside the usually occupied/reserved track (either during night hours or during operating hours, depending on the urgency) by using exclusive resources and via the operation of a single line.

In order for the maintenance works to commence, the relevant operation and safety terms shall be established by the Contractor:

- Removal of all trains from the subject area (train timetable, expiry of the transitional period);
- De-activation of the area via SCADA;
- In situ electrical isolation in the area.

Upon completion of works, the system operation shall resume by the Contractor as follows:

- Cleaning of the area;
- Removal of electrical isolation;
- Activation of the area via SCADA;
- Train timetable, commencement of transitional period.

The aforementioned steps and related time periods shall cause further decrease of the time window available to the maintenance group. The time periods that can be taken into account at this stage are as follows:

- The transition period can be assumed to last 20 min.

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- In order to activate and isolate power, a 20min period is initially calculated (detailed procedures must be developed, depending on various factors, such as rules and standards for safety and work environment, higher power work standards etc.).
- In order to clean the area, a conservative period of 15 min for cleaning is taken into account.

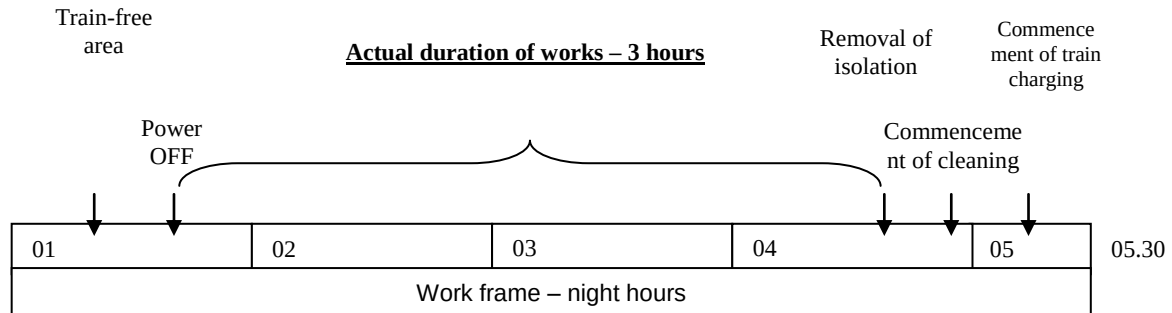


Figure 16 – Work frame – night hours

Different strategies can be applied by the Contractor, such as:

- Track occupation/reservation in a restricted line section, one track
- Track occupation/reservation in a restricted line section, both tracks
- The track occupation/reservation includes the entire line, one track, for the time window for works executed during night hours
- The track occupation/reservation includes the entire line, both tracks, for the time window for works executed during night hours.

The second assumption can be considered as more likely; the line is divided into 4 areas, as shown here-below:

- Area.1: New Railway Station – Venizelou (4 stations, 2 crossovers),
- Area.2: Aghias Sofias – Papafi (4 stations, 1 crossover),
- Area.3: Efklidis – Analipseos (3 stations, 1 crossover),
- Area.4: 25 Martiou – Nea Elvetia (3 stations, 2 crossovers).

In a 5-night shift working week, each area can be accessed at least once a week.

Work allocation can be balanced taking into account the fact that, although scenarios 1 and 4 include a provision for 2 crossovers, the following areas can be handled during operation before normal closure at 00:30:

- Pocket track beyond the New Railway Station.
- Nea Elvetia – Depot area.

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In case of emergency, it shall be possible to drive vehicles in single track operation mode and cover a 10min headway, i.e. from 00:00 to 07:00, at the section between Analipsi and Nea Elvetia.

This option could be implemented in case of emergency requiring extended occupation/reservation relating to extensive maintenance (e.g. tunnel washing); however, it shall be verified based on all operational requirements, including the management of the transition period. This technique can be applied in other line sections as well.

The aforementioned scenarios are presented in the following Figure:

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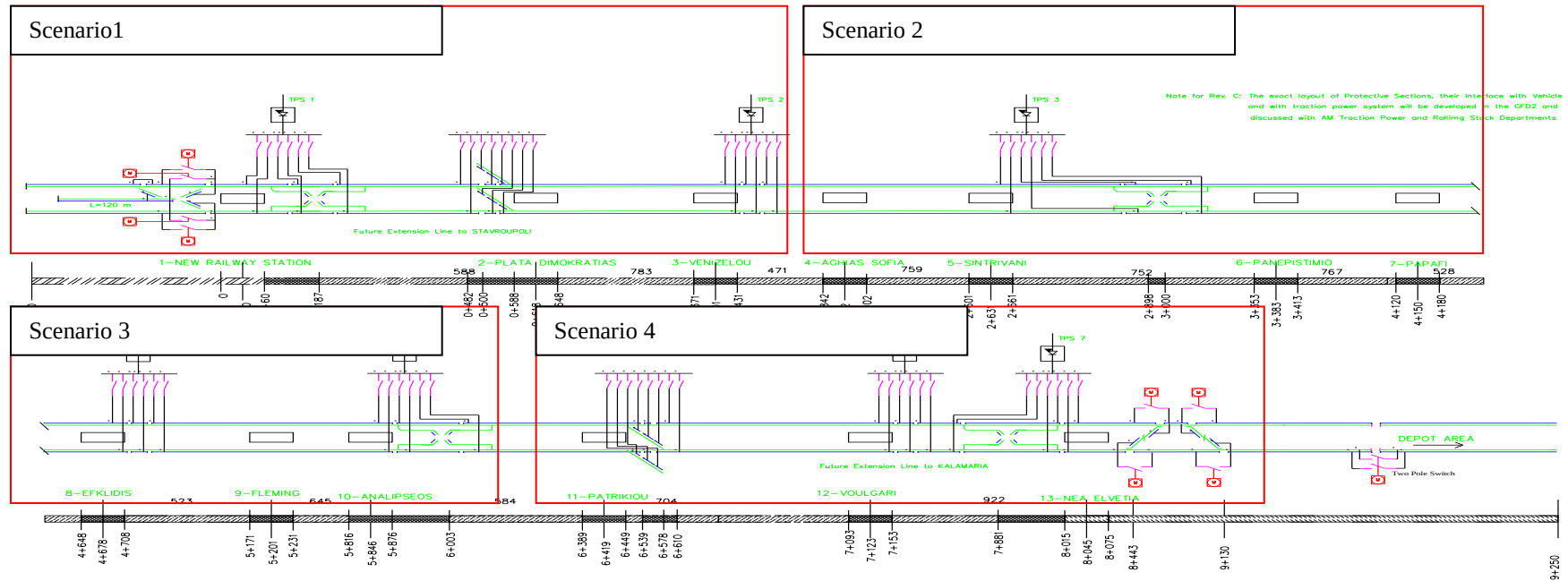


Figure 17 – Track occupation/blocking scenarios 1 to 4

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5.1.7.2 Depot Area

As regards the Depot area, the time period most likely for maintenance is during morning hours, preferably during off peak hours. However, the possibility for train stabling at the other end of the line (pocket track of the New Railway Station) shall minimize the risks related to maintenance works executed during peak hours, so that the entire time period from 09:00 to 17:00 can be utilized.

As shown in the document entitled “Depot Operation Program” (document 1G00EN542U111), 3 days/month shall be sufficient for in situ maintenance in the Depot area. The Contractor shall check and re-submit the “Depot Operation Program”, if he deems it advisable.

5.1.7.3 Interfaces with other Contractors

In case other contractors or subcontractors execute maintenance works in the Metro system, they shall operate in the framework of the quality, health and safety management system installed by the Contractor. The Contractor must organize same by properly integrating the relevant obligation in his Procedures. Their main interface fields shall be as follows:

- During normal/downgraded operation, the Contractor shall be responsible for direct interventions via coordinated actions between the OCC personnel and the maintenance contractor.
- During the meetings held to re-examine the Operation performance as well as during coordination meetings, the Contractor shall participate in the joint examination of the causes and results of the most significant events that occurred, in order to specify any possible actions to mitigate any negative impact, as well as any long-term improvement related actions.
- Coordination of and access to equipment and installations for scheduled and non scheduled maintenance shall be carried out in accordance with the foreseen procedures for the issuance of a “Work permit”, during which the maintenance Contractor shall submit a request to obtain the relevant permit.
- Train maintenance: The Contractor shall be responsible for the removal of trains from Service for the execution of a scheduled or non scheduled maintenance, based on the rolling stock maintenance requirements. The vehicles shall be delivered to the Maintenance Contractor and shall be returned to the Contractor upon completion of the maintenance works.

5.1.8 Maintenance Training Strategy

In order to provide the best possible support in the rectification of failures, the Contractor shall see to the provision of the appropriate maintenance related training, which is of outmost importance in view of ensuring the appropriate conditions for the fixed assets of the transport system and minimizing the

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operation down time. For this reason, the subject Contractor shall provide an appropriate training program, retaining a high level of knowledge for all persons employed in the specific field.

Prior to the commencement of the system operation, having ensured the cooperation between suppliers and employees engaged in maintenance, in situ training and issuance of a certificate verifying the subject training shall be provided at the care of the Contractor, especially as regards knowledge on the maintenance procedures of the maintenance personnel and as regards the subject personnel's skills. Training is considered by the personnel as part of its work and as a necessary pre-condition to cover the safety, reliability and availability of the system.

The above shall be achieved via:

- Highly specialized maintenance personnel;
- Structured training program for each position in the structure of the Contractor.
- Support provided to Sub-contractors during operation, maintenance and commencement of works.

The Contractor for the construction of the Base Project shall provide to AM and to the Contractor the initial training of the maintenance personnel (see § 2.8.4). Training is planned to create a framework capable of upgrading and keeping the training of each technician at the highest level. The overall Training Program (see § 2.8.4) to be prepared and executed by the Contractor shall be in accordance with the hiring plan, in order to optimize the training related effort and results. Knowledge shall be transferred from the supplier to the Contractor at a time as close as possible to the initiation of the trial run, so that the Contractor can undertake the maintenance of the system upon completion of the obligatory and preventive maintenance to be provided by the contractors responsible for the construction (see § 5.1.4).

It is important that training is provided by specialised personnel and that the quality of training is the same for the entire personnel, while it is also important that the Contractor provides an ongoing re-training program to support familiarization of the personnel with the system in question.

Training shall cover all aspects of the daily operation and maintenance and not only the technical part, but also safety, quality, the environment or other general courses, whose duration and the content of the relevant units shall be presented in the relevant documentation.

5.2 Maintenance Facilities – Complex 1 – Maintenance and Repair Building

A description is made below of Complex 1, including the Train Inspection and Maintenance Building, the Workshops, the Washing Plant, the Central Warehouse, the Mechanical Equipment Rooms, the Offices and one two-

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storey Parking Facility in two levels. The management of all assets and personnel at Complex 1 shall be carried out at the Contractor's exclusive responsibility.

The train entering the depot area crosses that building and selects whether it is going to stop at the washing plat (for train exterior washing, as required and as described above) or whether it is going to move on for the Train Stabling Shed. If a train repair is required, then the train instead of moving towards the Train Stabling Shed it shall move at the perimeter of the Train Stabling Shed to reach the Workshop, at level 58.00 on its southern side. The access of the people working in this building can be made in two ways, namely:

- Either at level 58.00, via a pedestrian bridge connecting Complex 2 (main depot entrance, administration, OCC, stabling shed) with Complex 1. This pedestrian bridge that shall be made of steel consists in a circulation corridor well protected from all sides via transparent panels (glass or polycarbonate panels), which is supported by columns. These columns are founded westwards on the natural soil (level 52.00) and eastwards on the retaining wall separating levels 52.00 and 58.00.
- Either at level 52.00/53.00 through a road coming from the south and moving just underneath the pedestrian bridge. This road provides access to the upper level of the underground parking facility (level 53.00), to the washing plant (level 52.00) and finally to the litter area (level 52.00). At the end of the road the vehicle reversing space is widened and there is a space for the parking of 2-3 large vehicles.

The workshop building has 6 levels, in which the various uses are positioned as follows:

Level 50.00

The first floor of the underground parking facility (170 spaces for vehicles and 55 spaces for bikes), the bogie storage area and the electromechanical areas are located at this level.

The underground parking facility is served by 2 emergency staircases and 4 lifts to/from the upper floors of the building, as well as by an ascending and descending ramp to/from the second level of the parking area. Another two emergency staircases continue towards a lower level (46.00) where an underground corridor/emergency exit is being constructed directing the parking facility users outside the building box. This corridor is provided for due to the positioning of the parking facility underneath the workshop.

The bogie storage area is connected to the aforementioned levels via two elevators for merchandise and one staircase.

Level 52.00

The washing plant, the power supply sub-station, the area for the parking of Major Vehicles and the Litter area are located at this level.

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As mentioned above, the washing plant is located at the point where the trains enter northwards, so that they can be washed externally (as required) before they enter the depot. For this reason, the access to the depot is achieved via two tracks, so as the trains can either stop at the washing plant or continue to the Stabling Shed.

The power supply sub-station is located at the west end of the building westwards of the access / exit tracks of the trains to the depot.

The area for the parking of the Major Vehicles is located wayside the litter area, it is sheltered and it can accommodate 2-3 major vehicles.

Finally, the litter area shall be located to the east of the train access / exit tracks and to the north of the parking area. This area is accessible through the road via a sheltered area, which is isolated with the use of vertical perforated, steel, galvanized and painted rollers of heavy type.

Level 53.00

The second floor of the underground parking facility (170 spaces for vehicles and 55 spaces for motorbikes) and the main entrance to it are positioned at this level.

The items applicable to level 50.00 are also applicable to this level too, as regards the parking facility and the escape routes.

Level 58.00

This level is the main level of the Workshop and includes the following:

- The Main Workshop
- The Repair Facility
- The Painting Facility
- The Bodies Area
- The Bogie Coupling Facility with two (2) Merchandise Lifts
- The Car Traverser
- The Main Entrance
- Gantry cranes
- The Main Warehouse (in two levels) and one Merchandise Lift
- Offices
- Electromechanical Areas
- Laboratories
- Staircases and Lifts
- Auxiliary Areas (sanitary areas, kitchens and locker rooms).

Moreover, it includes supports for the movement of railway vehicle bogie gantry cranes for two gantry cranes for the bogies of railway vehicles weighting ten (10) tons and one gantry crane for the bogies of railway vehicles weighting one and a half (1 ½) tons, as well as crane support brackets.

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Level 63.00

The second level of the Main Warehouse, Offices, Workshops, electromechanical areas, as well as auxiliary areas (sanitary areas, kitchens and locker rooms) are located at this level, and more specifically at the western and northern ends of the building.

Level 69.00

Offices and workshops (repair of motors, carpenter's workshop, etc.) Training Rooms, one canteen, outdoor activities' terrace, as well as auxiliary areas (sanitary areas, locker rooms with cabinets) are located at this level.

5.2.1 Train Inspection and Maintenance Building

A description is given below of the building where the Contractor shall carry out the inspection and maintenance of trains, including the following:

- Four inspection tracks for the Nominal Maintenance Inspection (NMI), the Limited Inspection (LI), the General Inspection (GI) and the Great General Inspection (GGI). Three out of these rails shall be laid on columns and the fourth one shall be laid in a pit. The latter shall serve side elevated platforms and a gantry crane in order to allow the performance of maintenance works of the roof mounted equipment (air-conditioning units, etc.). The opening of the gantry crane shall reach the area for repairing the roof-mounted equipment. These rails shall be powered through overhead stinger systems or, in case of rails in pits, through a stinger system safely installed within the pit.
- Rail grinding machine followed by a pit for the inspection of trains. During the grinding machine process, the train shall be pulled / pushed by a battery operated locomotive on the track. In an effort to minimize the disturbance caused by the lathe process, there shall be a compartmentation of the entire track.

One trip (route) on the track shall allow the trip of the bogies from the bogie storage area to the area of the grinding machine.

The filings produced by the lathe shall be led to a Metal Dust Bin through a conveyor belt. This Bin shall be removed from the lathe area by the use of a Forklift.

- Rapid repair track within the pit. Along the track, there shall be a sufficient number of lifting jacks, which shall allow the lifting of the entire train and the replacement of the bogies. The bogies, which are replaced, shall be pulled by hands up to the Bogy Temporary Storage Area and shall be led to any bogy repair workshop. Similarly, the bogies from the bogy storage area shall be led to the Bogy Temporary Storage Area.

The control centre as regards the lifting units shall allow the independent lifting of the vehicles and the simultaneous lifting of all vehicles forming a train-set. During the lifting process the flashing lights shall be energized.

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Within the boundaries of this rail track, the train shall be powered by a stinger system, which shall be safely installed within the trench and which shall be de-energized automatically during the lifting process.

- A vehicle overhaul area: the Main Workshop:

Partial and Main overhauls of the trains shall be carried out within this area of the Train Inspection and Maintenance Building. During this sequence, trains are de-coupled into single units, and then transferred onto a lifting plant where all necessary underframe units are removed for further replacement, maintenance, repair, testing, etc. into the various workshops constituting the Main Workshop.

Having being de-coupled, the single car units shall be installed on accommodation bogies to allow for their easy on-tracks transfer to the required work stand (lifting plant, paint shop, etc.).

In Pylea Depot, train access to the Main Workshop and cars on-tracks transfer shall be carried out through a Car Traverser. The car traverser shall be dimensioned to house a single car coupled with an electric tow truck. The Car Traverser shall move on carriage rails.

Full description of the equipment required under this Contract to perform such overhaul is included in the document entitled "Performance Specification for Depot Plant and Equipment:

- Car lifting plant
- Locksmith workshop
- Forge workshop
- Welding workshop
- Door repair workshop
- Bogie and wheel repair workshop
- Traction motors and auxiliary machines repair workshop
- Electro-Mechanical workshop
- Electronics workshop
- Machine fitting workshop
- Carpentry workshop
- Synthetic workshop
- Car painting and Grinding Unit.

The Train Inspection and Maintenance Building shall, in addition to the above, include:

- Maintenance staff changing rooms, toilets, canteen, etc.
- Supervisors' offices
- A general store, common to all maintenance services, accessible by road
- An oil waste and supply room

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- A compressor room, supplying compressed air to all areas within the Train Inspection and Maintenance Building
- A Central Tool Store for use by Train Maintenance Technicians
- A battery room
- An electric vehicles charging room
- A Lighting and Auxiliary Systems (LAS) room
- A stinger room.

5.2.2 Fixed Installations Maintenance Building

The building where the Contractor shall perform the maintenance of the fixed installations is described below; it is a special building located at the east of the train stabling area with 4 levels. It houses the various workshops and offices of the supervisors of the fixed installation systems. More specifically, the building includes an area for the following workshops:

- Power supply workshop, which includes 20KV, traction power, power distribution, lighting, earthing;
- Mechanical installations workshop, which includes ventilation, heating and air conditioning, pumping, escalators, lifts and fire protection systems;
- Low voltage workshop, which includes the train automation, signaling, telecommunications, information technologies and fare collection.

All the aforementioned workshops shall have road access.

Common installations, such as locker rooms, WCs, refreshment rooms etc. are also found in this building.

In Pylea Depot, the Fixed Installations Maintenance Building also houses the 20KV supply room of the Depot (PPC room), the Rectifier Substation (RS), the Lighting and Auxiliary Substation (LAS) to serve the Fixed Installations Maintenance Room, the Administrative Services Building, the OCC etc. – and one technical equipment room for signaling, which houses all operation and supervision related automations for the OCC.

5.2.3 Maintenance Workshop and Main Repair Workshop

A description follows of the Maintenance Workshop and of the Main Repair Workshop, where the Contractor shall carry out the maintenance and the main repairs of the Rolling Stock in the Depot, which are as follows:

- 5 maintenance tracks for inspection and fast repair at the Maintenance Workshop;
- 2 tracks for the Main Repair Workshop (one train-set length);
- 2 tracks for disassembled vehicles (half train-set length);
- 1 track for the underfloor wheel lathe and
- 2 tracks for service trains.

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Access to non-isolated tracks under normal conditions shall not be allowed and a relevant permit shall be required by the maintenance supervisor of the Contractor.

Shunting movements from the maintenance tracks up to the overhaul tracks and vice versa shall not obstruct movements from the line to the transfer section between the automatically controlled area and the manually controlled area.

5.2.4 Washing Plant

Whilst train interior cleaning activities shall be carried out within the stabling shed, train car body washing and underframe dust removal shall be performed within the washing plant.

Train exterior washing shall be carried out in a washing plant located north, at the entrance of the Pylea depot, fully specified in the document entitled "Performance Specification for Depot Equipment".

In addition to the outer car body washing, the washing plant shall include a Dust Removal program – and related facilities – for dry cleaning and high pressure washing of the car underframe. Dust removal facilities include pits with compressed air and water supplies, jets and a dust removal tower with exhaust turbines working over a water system to collect the dust.

All protections and separations shall be provided by the Contractor to ensure that works on a car do not spill water, mud, etc. on any other car of the train being washed or on any adjacent train.

The Dust Removal Program shall run separately or along with the Outer car body washing program, without manual intervention. However, further manual cleaning and high pressure washing of the car underframe shall be allowed. The Power Supply sectioning shall allow for safe human intervention.

The washing plant location shall be such that any train might be routed through to the washing plant after its service time and that from the washing plant, this train can reach any scheduled stabling position within the depot.

Storage of detergents, control room, dust removal tower, etc. shall be located in the vicinity of the active section of the washing plant and shall be accessible by road.

Train washing

In case the Contractor must proceed with the washing of an incoming train, the subject train shall be automatically guided directly to the washing plant where it shall automatically stop. The OCC shall set the train at washing mode through the signaling system. The train shall move at max. 5km/h along the washing plant. The "ready for operation" mode of the washing plant is a

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pre-condition for setting the train ready for washing. Washing plants are supervised and remotely controlled by the operator. The operator can stop the operation of the washing plant and the train at any time. Upon completion of the washing procedure, the train shall be automatically directed to the stabling position. The washing plants and the washing procedure shall be supervised by the operator via the CCTV.

Incoming trains that do not require washing shall divert the washing installations via a separate track.

In case of emergency, a train can pass from the washing plant at the opposite direction at low speed.

5.2.5 Testing Track

Trains shall be directed by the Contractor at SMM mode or at PM Mode towards the testing track. The signalling system shall protect the way in and the way out of the testing track. Both ends of the testing track are protected by buffers and signals at the ends of the track. Access to the testing track is feasible if there are no trains on the testing track. In order to exit from the testing track, a route request button is required. Movements on the testing track are protected through ATP (Automatic Train Protection) and trains operate through ATO (Automatic Train Operation).

5.2.6 Central Warehouse – Spare Parts

The Central Warehouse is located in the Depot area and is the central point for the storage and management of spare parts, consumables and special tools of the Project (see § 2.8.2).

In the Central Warehouse area, the Contractor shall undertake the operation and management of the following:

- Office for the Management of Spare Parts
- Readers for the identification and traceability of spare parts, consumables and special tools, to be installed by the Contractor of the Base Project
- Electronic system for the Management and organization of the stored spare parts, consumables and special tools, to be installed by the Contractor.

5.2.7 Offices

Cleaning and maintenance of the offices foreseen in all Metro areas shall be performed by the Contractor. An office arrangement for approximately 350 furnished offices and a total provision for approximately 600 positions in all Depot buildings, including Complex 1 and Complex 2, the Administration Building etc. (see § 3.6.3) has been made. The office locations foreseen in these buildings are recorded by approximation in § 3.12.

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All furniture related details concerning the aforementioned work positions are described in § 3.13.

The detailed positioning of all employees in the Depot shall be prepared in the framework of cooperation between AM and the Contractor, depending on the final needs, as these shall be configured.

5.2.8 Two-storey Parking Facility

The Contractor shall proceed with the cleaning and maintenance of the Parking Facility located in Complex 1 and described in § 3.9.

5.3 Maintenance Programs

5.3.1 Scheduled – Preventive Maintenance

The Contractor shall be responsible for the execution of the scheduled maintenance of infrastructure, rolling stock and systems, except for the a 12-month period upon issuance of the Completion Certificate covering the Base Project, during which the Construction Contractor of the Base Project is responsible for the preventive (scheduled) maintenance of the works, the rolling stock and the Base Project, as foreseen in § 5.1.4.

The purpose of the scheduled maintenance is to minimize, through scheduled measures, the number of failures affecting operation. The scheduled maintenance includes inspections, cleaning, calibration, lubrication, adjustments, replacement and repair of the equipment at pre-determined time periods. The scheduled maintenance related results are constantly collected and analyzed to specify their effectiveness and arrange the related time periods as required.

Maintenance can be scheduled based on time or performance.

The detailed scheduled maintenance activities that shall be executed are described in the maintenance manuals provided by the suppliers and examined by the maintenance group.

The types of the rolling stock scheduled maintenance (with the corresponding estimate of the kilometers run) shall be as follows:

- Nominal Maintenance Inspection (NME) (every 10,000 km)
- Limited Inspection (LI) (every 18,000 km)
- General Inspection (GI) (every 60,000 km)
- Great General Inspection (GGI) (every 120,000 km)
- Partial Overhaul (PO) (every 350,000 km)
- Basic Overhaul (MO) (every 800,000 km).

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The aforementioned vehicular kms shall be co-estimated by the Contractor together with the vehicular kilometers foreseen in the maintenance manuals prepared by the construction Contractors, so that they are established and be used as required in the framework of the maintenance proposed by the manufacturers.

For each equipment, system etc. that undergoes maintenance, the Contractor should specify, following the review of the delivered maintenance programs by AM based on the Project Log (see § 2.8.6), the mean time between repairs, the extend of maintenance works per type and the estimated time for maintenance.

The preventive maintenance activities are recorded by the maintenance information system in order to monitor the maintenance and reliability data concerning the equipment and the spare parts' units.

The Scheduled Maintenance is divided into the following:

5.3.1.1 Time-based maintenance plans

It is the usual maintenance performed by the Contractor at regular intervals, especially as regards safety related equipment or spare parts (e.g. cabling, rubber spare parts, clamping) where the anticipated downgrading is related to time or where the performance application does not provide actual improvement.

The activities executed based on the Project Log also include the so-called seasonal inspections covering systems that do not constantly operate throughout the year.

5.3.1.2 Performance-based maintenance plans

The maintenance cycle is specified by the performance data, such as vehicle/kilometers, operation cycles etc.: availability and easy collection of this data is the necessary pre-condition for the implementation of this type of program by the Contractor.

5.3.1.3 Preventive Maintenance On-Condition

This maintenance is performed by the Contractor only under specific conditions such as, for example, wheel rotation (when the measured profile is out of tolerance, or the diameter is smaller than the minimum permissible one) or replacement of boards based on diagnostic information.

In this case, the "status" is remotely detectable, with minimum effect on the vehicle shunting inside and outside the stabling shed, which is the most preferable situation in order to collect the maximum amount of data and make a decision to schedule the activity in question without removing the vehicle from the automated area.

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5.3.1.4 Predictive Maintenance

This type of maintenance constitutes a direct evolution of the maintenance mode subject to conditions, when new possibilities are added: first of all, the possibility of differentiating the maintenance cycle in order to avoid any unnecessary inspections. The scope of the preventive maintenance is to estimate the remaining life time of an item in order to activate its replacement in due time prior to its anticipated failure.

The implementation of this program by the Contractor on selected scopes requires a particular effort in terms of data analysis, adaptation of techniques, skills and is, therefore, subject to the cost-profit evaluation.

The preventive maintenance can be applied at a subsequent stage, when the Contractor shall be fully familiar with the installed systems and when a significant amount of background data shall be available for analysis.

5.3.2 Corrective Maintenance

The Contractor shall perform the corrective maintenance after a 36-month period from the date of issuance of the Completion Certificate of each work undertaken by the contractors of works, rolling stock and systems. During this 36-month period from the issuance of each Completion Certificate, the contractors of construction works, rolling stock and systems shall be responsible for the respective corrective maintenance, as provided for in § 5.1.4.

In order to avoid any failure, the Contractor shall adapt specific techniques for diagnosis and analysis. Corrective maintenance activities can lead to the replacement of the equipment that has failed or is out of tolerance, by restoring the ready-for-operation mode. This maintenance is achieved in situ, usually by exchanging the replaceable unit (LRU) that has failed.

The corrective maintenance activities are recorded by the maintenance information system in order to monitor the maintenance and reliability data concerning the equipment and back up units.

5.3.3 Line Replaceable Unit (LRU)

The characterization "Line Replaceable Unit (LRU)" refers to an equipment item that can be replaced by an identical spare part in a short time period by the maintenance personnel without requiring any specialized knowledge and procedures on the part of the supplier.

A LRU can consist of a simple component (e.g. printed circuit board, switch) or a set of components (e.g. shelves) or an entire equipment etc.

LRU repairs are usually not executed on site, but in workshops, laboratories etc.

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5.3.4 Post Maintenance Tests

In this section, the post maintenance test is not considered as operation control during or after maintenance, expected to be described in the maintenance manuals of the manufacturer.

Instead, it is a security related confirmation verifying that the system is ready to return to the automatic operation mode without any risk for the system and for the passengers.

The Thessaloniki Metro network has been designed to be a failsafe system, therefore it has auto-diagnostic characteristics which lead the system to a safer mode in case of an unforeseeable event.

This characteristic can be put at risk when the system operation turns into manual mode and then into automatic mode, following a human intervention that is supposed to take place under strict procedures in order to protect the technicians, the passengers and the entire system from dangerous situations.

When each scheduled or corrective maintenance activity is completed, before turning into a fully automated operation system, the maintenance personnel of the Contractor conducts a functional test to all systems affecting safety, in accordance with the hand-over back procedure, in order to ensure a procedure controlled by the various parts.

This entails communication and cross-checks between technicians and the operation personnel in the OCC.

The table corresponding to the check list is countersigned and sent to the Head of Maintenance and is filed after recording the relevant data into the maintenance system.

This functional test belongs to one of the two main cases:

- Test for vehicle re-setting from the manual operating mode to the automatic operating mode
- Termination of maintenance works in the main line/Depot area, removal of track occupation/reservation and back to service.

5.3.5 Dynamic Departure Test (DDT)

It is performed by the Contractor at the automatic operation mode; the relevant procedure consists in testing the proper communication between vehicle and track (wayside) and among the vehicle's sub-systems, such as:

- Speed commands, specifying the vehicle direction, detection of the speed limit;
- Setting of speed;

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- Stop at station;
- Emergency stop;
- ATC and train telecommunications;
- ATC – vehicle's doors.

In all cases, tests are executed under the close monitoring of the OCC and via radio communication with a person on board.

5.3.6 End of maintenance in the main line / warehouse area

Tests shall be performed by the Contractor in cooperation with the Operation Supervisor in the OCC in order to re-establish the normal safe work conditions, such as:

- The turnout areas are put back to service only after a test is performed in coordination with the CCR;
- The PSDs platform shall be tested in coordination with the CCR prior to being set into operation (remote command for operation in open / closed mode, control of closed/locked signal);
- Track areas, by definition, are cleaned in one scanning before setting vehicles in automatic mode.

5.3.7 Maintenance Management System

5.3.7.1 General

The Contractor shall implement an effective maintenance strategy, by setting and installing a Maintenance Management System in accordance with ISO 55001: 2014 (Asset management — Management systems — Requirements), in view of ensuring the optimum combination between the life cycle cost for the system and the product performance.

In order to support the Maintenance Management System, the Contractor shall use a Computerized Maintenance Management System (see § 4.6) to manage the preventive - time based or counter-based - maintenance and the corrective maintenance and shall allow the full management of scheduling and recording of maintenance activities.

The Computerized Maintenance Management System (CMMS) is a software program used to support the development of maintenance programs which can render the scheduled maintenance more effective. It is the application of a maintenance information system which must, as a minimum, meet the following conditions:

- Have a full database for filing all data related to maintenance;
- Be connected to other units / programs / databases to exchange information;

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- Operate as a planning / programming / cost control system;
- Provide dynamic and user-friendly reports.

5.3.7.2 Maintenance levels

The Maintenance Management System of the Contractor shall be proposed and installed by him and shall include all types of maintenance and activities specified in the maintenance programs. This system shall be submitted for approval to AM.

The maintenance levels shall be determined by the Contractor based on technical and management criteria.

The management and organization (Logistics) concerning Maintenance shall be theoretically divided into three different levels, as described below:

- First level maintenance: the purpose of the first level maintenance is to restore the operating mode of the failed items. The first level maintenance usually concerns the replacement instead of the repair of the failed sub-systems. It can be performed by replacing LRUs or by adjusting equipment.
- Second level maintenance: the purpose of the second level maintenance is to restore the LRUs that had been removed during the first level maintenance at stand-by mode. LRUs shall be diagnosed, repaired, tested and sent to the warehouse as spare parts for the first level maintenance. The LRUs sub-assemblies, which are usually not repaired at second level, shall be sent for third level maintenance.
- Third level maintenance: the third level maintenance consists in repairs to visible fittings. For example, it can include fault diagnosis at defective PCBs after the second level maintenance, the replacement of the affected visible fittings, the execution of the proper tests and the re-introduction of the repaired PCBs as spare parts following the second level maintenance.

5.3.7.3 Technical Levels of maintenance activities

The Technical Levels of maintenance activities shall be determined by the Contractor based on the skills, the tools / installations and the documentation required for the execution of the maintenance work. The maintenance levels include the following:

- Basic: This level of maintenance activities includes the inspection, maintenance, testing and simple replacements of LRUs. These activities must be executed and be supported by the work procedures specified in the operation and maintenance manuals.
- Intermediate: This level of maintenance activities includes complex activities that must be executed by specialized personnel, requiring the use of special and/or specific tools and detailed work procedures.

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- **Advanced:** This level of maintenance activities includes actions suggesting knowledge of a specific technique / technology already obtained by the manufacturers and/or specialized companies with special testing equipment.

The main purpose of this section is to organize scheduling during the initial period of operation. As experience is gained from the management of maintenance, these levels of maintenance activities can be less visible, given that the main purpose is to render the failed devices operative the soonest possible.

All maintenance reports shall be entered into the Maintenance Management System and shall be available to AM within 48 hours of the completion of maintenance.

5.4 Maintenance of the E/M and railway systems of the Line

The Contractor is responsible for the maintenance of all E/M and railway systems of the Line, except for the periods of preventive and corrective maintenance carried out by the construction contractors, as stated in detail in para. 5.1.4.

The Contractor, having evaluated:

- The Preliminary Maintenance Programs
- The Manual for each E/M and Railway System of the Line
- The relevant maintenance procedures

which shall be available along with the Project Log (see § 2.8.6), shall submit the revised procedures, if required, and the final Maintenance Program for approval by AM, which shall cover at least the minimum requirements foreseen in the preliminary program of AM.

In this program, the following shall be analyzed, inter alia:

- All types of maintenance divided into the main systems of the line and of the trains
- The number of hours and of personnel required for the maintenance works, and
- All required support as regards procedures, software, resources etc.

5.5 Maintenance of Building Installations

5.5.1 Scheduled Maintenance

The procedure for monitoring the structures and the general conditions of Civil Works is applied through a series of inspections, each one with a specific

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format and knowledge and skills required by the inspector.

The control and maintenance activities related to Civil Works are executed both by the in-house personnel and the external (associated) personnel and consist mainly in standard inspections classified as follows:

Type of Inspection	Kind	Description	Indoor/ Outdoor	Frequency
<u>1</u>	<u>Standard/ Cursory Inspection</u>	Inspection to verify that the critical safety systems are valid	Indoor	Annual
<u>2</u>	<u>General Inspection</u>	This concerns the visual inspection of the accessible surfaces and equipment and does not require the use of specialized equipment or personnel	Indoor	Every two months
<u>3</u>	<u>Reference Inspection</u>	More strict inspection of the less accessible areas of the infrastructure that can require the use of access equipment and specialized contractors	Indoor / Outdoor	Every two months
<u>4</u>	<u>Special Inspection</u>	This entails the engagement of specialized personnel and the use of specialized equipment for the inspection of those parts of the structure that are not normally accessible (such as removal of false ceiling frames)	Outdoor	When required

Note: Type 4 works are executed even in case Major Defects are identified during Type 1,2,3 inspections.

Depending on the area, inspection types 1, 2, 3, 4 can cover different items, as described in the following (non restrictive) table:

Items inspected during each type of inspection:

Type of Inspection	1	2	3	4
Location				
Bridge at the Depot	Wear of structural concrete items (cracking, spalling, discoloration etc.) Sealing/drainage failure indications Wear of suspension-expansion joints Wear of safety barriers Corrosion of backfills	Cracking of structural concrete items of the superstructure and the infrastructure. Surface wear of structural concrete items (spalling, discoloration, exposure of reinforcement) Sealing/sewage/drainage (trays, shafts, piping)	Cracking of structural concrete items of the superstructure and the infrastructure Surface wear of structural concrete items (spalling, discoloration, exposure of reinforcement) Sealing/sewage/drainage (trays, shafts, piping)	(*)

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	<i>Covers over cable ducts, sewage, sidewalks, obstacles</i>	<i>Suspension-expansion joints (Cracks, detachment, water tightness, sealing material) Safety barriers (handrails, supports, connections, oxidation) Baseplates (deformation, cracks) Backfills (corrosion, deformation)</i>	<i>Suspension-expansion joints (Cracks, detachment, water tightness, sealing material) Safety barriers (handrails, supports, connections, oxidation) Baseplates (deformation, cracks) Backfills (corrosion, deformation)</i>	
Tunnels	<i>Channels Sewage/drainage Trays Pedestrian walkways Handrails, Trackwork items</i>	<i>Final tunnel lining, Water inflow, threaded joints, Channels, Sewage/drainage Trays Pedestrian walkways Handrails, Trackwork items</i>	<i>Final tunnel lining, Water inflow, threaded joints, Channels, Sewage/drainage Trays Pedestrian walkways Handrails, Trackwork items</i>	(*)
Underground Stations/Shfts	<i>Plastering/Painting works (moisture, discoloration, spalling) Lining (cracks, moisture) Floors False ceilings (cracks, moisture) Balustrades Doors/frames Furniture/fixed equipment</i>	<i>Bearing concrete items (cracks, moisture) Plastering/painting works (moisture, discoloration, spalling) Lining (detachment, cracks, moisture) Floors, False ceilings, Joints, Balustrades, Doors/frames, Furniture/fixed equipment, Lighting Installation</i>	<i>Bearing concrete items (cracks, moisture) Plastering/painting works (moisture, discoloration, spalling) Lining (detachment, cracks, moisture) Floors, False ceilings, Roofs, Joints, Balustrades, Connections, supports, Doors/frames, Furniture/fixed equipment, Lighting Installation</i>	(*)

(*) The "Special Inspection" (Type 4) shall be carried out only when deemed necessary and only in case Major Defects are identified during Inspections 1, 2, 3.

The assignment level to external partners depends on various factors: the qualifications of the person assigned as responsible for these areas, the extent of the fixed assets and the structures that have to be monitored, the type of structures and the encountered level of criticality.

For an underground system, such as the Thessaloniki Metro system, the main issues shall be as follows: monitoring of seepage, cracks, water discharge, the condition of cables and pits and, in general, of pollution in the tunnel areas that can lead to downgrading and contamination of the installed equipment.

Seepage shall be closely monitored along with the permanent ducts and stray currents.

There is provision for works subject to conditions (such as injections in the tunnel, sealing, re-painting etc.), although these works can be classified as corrective maintenance works.

In Station areas, the Station Masters, during the daily execution of their duties, are also responsible for the visual inspection of the surfaces and

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equipment of the public and personnel areas (e.g. wall tiles, false ceilings, false floors, glass panels, lighting fixtures, loudspeakers, passenger information boards, etc.). If they identify that there is need for repair, maintenance or other relevant action, they must prepare the relevant report by filling in the Need for Repair Form and send it to the Chief of Maintenance of Infrastructure & Trackwork, who is responsible for the repair or replacement of equipment. The Station Master, if he/she discovers that the repair has not been made within a reasonable time period, he/she must request briefing from the Chief of Maintenance of Infrastructure & Trackwork, by notifying the relevant disturbance to the Maintenance Manager as well.

In order to execute the aforementioned duties, the Contractor must:

- Train the Station Masters in the performance of General Inspections
- Provide to the Station Masters access to the Maintenance Management System for entering their reports in the System.

5.5.2 Maintenance via outsourcing

As regards maintenance works that the Contractor may outsource to a sub-contractor, applicable shall be Article 12 of the Partnership Contract.

5.5.3 Personnel competence – scheduling

The Contractor shall schedule the required personnel to be either engaged by himself or be assigned via a sub-contract to an external (associate) company, if he chooses so.

5.6 Maintenance of Infrastructures

A preliminary maintenance program shall be provided to the Contractor by AM for all infrastructures; the subject Contractor, after evaluating this program, shall submit the final Maintenance Program for approval to AM, which shall cover -at least- the minimum requirements foreseen in the preliminary program of AM.

The maintenance of infrastructures by the Contractor and, in general, of AM's fixed assets, concerns the procedures related to programming, inspection and monitoring of the condition of the above, as well as intervention, whenever deemed necessary, in accordance with the Fixed Assets Management Plan to be submitted in the framework of Submission of the Maintenance Program (see §5.1.2), in order to ensure that:

- Fixed assets are kept in the foreseen condition;
- The anticipated life time and the remaining life time of the fixed assets meet the requirements of the Contract;
- The requirements for long-term service, safety and integrity of the system are met.

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5.7 Maintenance of the Depot

The Contractor is responsible for the maintenance of the Depot and, in particular, for the following:

- All installations, interior and exterior
- The surrounding area.

5.8 Maintenance of the OCC and the ECC

The Contractor is responsible for the maintenance of the OCC and the ECC, taking into account:

- The continuous (24/7/365) operation of the OCC
- The special tools used for lining purposes
- The special furniture in the OCC/ECC.

5.9 Maintenance of Equipment in the Station Master Room (SMR)

The Contractor is responsible for the maintenance of the equipment in the Station Master Room (SMR), taking into account the following:

- The continuous (24/7/365) operation of the SMR
- The special tools used for lining purposes
- The special furniture in the SMR.

5.10 Maintenance of the Central Warehouse

The Contractor is responsible for the maintenance of the Central Warehouse (§5.2.6). In particular, a periodic control/maintenance of the scaffoldings/shelves/areas and storage infrastructures shall be also required.

With regard to the special tools, the Contractor shall be required to periodically check all special tools based on their manuals, ensuring the proper rating/calibration and their proper and reliable operation at any time.

As regards the spare parts, the Contractor is responsible for their maintenance, as required based on their manuals, so that they are functional at any time.

5.11 Trackwork and 3rd rail

The maintenance of the line concerns the main line, the Depot and the various types of installations. The relevant main characteristics can be summarized as follows:

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5.11.1 Scheduled Maintenance

The accurate scheduling of the works constitutes the Contractor's responsibility, on the basis of the systems and infrastructures Maintenance Manuals. An indicative list of scheduled works for the maintenance of the Base Project (New Railway Station – PYLEA Station) is presented below:

Work	Cycle	Man*h	Repetitions/ year	No. of areas	Total Man*h/year
On board safety inspection	W	2	365	1	730
Crossovers – Cleaning & Lubrication	M	2	12	26	1052
Crossovers – Safety Inspection	2M	2	6	26	576
Crossovers - Maintenance Inspection	4M	3	3	26	432
Track – Safety Inspection	M	2	12	9.6 Km	1008
Track – Maintenance Inspection	6M	2	2	9.6 Km	168
3 rd Rail Inspection	M	2	12	9.6 Km	1008
3 rd Rail Inspection	6M	2	2	9.6 Km	168
3 rd Rail Inspection	Y	2	1	9.6 Km	84
3 rd Rail Inspection	5Y	8	0,2	9.6 Km	67,2
Track Recording	Y	5	1	9.6 Km	210
Track Ultrasound Test	Y	Ext. associates	1	0	0
Corrugation Test	Y	Ext. associates	1	0	0
Tunnel washing	6M/Y	10	1	9.6 Km	198
Total					6004

As regards the Extension to Kalamaria, the aforementioned estimates shall be proportionally revised.

The following are pointed out:

- Inspections are divided into safety and maintenance inspections:
 - *Safety inspection: the purpose is to ensure that all safety related items are verified and there is no potential risk for the safe operation of the Metro network.*
 - *Maintenance inspection: the purpose is to check the condition of the line installation and report the relevant findings and measures to be used in the planning of further maintenance related activities (e.g. grinding, compression, bolting)*
- The recording of trackwork, ultrasound and corrugation tests is a critical activity checked by accredited personnel or agency.
- The recording of trackwork, ultrasounds, corrugation tests and the tunnel washing require interruption of service.
- All other activities can be managed, in general, via speed limitation or occupation/reservation of one track, thus they can be carried out after

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peak hours. Smaller items (e.g. checking of crossovers) require occupation/reservation of both tracks.

- Track recording regularity may differ, on an as-needed basis.
- Ultrasound checks shall be carried out by specialized personnel with the necessary training and equipment.

An indicative list of scheduled works for the trackwork maintenance in the Depot is presented below:

Work	Cycle	Man*h	Repetitions/ year	No. of areas
Crossovers – Cleaning & Lubrication	M	20	12	240
Crossovers – Safety Inspection	4M	3	3	9
Crossovers – Maintenance Inspection	8M	3	1,5	4,5
Track – Lubrication Control	M	2	12	24
Track – Safety Inspection	2M	20	6	120
Track – Maintenance Inspection	6M	30	2	60
Track – Lubrication Maintenance	Y	4	1	4
3rd Rail Inspection	6M	10	2	20
3rd Rail Inspection	Y	10	1	10
3rd Rail Inspection	5Y	80	0,2	16
Total				507

As regards the Extension to Kalamaria, the aforementioned estimates shall be proportionally revised.

A brief description of the aforementioned trackwork maintenance works in the Depot is recorded as follows:

Work	Description
<i>On board safety inspection</i>	The purpose is to carry out continuous and regular inspections of the track conditions to identify any risky or potentially risky conditions.
<i>Turnout cleaning and lubrication</i>	Maintaining the turnouts' function at the highest reliability level through frequent inspections, cleaning of slide chairs and lubrication (as required).
<i>Tracks/turnouts Safety Inspection</i>	Certifies that safe operation requirements are met, ensuring the lack of defects that could lead to dangerous situations or accidents.
<i>Tracks/turnouts maintenance Inspection</i>	Data collection about the trackwork conditions aiming at organizing short-term / long-term interventions and scheduling further controls. The purpose is to ensure not only the passenger safety, but also the passenger comfort, prevent traffic interruptions, personnel accidents and environmental disasters.
<i>Track recording</i>	It is required to carry out precision measurements aiming at controlling the track geometry and profile through the use of a special vehicle that shall record the following data: • Track level and track alignment – width • Track cant and twist

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	Rail head profile (for rail corrugation test) The measurement device produces graphic displays and presents various data.
<i>Ultrasound test</i>	Rail inspection through the use of ultrasound is the usual method for rail control against inner defects before their situation becomes critical: this kind of inspection is deemed necessary mainly for safety reasons.
<i>Rail corrugation test</i>	Cases of rail corrugation and irregularities are identified and shall either remain under control, or shall be repaired by rail grinding.
<i>3rd rail inspection</i>	All 3 rd rail features, as well as covers, cables, the rail surface, ramps, anchoring points, isolated joints and suspension joints are checked for damage, if any.

Based on the aforementioned scheduled inspections, the following works can be implemented:

- Rail adjustment
- Compression & Balancing.

5.11.2 Maintenance via outsourcing

In relation to maintenance works that the Contractor may assign to a sub-contractor by outsourcing, applicable shall be Article 12 of the Partnership Contract.

5.11.3 Capacity – scheduling of personnel

It is believed that, since the line is fully underground, the inspection of rails, switches and other line installations can be carried out only during non service hours (except for specific areas which can be set out of service earlier).

The Contractor shall organize/schedule the required personnel to be either activated by himself or to be awarded via a sub-contract to an external company, if the Contractor chooses to do so.

5.11.4 Furniture

As regards the positions of offices, see § 3.13.

5.11.5 Office Places

As regards office places, see §3.12.

5.12 Maintenance of Rolling Stock and Equipment - Depot

5.12.1 Rolling Stock

The Maintenance Department of the Contractor shall be responsible for the maintenance of all vehicles.

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The rolling stock to be delivered to the Contractor shall consist of the following:

- a. 18 trains with 4 cars, by the Construction Contractor of the Base Project, and
- b. 15 new Trains with 4 cars, by the rolling stock Supply Contractor of the Extension to Kalamaria Project.

The rolling stock required for the operation of the line is fully automated and driverless; however, there is provision for train attendants, at least during the initial service period.

Each one of the works and rolling stock contractors is responsible for the corrective maintenance of the rolling stock for a period of 36 months from the date of issuance of the Completion Certificate for all his works, while for a period of 12 months from the date of issuance of the Completion Certificate only the Construction Contractor of the Base Project is responsible for the preventive (scheduled) maintenance of the rolling stock as well. The obligation for (corrective and preventive) maintenance of the entire fleet of trains for the period beyond the aforementioned time periods must be fulfilled exclusively by the Contractor.

5.12.2 Depot equipment and auxiliary vehicles

The Contractor is responsible for the maintenance of the Depot equipment and the auxiliary vehicles.

A list with the Depot equipment to be used for the maintenance activities of the Thessaloniki Metro is presented in Annex B of this document.

Maintenance is usually time-scheduled, although it can be adjusted, for the various items, depending on the use of equipment, for example in the following cases:

- Diesel vehicles (based on Km)
- Main lathe (based on hours)
- Vehicles with rigging equipment, movable platforms (based on hours).

5.12.3 Maintenance via outsourcing

In relation to maintenance works that the Contractor may assign to a sub-contractor by outsourcing, applicable shall be Article 12 of the Partnership Contract.

5.12.4 Personnel competence – scheduling

The Contractor shall organize/schedule the required personnel to be either activated by himself or to be awarded via a sub-contract to an external company, if the Contractor chooses to do so.

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After the elapse of a period not greater than 10 years or even less, if required, as of the beginning of the operation of the equipment of the various Control and Low Voltage systems in the Base Project and the Extension to Kalamaria, the Contractor shall proceed with the replacement of the specific central and peripheral IT equipment, so that the specific systems can continue to operate in a reliable manner and with a high degree of availability. This equipment shall include as a minimum, as an example, but not limited to, the following systems:

- Automatic Fare Collection System (AFC)
Servers (OCC), Station PCs
- Closed TV Circuit (CCTV)
NVR recorders in the OCC and at Stations
- Public Announcement System (PA)
Servers (OCC)
- Integrated Communications Control System (ICCS)
Servers and PCs (OCC)
- Radio Communication System (TETRA)
Servers and PCs (OCC)
- Safety Management System (SMS)
Servers and PCs (OCC), Station PCs
- Access Control System (ACC)
Servers and PCs (OCC)
- Intrusion Detection System (IDS)
Servers and PCs (OCC)
- Data Transmission System (DTS)
NMS PCs (OCC)
- Automatic and Direct Telephone Systems (PABX + DLT)
NMS PCs (OCC)
- Power Remote Control System (PRCS)
Servers (OCC), Station PCs
- Building Automation and Control System (BACS)
Servers (OCC), Station PCs.

Especially as regards hard discs (HDD) of the aforementioned systems, these shall be replaced more frequently, as provided for by the manufacturer (usually every 3-5 years).

If the manufacturers/suppliers of the aforementioned equipment require replacement more frequently, so that the aforementioned systems can continue to operate smoothly and in a reliable manner throughout the validity period of the contract, the manufacturers' requirements shall apply.

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Reporting to the OCC and the ECR, since similar equipment has been also installed there.

In view of the above, the Contractor shall proceed with -along with the replacement or the necessary upgrading of any associated spare parts or software required (e.g. operational system, application software, database software etc.)- the issuance of the respective permits and/or certificates to be required for the proper operation of the systems.

The aforementioned activities in the framework of the maintenance shall be recorded by the central information system of the Contractor.

5.14 Special points

The following constitute special points:

5.14.1 Third rail system

As concerns the maintenance of the 3rd rail at specific locations of the project, including the train reversing points at the forestations of Nea Elvetia and the New Railway Station, as well as at the intermediate crossovers (Sintrivani, Analipsi), it is stressed that, at first, it is necessary to supervise the “gaps” (loss of power) that are likely to be created due to the wear of the train shoes and the 3rd rail.

Avoiding “gaps” (loss of power) leads to the need for proper maintenance, arrangement or replacement of the worn parts, so that these gaps are not created or are minimized, thus preventing any 750 VDC power supply interruptions of trains, since these trains move over these “gaps” (these incidents concerning gap detection and the short power interruption involved for each train are always detected by the trains and are announced to the OCC, to the ATS signaling system). At certain points (e.g. Analipsi crossover), the train movement from track 1 to the opposite track 2, as well as at the reverse direction, the “gap” (loss of power) is automatically handled by the signaling system, which de-activates and properly re-activates certain main train systems (traction, auxiliary power, A/C and compressors), so that they are not set ON and OFF accidentally, but based on a planned and systematic manner.

The Contractor shall take the above into account, in order to minimize any possible impact on the train systems, which shall be burdened without any reason whatsoever due to the continuous setting ON and OFF the 750VDC power supply when trains face “gaps” (loss of power).

5.14.2 Differences in systems of the Base Project and the Extensions

It is stressed that it is necessary for the Contractor to update with all required details (drawings, diagrams, manuals and operation and maintenance procedures etc.) the maintenance personnel concerning the maintenance

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personnel as regards the construction and operational differences that are likely to exist in the same electromechanical and railway systems and equipment between the Base Project and the Extension to Kalamaria, which is the result of the fact that this equipment was designed and installed by various contractors, at different time periods and, in general, by different suppliers (e.g. traction system). The above are requested in order to further ensure the safety of the maintenance personnel, as well as the proper technical approach as regards the maintenance of each equipment item.

5.14.3 Radio coverage Control

For the signaling system a special requirement applies, which consists in the annual control of the radio coverage level in tunnels, namely of the DCS wireless data transmission system. On the basis of these measurements, the data transmission equipment in tunnels shall be cleaned every 3 years as a minimum or earlier, if dictated by the indications of the measurements.

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6. CLEANING

6.1 General

The Contractor shall be under the obligation to adhere to the cleaning requirements, as these are stated below and as described in the document entitled “Cleaning and Security Services Specifications”.

6.2 Cleaning obligations

The cleaning obligations of the Contractor cover all the areas of the Thessaloniki Metro, namely stations, tunnels, shafts and branchings, tunnel recesses, the Depot with all its buildings and outdoor areas, as well as the trains, the OCC/ ECT and the electromechanical and railway systems. More specifically, the following cleaning works are required:

A. Stations

The following station areas shall be cleaned as a minimum, namely:

- the outdoor areas of the stations located around the Metro entrances and structures at street level, including sheds, glass panes, balustrades, parapet walls, walls, painted surfaces covered with panels, tiles or marbles and the terminations of the air ducts in their periphery.
- the indoor and outdoor staircases, indoor passenger/personnel areas and technical rooms, floors, false floors, indoor features, balustrades and handrails, parapet walls, walls and various painted surfaces covered with panels, tiles or marbles, lighting fixtures, loudspeakers, cameras, equipment boxes visible to the public, Emergency Control Units (ECUs), seats, furniture, platforms and PSD, ticket issuing machines, access gates and ticket validators and various steel elements. At track level, tunnel drainage ducts shall be cleaned periodically.

More precisely:

- False ceilings shall be cleaned periodically at a frequency which will be agreed upon with AM.
 - PSDs facing the tracks in station platforms: PSDs shall be cleaned periodically (e.g. on a monthly basis, unless otherwise agreed upon with AM based on the actual needs) by a specially trained crew, accompanied by technical personnel of the Contractor. Works shall be executed during non-revenue service hours, while the equipment and the method to be used shall ensure safe execution of the works from the track. Cleaning works shall be carried out so as not to cause any disturbance whatsoever to and so as not to jeopardize the personnel, the passengers and the Metro systems.
 - The screens and equipment surfaces in personnel areas shall be carefully cleaned under the supervision of the technical personnel of the Contractor.
-

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- Works of art and exhibits possibly installed in station areas shall be cleaned in line with the instructions of the artists/exhibitors and as agreed upon with AM.

Litter shall be collected by personnel in trash bin trolleys from the passenger areas and the personnel working rooms. Then, during night hours, litter shall be transferred outside the station for being discharged to the waste disposal areas used by the Municipalities.

When station passenger areas are used for events, exhibitions, etc., the Contractor shall take due care in order to clean the areas and remove waste matter after the end of these events.

B. Shafts, crossovers and branchings

- The areas of shafts, crossovers and branchings shall be cleaned periodically (indicatively, technical rooms every three months, escape and branching areas every six months, unless otherwise agreed upon with AM depending on the actual needs), in order to remove any objects and material left as sub-products maintenance, repair, painting, etc. works in view of preventing dirt concentration on equipment which would jeopardize the operability of the equipment (e.g. from a short-circuiting).
- All technical areas which include equipment in shafts, crossovers and branchings shall be cleaned by specialized personnel using special equipment, where required, while all procedures and necessary safety measures shall be introduced to ensure execution of these works. Shafts and passenger escape routes shall be regularly cleaned on a per case basis by the appropriate cleaning crews depending on the area and the equipment requirements using the relevant technical personnel. Escape routes shall be cleaned in such a way so that it ensured that they are free from materials and stagnant water. If required, the technical personnel of the Contactor shall accompany the cleaning crew throughout the cleaning process.

C. Tunnels

- Tunnels shall be regularly cleaned using a special washing device based on an indicative periodicity of 12 months, while any eventual waste shall be collected every three months, as stated in detail in the document "Cleaning and Security Requirements".

D. Tunnel recesses

- Tunnel recesses shall be periodically cleaned (indicatively every three months in the case of technical rooms) unless differently

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agreed upon with AM, in order to ensure that there are no objects and materials as sub-products of maintenance, repair, painting works, etc. and that there is no dust concentration on the equipment which would jeopardize the operability of the equipment (e.g. short circuiting).

E. Depot

- The Depot, the building indoor areas, exterior areas, internal roads and walkways shall be cleaned at the responsibility and at the expenses of the Contractor utilizing the appropriate crews, equipment, method, while works shall be carried out at the appropriate time period so that the needs of each area are adhered to and that the safety of the cleaning personnel, the technical and administrative personnel and the Metro systems is ensured.
- Special reference is made to the need for thorough cleaning of the Operation Control Center and the ECR at the Depot.

F. Trains

With regard to the cleaning of the trains, the following is clarified:

- On a daily basis, the interior of the trains shall be thoroughly cleaned by cleaning crews, which will perform brushing and washing of the floors, cleaning of the passenger seats and the interior lateral panels, cleaning of stanchions and steel elements.
- The exterior of the trains shall be cleaned at the depot washing plant on a daily basis if trains circulate on the network. In case of stabled trains, exterior cleaning shall be effected before trains run on the network.
- Every two months trains will undergo “thorough cleaning”, i.e. all interior and exterior surfaces, exposed surfaces underneath the floor (cleaning in opening pits), interior and exterior roof, passenger seats and glass panes with particular attention given at the connection points of the perimeter gaskets shall be thoroughly cleaned with due care.
- In the event of graffiti, the necessity of removing the graffiti before the train is put in revenue service shall be immediately assessed, so as to minimize disturbance to the Metro services offered. If it is not necessary to proceed immediately with graffiti removal, i.e. the graffiti does not outrage public decency or no risk for safe train circulation is entailed, it will be allowed to clean the trains during non-revenue service hours, otherwise, trains will be put out of operation and will be immediately cleaned, so that they are put back into revenue service the soonest possible.

G. Electromechanical and railway systems

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- With regard to the electromechanical and railway systems in technical rooms where authorized access is required, their equipment shall be only externally cleaned at specific intervals (corresponding to the intervals specified for the cleaning of technical rooms) to avoid dirt concentration which would jeopardize equipment functionality (e.g. short circuiting).
- All technical rooms with equipment shall be cleaned by specialized personnel with the use of special equipment, when required, while all procedures and necessary safety measures shall be kept during the execution of these works.

Special cleaning by-products, such as train washing plant by-products, shall be cleaned following a special procedure and safety provisions at the frequency specified in the document of the specifications.

The Contractor and the cleaning crews shall make all efforts in order to ensure that through the cleaning activities the high quality of the Metro services provided to the citizens is highlighted. Passenger areas and the working areas of the administrative and technical staff of the Metro should be kept clean.

It is pointed out that the Contractor shall be under the obligation to clean the graffiti and to manage vandalisms in the project in general (see § 5.1.5.2).

The Contractor shall be evaluated based on the performance indicators (see para. 9.4.3) for cleaning applicable to cleaning crews and the work performed. These indicators shall be periodically reviewed by AM based on specific checklists to be made available to the Contractor upon contract signing. Indicators shall be also related with the monthly certificates and the imposition of deduction, in the event of reduced performance of the Contractor.

6.3 Document Submission

In the framework of the services to be provided, the Contractor shall submit the following documents for approval by AM within one hundred and eighty calendar days (180) days upon signing of the Contract:

1. Cleaning Manual
2. Cleaning Equipment List.

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7. SECURITY (SAFETY AND PROTECTION)

7.1 Security Services – General

The Contractor shall be fully responsible for the security of all areas, facilities, trains, forestations, station accesses, shafts and tunnel portals of the Metro and of all the areas and buildings of the Depot against intrusion, vandalism and malicious actions, as referred to in detail below.

The Contractor shall be responsible to adhere to the Security requirements, as mentioned below and as described in more details in the document entitled “Cleaning and Security Services Specifications”.

7.2 Document Submission

In the framework of the security services to be provided, the Contractor shall submit the following documents for approval by AM within one hundred and eighty calendar days (180) days upon signing of the Contract:

- A. Operation Safety Plan
- B. Security & Emergency Management Manual.

In the Operation Safety Plan, the Contractor shall describe the management of both the safety personnel and the systems that to be applied, how the hardware of the safety systems installed is utilized in the optimum manner, the appropriate training of the personnel, the equipment and the contingency plan, as well as the high readiness and responsiveness which ensure immediate intervention for the prevention of incidents before they become hazardous or harmful to the passengers, the personnel and the Metro system.

This Plan shall cover the organization and hierarchy of the security team, the total of the required security staff that the team should consist of in order to efficiently cover all network and Metro facilities, the management of events and emergency conditions in general, such as intrusions, aggressive behaviors, intention to cause injury, theft, etc. that the team may be called upon to address, while the Manual shall present in detail such possible scenarios and the required actions of the security team.

In this Plan, the Contractor shall describe how he intends to ensure the relevant quality indicators, as foreseen in para. 9.4.3 and how these are interrelated with the monthly certificates, which will be submitted to AM in the framework of the Contractor's fee payment.

The Security and Emergency Plan shall include a complete analysis of the manner in which the group will act, including *inter alia* the following:

- a. the necessary training that every member of the security staff must have undergone depending on the position of responsibility occupied;
- b. the access level that each member of the security team enjoys in the relevant areas of responsibility;
- c. the surveillance system applied in all areas;

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- d. the Security Equipment List and the guard's uniform characteristics;
- e. the communication method between the members of the security team, the Station Masters, the operators and the Contractor persons in charge, depending on the case. The personnel in question shall be under the orders of the Safety Officer, to be appointed by AM and shall be in direct communication with the Police, the Fire Brigade and the Special Suppressive Counter-terrorism Unit (E.K.A.M.), should their intervention is required.

AM shall be entitled to request from the Contractor changes to the security scheme, which could concern targeted needs of the security staff and the security hours, as these will result from revenue service or due to special events and conditions.

AM shall be entitled to request from the Contractor to replace members of the security staff who do not comply with the security procedures of the Contractor for reasons related to inadequate execution of duties or for improper behavior before personnel or passengers. It is pointed out that AM shall be entitled to request from the Contractor the psychometric tests of members of the security staff deemed necessary. The tests will be carried out at the expenses and at the care of the Contractor.

7.3 Necessary qualifications of the security staff:

The Contractor shall submit for approval to AM the entire security team of the Contractor for all the positions required, while the following minimum requirements shall be met. Namely, the personnel of the security:

- shall be holders of a High School Leaving certificate and shall write and speak Greek fluently;
- shall be able to have a basic conversation in English;
- shall wear the uniform of the security team of the Contractor, which must comply with the provisions of Law 2518/97 and must bear the distinctive signs of the Contractor and the label of the Thessaloniki Metro, as it will be approved by AM;
- have professional experience in the provision of security services.

It is pointed out that the Contractor shall not be allowed to use rented security staff for the needs of the present Contract.

The security staff of the Contractor cannot be replaced without prior approval of AM, while deploying security staff for other security tasks is not allowed without prior approval of AM.

The security staff of the Contractor shall be trained at the care and expenses of the Contractor, as described in the requirements of para. 2.8.4 herein.

The training plan which will be included in the aforementioned Operation Safety Plan of the Contractor shall be properly adjusted to the service needs and duties of the personnel in line with:

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- the requirements of the Training Program prepared by the contractor responsible for the construction of the Thessaloniki Metro which will be made available to the Contractor together with the Project Log. It is pointed out that in the framework of the training of the Contractor trainers, the Thessaloniki Metro Base Project Contractor shall train two (2) Safety Officers of the Contractor. Then, the Contractor will study the Training Plan and will propose to AM for approval the changes deemed necessary for the sound training of the total of the personnel.
- the operation method of the Metro system.
- the duties of the security personnel of the system and the Metro areas.
- issues related to the transportation and service needs of the passengers.
- issues related to the communication with the passengers and rules of behavior.
- issues related to the addressing of sceptical passengers.
- addressing emergencies and ways of communication with the Metro operations personnel.
- issues related to the taking up of duties and issues related to the access rights of the security personnel.
- issues related to the use of the communication and safety systems of the Metro.

7.4 Obligations of the security personnel

The precise obligations are stated in the document "Cleaning and Security Requirements".

The security team shall provide security services onsite on a 24 hours basis at the two entrances of the depot, controlling also the perimeter, the train stabling areas, the tunnel portal and the OCC where security guards shall be present at all times and where the closed circuit TV cameras and the security systems shall be controlled on a permanent basis.

In the following areas, the Contractor security personnel shall carry out as an example but without however being limited them to the following duties:

A. General

- (i) Control and prevention of unauthorized access, prevention of graffiti, prevention of terrorist attacks and of other malicious acts
- (ii) Assistance during emergencies, e.g. fire, earthquake, flood, emergency evacuation of trains or stations, etc.
- (iii) Provision of assistance and information to the public.

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B. Stations

- (i) The actions to be undertaken by the security personnel shall be aimed at ensuring immediate intervention during incidents and at creating a sense of safety to the passengers who will approach the Metro system as a pleasant, reliable, safe and attractive Mode of Transport.
- (ii) A group of security guards ready to take action shall be present in stations and shall patrol between stations and trains.

The security duties of the Contactor shall include:

- (i) Ensuring passenger and personnel safety against persons or groups which could cause hazardous conditions or other disturbance.
- (ii) Ensuring passenger compliance with prohibitions related to smoking, illegal substances, eating and drinking in the Metro system through polite requests and suggestions.
- (iii) Protection against theft, vandalisms, destruction of the Metro facilities and passenger property.
- (iv) Assisting the operation personnel of the Contactor in incidents and emergencies.
- (v) Providing information to the passengers concerning the use of the Metro.
- (vi) Assisting passengers with special needs.
- (vii) The security personnel shall be in close cooperation with the Station Master, the train attendants and controllers, the safety and operation officers at the Control Center, while it shall communicate through radio with the personnel in question and the remaining security personnel.

C. Shafts, cross-overs and branchings

Immediate intervention in ventilation shafts, emergency exit shafts and trumpet shafts from the security groups found in adjacent stations or patrolling between stations and trains.

D. Tunnel

The tunnel portal in the depot area shall be patrolled, while the patrolling guards shall be able to immediately intervene in tunnels in the event of intrusion detected by the security systems or the guards.

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E. Depot

- Operation Control Centre: Guards shall be present on a 24-hour basis in order to monitor the intrusion detection system, supervise the security systems and the CCTV monitors and coordinate actions in the event of an incident.
- Depot Accesses: Guards shall be present on a 24-hour basis on both Depot accesses to control access in the area, prevent intrusions and malevolent actions.
- Perimeter and Depot areas: Guards shall patrol the perimeter of the Depot, the maintenance areas and the train stabling areas as well as key points of the Depot area to ensure immediate intervention.

F. Trains

It is noted that with regard to the unavailability of trains and Metro systems due to eventual vandalisms, this shall not have any impact whatsoever on the train availability indicators recorded in the Payments Document.

G. Cash-in-transit

The duties of the Contractor shall include:

- Safe cash transportation from the Stations to the coins and banknotes counting center,
- Cash transportation to the automatic ticket issuing machines (ATIMs) and addition of coins and banknotes for automatic cash return (change) to the users of ATIMs,
- Cash transportation from the coins and banknotes counting center and cash deposit to the bank.

For more information, please refer to article 8 herein and more precisely, to paragraphs 8.4 to 8.7.

H. Cyber security

As a modern railway infrastructure project with state-of-the-art systems and new applied technologies intended for meeting the needs of the passengers, the Base Project and the Thessaloniki Metro Extension consist of many critical and interacting electromechanical and railway systems that will process a great volume of information of different level of sensitivity. These systems will control critical operations of the Line, such as signaling, train circulation, power supply, fare collection, emergency procedures control, environmental conditions control, telecommunications, digital transmission of data, etc.

In view of ensuring the availability, integrity and confidentiality of critical information and of the systems processing them, it is necessary that adequate technical and organizational security measures are applied

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covering the entire width of the infrastructure based on the international and national regulatory requirements and the optimum cyber security practices. These security measures should prevent, identify and reduce risks, such as unauthorized access to information, unauthorized modifications of system settings, intentional or unintentional destruction of data, whether these originate from inner or outer factors. At the same time, the proposed security measures should provide the option for complete recording of actions and for incident monitoring in view of addressing problems and any safety incidents on time.

The Contractor should take all necessary actions in order to protect the automatic control systems (including BACS, PRCS, ICCS, PLCs, RTUs, EM, etc.) both in the Project as well as in the trains and in the auxiliary information systems (including server operational systems, data bases, work stations, software applications, network equipment, cabling, etc.) by applying an efficient Information Security Life Cycle which will be based on a business risk management approach with clearly set roles, responsibilities, policies etc. and security procedures which should be adhered to during the operation of the infrastructure.

This document describes the minimum information security level requirements for the Base Project and Kalamaria extension and shall cover the following areas:

- Risk Assessment & Risk Management Framework
 - General Security Requirements
 - Compliance with International Standards, Optimum Practices and Regulatory Framework
 - Development of Information Security Management System
- Information Security Infrastructure and Services
 - General Architectural Security Planning Method Statement
 - User Authentication and Authorization
 - Network & Communications Security
 - Secure Remote Access
 - Systems' Security (Servers, End-Points, Virtual Systems, Mobile Devices)
 - Application & Database Security
 - Embedded Systems Security
 - Data Security
 - Operations Security
 - Security Logging and Monitoring

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- Availability and Physical Presence
 - Operational Continuity and Recovery from Disasters
 - Information Systems Physical and Environmental Security
- Independent Security Assessment, Training and Certification
 - Independent Technical Audit & Security Assessment
 - Training and Awareness Raising of Personnel on Security-related Issues
 - Certification of Infrastructure based on International Information Security Standards.

The above should be applied in the following areas, namely:

- In the Base Project, the extension to Kalamaria and in their E/M systems, including rolling stock, where required;
- In the central IT system, which will be organized and installed parallel to the Depot, in the Administration Building, in stations on the line to support the operation of the Operations and Maintenance Company of the Thessaloniki Metro covering, in addition to the issues related to the Project, all issues related to the personnel, revenues/expenses and financial administration, spare parts management, legal support, public relations, quality and any other administrative activities necessary for the operation, maintenance, cleaning, safety and fare collection management in the Project.

7.5 Security equipment

During the execution of the Contract, the Contractor shall replace the aforementioned equipment when damaged or needing replacement.

The Contractor shall ensure all measures required for the safety of the passengers and the personnel, as well as for all structures and Metro systems, while he shall also cooperate with AM and the Hellenic Police.

Thessaloniki Metro has been equipped with the necessary equipment which shall constitute the basic tools that the Contractor must utilize in full for the execution of the security services in the Thessaloniki Metro network. The following is pointed out:

- a. In the Operation Control Center (OCC), a special area is reserved for the Security Personnel.
- b. An Intrusion Detection System (IDS) has been installed in all station entrances and branchings, shafts, emergency exit hatches.
- c. The communication between members of the security personnel as well as between the security personnel and the OCC shall be carried

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out through TETRA wireless network on a channel specially reserved for the Thessaloniki Metro using devices which will be made available to the Contractor.

- d. Access Control (ACC system) is ensured through the use of entrance cards in all technical and personnel rooms.
- e. There are CCTV cameras which can be accessed from the OCC, the security personnel room and the Station Master Rooms.
- f. The security systems control data are accessible through the Integrated Communications Control System (ICCS).

It is noted that AM shall ensure immediate and quick access to the drawings of the entire Metro network for the Contractor. The Heads of the security team shall familiarize themselves with this system, so that they may be able to locate the relevant accesses and rooms in every incident and give immediately the right instructions and orders to the security teams in order for them to reach the incident area as soon as possible.

7.6 Obtaining Permits for the Execution of Works

The Contractor shall be responsible for obtaining all necessary permits for the execution of the works in works execution area, for examining whether the relevant permits have been granted and for examining the suitability of the personnel assigned to the activities prior to the execution of the works. Adequate information shall be provided on the commencement and completion of these works, as well as on the availability of the relevant rooms and equipment, where necessary.

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8. AUTOMATIC FARE COLLECTION SYSTEM MANAGEMENT (AFC)

8.1 General

The Contractor is under the obligation to implement the provisions foreseen in the following paragraphs of the present chapter concerning the Automatic Fare Collection System Management.

In all stations, the Automatic Fare Collection System shall consist of the following equipment:

- a. One or more Card Issuing Terminals (CIT) at the Ticket Offices issuing all types of smart cards (CSC).
- b. Automatic Ticket Issuing Machines (ATIMs), used by the passengers, accepting banknotes, coins and bank/credit cards, issuing one-way electronic tickets and recharging Smart Cards.
- c. Configurable entrance/ exit control units (gates), arranged in one row, for ticket validation and control and for preventing passenger entrance to the system without a valid ticket.
- d. A Station Computer where all ticket sales and ridership data will be collected and where the operation of all AFC system new units. The main incidents and alarms shall be also collected in the Station Computer. The construction contractor shall propose the list of (critical) alarms and incidents which must be transmitted online to the Management Center per AFC equipment.
- e. A local network to ensure the communication between all equipment units.
- f. Interconnection with the Management Centre so that all messages, including critical messages (alarms, equipment failures, etc.), and the Station's Accounting Logs are transmitted to the Administration Building of the Depot. The Management Center has been installed in the Administration Building of the Depot and the Contractor is under the obligation to operate it on a 24-hour basis, 7 days a week.

8.2 Ticket & smart card sales

The Contractor shall be responsible for keeping in the sound condition the equipment required for the issuance of tickets and smart cards for entry to and use of the Thessaloniki Metro network.

Valid tickets (CSC, contactless memory cards) shall be issued by the Automatic Ticket Issuing Machines (ATIMs), used by the passengers, and by the Ticket Offices in Stations.

Tickets and cards shall be provided by ThETA.

In all stations and inside the Ticket Offices, Card Issuing Terminals (CIT) have been installed. Ticket Offices are equipped with one CIT which issue

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and/or control all types of CSC cards. CSC cards recharging using cash (coins/ banknotes/ bank cards) will be ensured in the ATIMs at the concourse level.

The Contractor shall ensure that the ATIMs are always in a good condition to perform the following tasks:

- Issuance of Contactless Electronic Tickets.
- Recharging (additional fare or trip or renewal of card validity) and control of Contactless Smart Cards (CSC).

Ticket Offices shall be manned by the Contractor and shall work in two shifts.

The detailed design of the electronic tickets (size, structure, data, operation method, etc.) shall constitute the scope of a detailed design of the Contractor of the Base Project subject to AM's approval.

ATIMs shall be able to return change from the slot where tickets are delivered depending on the fare of the selected ticket. When the amount in the coin vault does not suffice for returning change, the machine shall display the relevant indication on the screen and the relevant signal shall be transmitted to the Station Computer. Having access rights to the ATIMs, the Contractor's station personnel shall fill the empty coin vaults with the required coins. A signal "banknotes vault almost full" shall be transmitted to the Station Computer when the number of the stored banknotes exceeds a predetermined set limit. When the banknote vault reaches its full capacity, a signal "banknotes vault almost full" shall be transmitted to the Station Master, so that he proceeds with the necessary actions for emptying the vault.

Details on the operation of the ATIMs and the CITs shall be given to the Contractor together with the Project Log (see §2.8.6).

8.3 Maintenance of Machinery

The Contractor shall be responsible for the maintenance of the AFCS machinery, in line with the requirements of the Contract and the detailed provisions of Chapter 8.

In addition to the requirements referred to therein, the following print-outs shall be also required as part of the Maintenance Log. Namely:

- a. the failure percentages of the machinery.
- b. operation-related statistic data, including operation hours, faults, cumulative transactions and relative data enabling assessment of the Mean Time Between Failures.

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8.4 Fare collection (cash and back-up documentation) by ticket issuing machines & ticket offices

The Contractor shall be responsible for the collection of the fare from tickets and cards sold from the ticket issuing machines and the ticket offices. More precisely, the Contractor:

- a. shall collect the cash from the ATIMs and the ticket offices and
- b. shall collect all the back-up documentation (in electronic form and in hard copy) of the above transactions and of the transactions effected via a bank card.

All transactions shall be recorded in accounting logs in a non-volatile memory. The contents of the recyclers and of the coin and banknotes vaults per machine (per type and quantity of coins/banknotes) shall be also stored in a similar memory. The maintenance printer shall print this information every time that the front door (maintenance door) opens. Accounting logs shall be protected against destruction, change or modification.

The accounting and transaction logs shall be transmitted to the Station Computer and the Management Center. The data shall be displayed on the screen of both the Station Computer and the Management Center, while it shall be possible to print the relevant data when required. All transactions completed in the course of seven consecutive days shall be stored in the ATIMs.

Detailed sales data per product and the totals of each machine shall be recorded in counting machines which do not allow for data alteration or reading. This data shall be transmitted automatically both to the Station Computer and the Management Center.

Details related to the operation of the machines and the sales data shall be included in the Project Log, which will be made available to the Contractor (see § 2.8.6).

Coins and banknotes in the stations' ATIMs shall be stored in safe vaults. Access to the content of the vaults, located either inside the ATIM or in the Station, is prohibited.

8.5 Cash transportation for counting purposes

The Contractor shall be responsible for the transportation of cash to the Cash Counting Area. Cash shall be transferred in the way that the Contractor deems optimum for safety.

Access to the collection boxes is allowed only in the cash counting area.

8.6 Cash counting

The Contractor shall count the cash collected from the ATIMs and the ticket offices in the Cash Counting Area before cash is transferred to the Bank.

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The Contractor shall be provided with an equipment set that will ensure:

- counting and arrangement of the coins collected in the vaults inside the ATIMs;
- arrangement of the coins in bags based on their nominal value, so that coins are ready for being deposited to the bank.
- banknote counting.

The coins counting and arrangement equipment can process as a minimum all the coins accepted by the ATIMs. Banknote counting machines can process all EURO banknotes.

The coins counting and arrangement equipment features one feeder which can accommodate the content of one coin vault. All unacceptable coins (invalid or broken) shall be separated from the valid ones in a separate bag. The machine is connected to a printer which prints the results of the counting process.

The Contractor shall be responsible to clearly mark the results of the counted cash (counting documentation) and to protect it before it is safely transferred to the Bank.

The Contractor shall advise AM on the results of each counting process.

8.7 Fare transportation to the Bank

The Contractor shall be responsible to safely transport the fare collected from the tickets and the cards sold, as well as from the Cash Counting Area to the Bank where the collected fare is deposited.

Money transportation shall be ensured by a security services provider with which the Contractor shall sign a relevant contract, in adherence to the requirements of Article 12 of the Partnership Contract concerning Subcontractors and Service Agreements.

8.8 System Reports

8.8.1 General

Sales, Circulation and Operation statistics shall be provided by the Contractor in the form of a report and, where required, in the form of graphics. All cancellation and sales data processing shall be carried out once a day as a minimum.

All error and maintenance history files shall be transferred to the Management Centre where they shall be classified on a daily basis in management and maintenance reports.

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Moreover, the Contractor shall maintain a Log on the behavior of the machinery per Management Centre.

All the aforementioned statistics and files shall be transmitted by the Contractor to AM.

8.8.2 Sales Statistics

The subject statistics to be carried out by the Contractor and to be copied to AM shall allow for the following actions to be performed:

- Dividing of sales depending on the ticket type (number of sales functions and sales products) per equipment and station.
- Counting of revenues per day, week, month, quarter and year, per station and station equipment.
- Accounting reports on the content of the cash vaults (coins and banknotes) for every vault change per ATIM in every station, line and for all stations.
- Calculation of the revenues to be processed for distribution.
- Number of transactions per day, week, month, quarter and year for every single station, per ticket type and per sales terminal.
- Quantities per type of ticket and needs in cash for cash return (change) in order to retrofit the machinery on a daily basis per station and ticket office on the basis of the use history.

8.8.3 Cancellation Statistics

The Contractor shall provide on a monthly basis to AM detailed cancellation data, as agreed upon with AM, including:

- Inbound passengers per reader, control line, for all station control lines per station and for the entire network. The aforementioned recordings shall be divided per type of tickets/cards.
- Outbound passengers per reader, control line, for all station control lines per station and for the entire network. The aforementioned recordings shall be divided per type of tickets/cards.
- Origin - Destination matrix (all types of cards and tickets) for the entire system.

8.8.4 Fraud Prevention

At least once a day, all card transactions shall be analyzed, in order to detect any illegal card use. A complete record of the transaction history of each card shall be kept at the Management Centre to enable comparison with the latest

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transaction. This procedure shall be coordinated, as required, with the central AFC System of Thessaloniki Metro, as this will be managed by THeTA.

In the framework of the analysis, the following data shall be checked:

- Change of the type of the card (e.g. from a concession card to a standard one).
- The card used has not been registered as sold.

Cards ascertained as having undergone an illegal change shall be recorded in the Black List, while the updated Black List shall be uploaded in the Station Computer for being transmitted to the ticket validators.

8.9 Ticket and Card Control in the System

TheTA shall control the validity of tickets and cards in the Thessaloniki Metro network.

Ticket evasion shall be controlled by AM controllers (and/or of THeTA) who will use portable control devices, made available to them by the construction contractors. Portable control devices shall be used for card control and control data recording. Through the portable devices, controllers shall verify the validity of the cards and tickets by reading/using all data required to this end, such as monthly card validity, ticket validated for the specific trip, black list, etc. Through the portable devices, controllers shall record the data of the penalty imposed. The data in question shall be transmitted by means of a special terminal from the portable devices to the Fare Collection Management Centre.

The revenue to derive from the fare penalties imposed shall be collected by AM.

The Contractor shall assist AM upon request to facilitate it in access-related issues or in supporting actions related to the central or the peripheral systems (i.e. in stations) and fare collection equipment.

The Contractor shall periodically check the opening of the gates for emergencies when passenger evacuation will be required.

8.10 Periodical Certification of the AFC system on the use of bank/credit cards

The Contractor shall be under the obligation to periodically certify the AFC system in relation to the use of bank/credit cards. The certification shall be carried out by an independent certified body, who will perform the audits for the system's certifications in line with the standards of the credit institutions (such as the Payment Card Industry Data Security Standards PCI DSS) and at the intervals foreseen by these institutions. The Contractor shall organize these controls by an Independent Accredited Authority.



**International Tender based on the Open Procedure
for the Conclusion of a PPP Contract concerning
the Operation and Maintenance of Thessaloniki
Metro Network**

RFP-427/22
Α.Σ. 164503

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9. GENERAL SCOPES

9.1 Quality Management

9.1.1 Submission of a Quality Management System

Within one hundred and eighty (180) calendar days upon signing of the Contract, the Contractor shall submit to AM for approval the entire documentation of the Quality Management System (QMS). Any revision of the aforementioned QMS shall be submitted to AM for approval.

The approved documents (procedures, programs, O&M manuals, etc.) of the QMP on the Infrastructures, Systems and Rolling Stock in relation to the Operation and Maintenance of the Thessaloniki Metro (different for the Base Project and the Extension to Kalamaria) are included in the Project Log (see §2.8.6) that AM will provide to the Contractor. Within sixty (60) calendar days from the signing of the Contract, the Contractor is obliged to evaluate, clarify, create and submit for approval to AM the integral relevant documents for the entire Thessaloniki Metro network (Base Project and Extension to Kalamaria), that will include all the infrastructures and the systems for both projects, adhering to as a minimum to the requirements and the levels of the results mentioned therein. In case the integral documentation for the entire Thessaloniki Metro network (Base Project and Extension to Kalamaria) cannot be submitted, the Contractor shall submit for approval the relevant documents concerning the Base Project and, at least, three (3) months prior to the commissioning of the Extension to Kalamaria, he shall submit for approval the integral documentation against no further compensation.

The integral documents of the QMS shall be updated and resubmitted by the Contractor for approval to AM, prior to the commencement of each of the two revenue service phases and whenever required by AM, so that the aforementioned documents be approved prior to the commencement of each of the two revenue service phases.

9.1.2 Quality Management System

The Quality Management System to be finally approved shall include the following:

- A well-defined Quality Policy and Quality Goals clearly depicting the commitment of the Contractor to provide the executed Services in due respect of Quality Management.
- A Quality Manual describing the entire structure and application field of the QMS, where the efficiency of the QMS in monitoring and controlling all critical construction processes should be clearly specified by describing the interaction between several processes of the Quality System and through references to the implemented quality standards.

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- Organizational Chart and Job Descriptions. The Organizational Chart must have AM's final approval.
- Detailed Operating Procedures, Method Statements, Manuals, Programs, Work Instructions and anything else required for the execution of the scope of the Contract. The Contractor, along with the Project Log (see paragraph 2.8.6), shall receive all programs and procedures of the construction and systems contractors concerning the operation and maintenance thereof. For each basic work described in this document, the Contractor shall submit to AM for approval the relevant procedure or work order either by evaluating and revising the respective documents of the construction and systems contractors, should they exist, or by developing new ones.
- The supporting forms ensuring effective operation of all QMS processes, which constitute a proof that the QMS is thoroughly controlled through systematic recordings.
- Health and Safety Management Procedures, as stated in article 9.2.
- Suppliers – Subcontractors and Associated Third Parties Control Procedures with reference made to the Evaluation of the Suppliers and the Associated Third Parties in the framework of the Processing and Control of Supplies and Delivered Services, the Relationships with Subcontractors and Control. It is clarified that the meaning of "Subcontractor" is the one foreseen in Article 12 of the Partnership Contract. The remaining entities cooperating with the Contractor shall be addressed as Suppliers are addressed in Standard ISO 9001:2015.

In general, the Quality Management System must comply with the requirements of the Legislation and the contractual documents, AM's relevant QMS, while the suggestions of AM should be taken into consideration. Both the Contractor and AM shall inspect, at regular intervals and at least once a year, adherence to the QMS in all structures of the Contractor.

9.1.3 Quality Control

The Contractor shall be responsible for the quality of all materials, equipment, spare parts and consumables to be used in the Project, while their quality shall be checked at the Contractor's care and expenses, while the relevant cost shall be included in a converted form in the Lump Sum Price. The minimum life cycle of the equipment with the foreseen preventive maintenance shall be at least the one foreseen in the specifications of the individual materials/systems.

Deploying the adequate personnel, the Contractor shall perform all necessary checks, tests and inspections both in the factories of the suppliers and onsite the Project, so as to ensure that the Project is carried out in line with the designs and the specifications, while access shall be provided at all times to the employees of AM, so that they may perform the inspection of the Project and attend the executed tests. The Contractor is under the obligation to

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incorporate the quality control and the Project Quality Management data in the Monthly Progress Report.

In any case, adherence to all the aforementioned procedures does not release the Contractor from his responsibility to ensure the sound quality of the scopes to be utilized in the Project and the sound, safe and workmanship like execution of the Project.

All the aforementioned obligations of the Contractor shall be carried out at his own care, responsibility and expenses, while the relevant cost shall be included in a converted form in this Financial Offer.

9.1.4 Requirements applicable to the Suppliers of Services, Materials, Equipment, Consumables and Tools

The management of the delivered materials, equipment, consumables, tools and services integrated in the Project must be specified in due clarity and detail in the Quality Management System of the Contractor.

The selection of all suppliers of materials, equipment, consumables and tools integrated in the Project shall be subject to an approval procedure by the Contractor. The minimum criteria for the approval of integrated materials are as follows:

- Provision for the material in the Project designs and in the contractual documents.
- Certification in line with ISO 9000 Standard Series.
- Quality Control Certificates of the project (material) issued either by the Quality Control System of the Manufacturer and/or by an independent accredited testing or certification authority depending on the requirements of the contracting documents and the Standardization Legislation.

Based on the aforementioned approvals, the Contractor shall keep a "List of Approved Materials, Equipment, Consumables and Tools of the Project", which is unambiguously valid for certain sections of the Project or specific applications. The List of Approved Materials, Equipment, Consumables and Tools includes *inter alia* a reference of the approval document and constitutes an item of the deliverable Project files.

The Contractor shall ensure that purchases are carried out in a way that excludes lack of compliance in purchases due to erroneous data and specifications during communication with suppliers. To this end, purchases shall be carried out based on a specific procedure using a standardized form of the QMS. The same shall apply and adhered to for long-term purchase agreements or Technical Services Agreements where special contracts are concluded which include all the aforementioned data.

At the same time, where deemed necessary, controls and inspections shall be carried out in order to ensure that purchased products meet the agreed requirements. A log of these controls and inspections shall be kept by the Quality Management Manager of the Contractor.

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AM reserves the right to demand additional quality controls for materials critical to the Project.

If it is ascertained that the characteristics of the materials deviate from the specified ones, these materials shall be registered in their entirety as non-compliant and the respective procedure for handling them, as foreseen in the QMS and the Legislation, shall apply.

With regard to the consumable materials and spare parts specified in the Project's maintenance manuals, the relevant lists of materials supplied by the works contractors shall be made available to the Contractor together with the Project Log (see §2.8.6). If the Contractor wishes to choose, if possible for reasons of compatibility, a different spare part or material than the one specified in the lists, the procedure for submission to AM for approval shall apply.

Works and systems contractors have guaranteed that all suppliers/manufacturers of the equipment utilized in the Project shall provide the necessary spare parts (identical or new compatible ones) for a period of fifteen (15) years upon expiry of the warranty period of the entire Project delivered by them. The relevant "Lists of Approved Materials, Equipment, Consumables and Tools of the Project" of the Base Project and of the Extension to Kalamaria shall be made available to the Contractor together with the Project Log (see §2.8.6).

Works and systems contractors have provided the special tools required for the maintenance and repair of the Metro system. The type and quantity of the special tools made available to AM shall suffice to ensure the unhindered operation of the systems. The special tools approved by AM shall be made available to the Contractor.

9.2 Health and Safety Management

9.2.1 General

The Contractor has the obligation to ensure the health and safety of his employees as regards all aspects of their work by preventing their exposure to occupational risks, aiming at avoiding any labor accidents and illnesses with severe direct and indirect impact on the lives of employees.

The Contractor has the responsibility to ensure that his Sub-Contractors' employees as well, working in areas where works are being executed, or any third party who is present in the areas where works are under execution, remain safe at all times.

In order to achieve the objectives that have been set, the Contractor must implement the foreseen safety and health measures, based on the assessment of professional risks in the areas under his responsibility, taking into account the Thessaloniki Metro characteristics with driverless trains, as well as the provisions and requirements of the applicable legislation for Health and Safety at Work.

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The Contractor has also the obligation to ensure the health and safety of passengers in stations and trains and his entire personnel must implement in an organized and specified manner the necessary actions which, at first, shall prevent and address any events that put the health and safety of passengers at risk.

In view of the above, the Contractor has the obligation to implement the necessary measures in order to carry out the necessary activities related to the updating and training of personnel, the prevention of professional risks, the prevention and addressing all eventual risks for passengers, as well as to establish the necessary organization and provide the necessary means for the aforementioned cases.

The Contractor is obligated to adhere to the Greek legislation for Health and Safety at Work, in particular to the Code of Laws for Health and Safety at Work, as well as to Law 3850/2010.

More specifically, the Contractor is obligated to act as follows:

- implement the suggestions of the Health and Safety Inspectors and, in general, facilitate their work during inspections;
- supervise the proper implementation of the Health and Safety measures for employees;
- notify to the employees the professional risks that their work entail;
- establish a plan of preventive actions and improvement of work conditions per group of employees, taking into account in particular the work organization, the social relations, the environmental and technological factors as well as the psychosocial risks;
- ensure the maintenance and monitoring of the safe operation of various means and installations;
- encourage and facilitate the education and training of employees and their representatives;
- implement collective protection measures for employees, and
- evaluate the psychosocial risks, the violence and harassment related risks, inter alia, including the sexual harassment, and implement measures to prevent, control and limit them.

9.2.2 Occupational Health and Safety Management System (OHSMS)

The Contractor shall develop, implement and apply the Occupational Health and Safety Management System (OHSMS) based on ISO 45001. The Contractor must be certified by an independent organization for the implementation of the aforementioned standard as regards his organization, prior to the revenue service of the Base Project and extend the relevant certification for the entire network prior to the commissioning of the Extension

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to Kalamaria and shall take all necessary measures to keep the subject certificate valid throughout the duration of the Contract.

The necessary documents to be developed for the implementation of the OHSMS shall be submitted to AM for approval and shall be re-submitted in case they are amended or revised.

The Contractor is under the obligation to set up a special area on his corporate website, so that all necessary documents for OHSMS be directly at the disposal of his employees.

The signed policy for the Occupational Health and Safety shall be available at every location where works shall be executed, so that all employees are aware of the commitments made by the management of the Contractor and AM as regards the Occupational Health and Safety.

The Contractor shall carry out an annual evaluation of the OHSMS, as a minimum, which shall include in-house controls, management overviews and any other action required in order to prove the compliance, effectiveness and constant improvement of the OHSMS.

9.2.3 General and special obligations of the Contractor

Taking into account the nature of the activities of the employees, the Contractor must act as follows:

- Assess the risks related to the health and safety of the employees, when selecting the work equipment, the chemical and biological factors or compounds, when arranging the work areas, as well as the risks related to the production process. This assessment shall ensure that the prevention related activities and the work methods that are used improve the level of protection as regards the health and safety of employees and are integrated into the overall activities of the employees and at all levels of the hierarchy.
- When assigning duties to an employee, the Contractor must take into account the capacities of the subject employee as regards health and safety issues.
- Take all necessary measures, so that only the employees who have received the appropriate instructions have access to the high and special risk zones.
- When other businesses share the same work location (see paragraph 9.10 for the THeTA employees to be housed in Pylea Depot), employers must cooperate in order to implement the provisions as regards safety, health and hygiene and, taking into account the nature of activities, they must coordinate their activities for the protection of employees and prevent business risks, they must inform each other and each one of them must inform his/her employees and their representatives about these

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risks. The responsibility for the coordination of activities shall be undertaken by the Contractor.

- Operation and maintenance of any equipment item shall be carried out exclusively by adequately specialized, trained and certified for the execution of the specific task personnel (e.g. electrical switchboards shall be opened only by certified electricians; tunnel ventilation fans shall be maintained only by specialized ventilation technicians, maintenance vehicles in the Depot shall be driven only by trained personnel, etc.). Especially in the Depot areas where AM and THeTA personnel is also executing works, the Contractor shall ensure that non-adequate personnel shall not operate or become involved in any way whatsoever with the electromechanical and railway systems of the works.
- All expenses related to the implementation of the Health and Safety provisions for anyone involved or engaged in the Project shall be borne by the Contractor, they have been taken into consideration by him during the compilation of his Financial Offer and are included therein in a converted form.

Moreover, the Contractor must act as follows and proceed with the relevant communications to AM:

- notify within 24 hours the Labour Inspection Authorities concerned, the nearest Police Authorities and the services concerned of the insurance organization to which the employee is subject, all labour accidents and, in case of a severe injury or death, he shall keep unchanged all information that can be useful to identify the causes of the accident.
- keep a special book of accidents indicating the causes and describing the accident and make available to the Authorities concerned. The measures introduced in order to avoid similar incidents in the future shall be also recorded in this special book.
- keep a list of labour accidents resulting in the employee's incapacity for work for more than three working days.

The Contractor must comply with the labor legislation applicable each time as regards the presence of a doctor and nursing staff and in the Project.

9.2.4 Professional Risk Written Assessment

The Contractor shall submit a quantitative Professional Risk Written Assessment for each work position foreseen in the Organization he shall configure, both in work areas (offices, train and equipment maintenance, train stabling and cleaning areas etc.) and in public areas in the stations where the personnel is in contact with the public.

The Professional Risk Written Assessment, which constitutes one of the most significant tools for the most efficient Management of Occupational Health

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and Safety, shall satisfy the following requirements, through the systematic examination of all aspects of each executed work. Namely, it shall:

- identify the professional risk sources,
- identify to which extent and based on what measures the risk sources can be eliminated or whether these risks can be avoided, and, when this is not possible,
- it shall record the prevention measures already applied and propose supplementary in order to control and minimize the risks and to protect the employees.

The Professional Risk Written Assessment must include acknowledgement and recording of the existing risks, as well as of those risks that may occur in each category of employees, such as, risks due to train movement, electrification (from 750V DC, 110 VDC, 230/400 VAC, 20 kV systems, touch potentials), fall of employee from a height (resulting in lower extremity fracture, muscle damage, torn ligaments etc.), eye injury, fall of an object, fire/explosion, slippage/stumble (resulting in sprain, lower extremity fracture, muscle damage, torn ligaments etc.), musculoskeletal, risk due to moving industrial vehicle, blunt force trauma, risk from moving parts of turnout mechanisms in the tunnels, risk from maintenance and repair machines in the Depot, risk from hoisting machines – cranes – tower cranes, risk from exposure to harmful agents (natural, chemical, biological), risk from work organization, miscellaneous (heat, train collision).

For risk assessment purposes, a quantitative approach shall be implemented consisting of the quantitative risk assessment (analysis) (through the importance factor) of each of the factors affecting hazard risks, i.e.:

1. Criticality of incidents
2. Exposure of employees to risks
3. Likelihood/frequency of occurrence of the incidents

assuming, based on the international practice, that:

$$\text{Hazard risks} = \text{Criticality} \times \text{Exposure} \times \text{Likelihood}$$

The assessment of each factor should be based – to the extent possible – on international standards and the Greek legislation. In cases this is not possible, reliable data shall be used from incidents, accidents and near accidents, data from systematic remarks in work areas, as well as results from interviews of the employees themselves. Acceptable without any further implementation of measures shall be the low or negligible hazardousness cases that shall occur from the above analysis.

The finds and results of the Professional Risk Written Assessment that shall also include the preventive measures shall be organized per main category of

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employees (i.e. employees for building maintenance, trackwork, power supply systems, low voltage systems, signaling systems, mechanical systems, train attendants, station masters, ticker sellers, OCC controllers, guards, patrols, cleaners etc.) and shall be notified on them.

The Professional Risk Written Assessment and the preventive measures shall be checked and approved by AM, shall be integrated into the corporate website and shall be made available to the employees, and to the persons responsible for health and safety issues, who shall supervise their implementation.

The aforementioned assessment shall also include:

- the employees of AM and of THETA whose offices will be located inside Pylea Depot, who will participate in the special training provided by the Contractor, and for whom special accessibility restrictions will apply,
- any persons visiting the Depot, the personnel and technical rooms of the stations in special cases.

9.2.5 Assessment of risks for passengers/users

The Contractor shall be responsible for the preparation of a risk recording and assessment study during the operation of the Thessaloniki Metro network as regards the passengers/users; the subject study shall also include the measures required to be introduced, so that all actions related to addressing the incidents on the part of the Contractor's entire personnel be, in principle, in line with ISO 45000/45001, Law 3850/2010 and with any other applicable legislation, in order to ensure the safety of passengers.

This study shall take into account and/or shall retrieve data from other respective or existing studies that have been prepared during the construction of the projects, while they shall cover incidents and procedures related to dealing with incidents such as: de-railing or any other train failure in stations and tunnels, incidents related to passenger evacuation from stopped trains or from stations, fire/smoke incidents in trains and/or in stations, the need to handle emergencies, and crises including a wide range of incidents starting from improper behavior of citizens up to terrorist acts, incidents related to insufficient security/safety/protection, incidents related to the ticket gates, PSDs and/or train doors, the incidents related to flood and water ingress in stations, blackout in an extended part of the city or in the entire city resulting in the stoppage of operation in stations and trains, incidents related touch potentials in platforms, especially in relation to the PSDs and trains, passenger slippage/stumble in public areas and/or in staircases or escalators, earthquakes etc.

The subject risk assessment study for passengers/users, as well as the proposed measures for prevention and handling various situations shall be submitted to AM for approval and, subsequently, the measures to address the above shall be introduced for each case separately.

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In the aforementioned framework, prior to the commissioning of the Base Project and at a time to be agreed upon with AM, the Contractor, in cooperation with AM, and the Base Project Contractor (AIASA), shall organize a fire incident simulation in a train, in a tunnel and in a platform of a transfer station which shall include active participation of the Fire Brigade, the Police and the National First Aid Center (EKAV), as a minimum, while the response time and effects of the incidents shall be recorded.

9.3 Environmental Impacts Mitigation Measures

9.3.1 General

The Contractor shall be exclusively responsible and shall take all necessary measures in order to minimize the impacts on the environment that may be generated during network operation, as well as the adherence to the National and Community legislation and the approved Environmental Terms of the Project (JMD 19766/28.7.1993, as amended by JMD under ref. no. 180802/31.12.2004, oik.138340/6.4.2009, oik.124946/30.4.2010, oik.170057/10.1.2014 and as renewed by the Decision under ref. no. EYPE/138853/22.12.2003 and oik.145075/7.1.2015 concerning the Base Project and the JMD under ref. no. oik.203064/06.09.2011 concerning the Extension to Kalamaria) concerning the protection of the environment, emissions, noise, waste to be generated from the areas of the Thessaloniki Metro Network or to result from Contractor's activities, and shall seek ways to minimize the negative impacts on the environment.

In addition, he shall be under the obligation to adhere to the provisions, arrangements and measures for the mitigation of the environmental impact as these are included in the updated Environmental Studies and Environmental Reports prepared by AM in the framework of the procedure related to the environmental permits of the projects.

This document includes a detailed description of the additional obligations of the Contractor to meet the environmental requirements, beyond those foreseen in the approved environmental terms of both Projects (Base Project and Extension to Kalamaria).

The actions proposed in this document aim at minimizing pollution to all affected elements (air, ground, water) and mitigate disturbance to the man-made environment during the operation phase of the project.

The Contractor shall be exclusively responsible to develop and implement the following relevant designs, monitoring programs and reports:

S/N	Designs-Studies/Monitoring Programs/Reports
1	Environmental Monitoring Program (EMP)
2	Annual Revision Report of the EMP
3	Annual Reports for the Monitoring of Environmental Impact
4	Renewal and/or Modification of Approved Environmental Terms

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	Designs
5	Design of Compliance of Final Project Planning
6	Technical Report concerning Leakage of Hazardous Substances in the Ground and in Water
7	Waste Management Plan
8	Manual for the Environmental Management System (EMS), per ISO 14001
9	Monitoring Program of Airborne and Groundborne Noise and Vibrations during the operation of the project
10	Special Acoustical Study to Control Noise and Vibrations during the operation of the Project
11	Annual Reports for the Evaluation of the Results of the Noise & Vibration Monitoring Program during the operation of the project

Table 7 – Designs-Studies / Monitoring Programs / Reports related to the Environment

The content of the aforementioned designs, monitoring programs and reports, as well as the time for their submission, is described in detail in this article. The above are subject to AM's approval, as well as to the approval of the Service concerned of the Ministry of Energy, where required. However the Contractor, irrespective of this approval, remains totally responsible for the completeness and implementation of the above, in accordance with the applicable legislation.

In case it is required to issue an environmental permit, such as renewal or modification of the environmental terms of the Project or the preparation of the Compliance Envelope in the Final Planning, the Contractor shall be responsible for the preparation of the required Environmental Study/Report, in order to ensure the required approval of environmental terms by the Department responsible for the Issuance of an Environmental Permit of the Ministry of Energy, further to AM's review.

9.3.2 Environmental Monitoring Plan

Within two hundred and seventy (270) calendar days from the signing of the Contract, the Contractor shall submit for approval to AM a Report presenting in detail the Environmental Monitoring Plan (EMP) in three (3) copies and in digital format. This Plan shall describe all necessary measures and procedures to be implemented during the operation of the Thessaloniki Metro, so as to ensure the implementation of the environmental requirements and the adherence to the Environmental Terms, in line with the provisions of para. 9.3.1. The EMP shall be directly related with the Services of the Contractor and shall be annually revised. Then, the Contractor shall submit to AM a Revisionary Report stating the deviations from the approved EMP.

In particular, the EMP shall include *inter alia* a detailed analysis of the following environmental parameters:

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1. Measures and devices for the control of noise and vibrations generated during the operation of any type of mobile and fixed machinery. These proposals shall be finalized in the framework of the Special Noise and Vibrations Control Study.
2. Description of the preventive measures to be introduced, as well as of the equipment and installations to be used, in order to prevent the leakage of pollutants to surface and ground water and the soil to surface and ground water and the soil during the operation and maintenance of the network (Pylea Depot). The subject proposals shall be described in the Technical Report for the Leakage of Hazardous Substances on the Ground and in Water.
3. Description of the methods for the management for any kind of solid and liquid waste with emphasis given on toxic or highly polluting waste (batteries, oil etc.). Recording of all water connection – disposal points to/from EYATH's network and suggestions for frequent quality controls for meeting EYATH's regulation. Further to its chemical composition analysis, water shall be disposed in line with the applicable legislation either in the closest outlet within the permanent surface water drainage system or in a Waste Disposal Site. The frequency of sludge disposal in the Waste Disposal Sites shall be determined. The above shall be described in the Waste Management Plan. It is noted that the Contractor must comply in full with the applicable legislation concerning waste management.
4. Response to emergencies related to the environmental downgrading and the decline of the health and safety of the employees and residents. In any case, the Contractor shall be responsible to thoroughly investigate the problem and propose special contingency measures to AM.

9.3.3 Annual Environmental Impact Monitoring Reports

These reports shall be submitted for approval to AM during the validity period of the Contract and more precisely by January 15th of each year. The subject Report, following AM's approval, shall be posted on AM's website to inform the public accordingly.

In the subject reports, the following shall be stated:

- Detailed recording of activities that are implemented in order to adhere to the environmental terms related to the Project operation and maintenance.
- Basic information (indexes) concerning the implementation of the Environmental Management System.
- Basic information concerning waste management.
- Impact from the operation of the network. The impact on natural environment (air, water, ground, flora), structural environment (buildings, road network, infrastructure network, etc. inside or adjacent to the

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network) and the quality of life of the residents (e.g. noise, pollution, etc.) shall be studied.

- Quantified and processed data to arise from the monitoring of the environmental impact, such as measurements of noise, vibrations, particulate matter in the tunnels, quantity and chemical composition of all liquid waste and reference to their disposal/discharge method/ network, quantities and type of solid waste and information on their disposal site.
- Problems, emergencies and/or protests that have arisen within the last year and to the way in which these have been addressed or are about to be addressed. Finally, proposals shall be included for further reduction of the environmental impact.
- Information about energy consumption and assessment of the environmental footprint from the operation of the Project in order to mitigate the subject footprint.
- Electronic control cards for the equipment in operation using controlled or fluoride gas (for example, freon for A/Cs) and submission in F-GASES & ODS database.

9.3.4 Annual Reports for Carbon Footprint

According to the Greek Climate Law (Law 4936/2022) and in particular based on article 20, the Contractor must submit until October 31st, in a public accessible electronic database implemented and operated by the Natural Environment and Climate Change Agency, a report about their carbon footprint for the reference year. This report includes voluntary targets and activities to mitigate or counterbalance the emissions. The report is updated and confirmed on an annual basis.

The Contractor shall submit to AM on an annual basis the aforementioned report concerning the carbon footprint and, subsequently, AM shall submit it to an electronic platform of the Ministry of Energy. This requires from the Contractor to have a database in order to assess the environmental footprint on an annual basis.

9.3.5 Waste Control and Management

The Contractor shall transmit to AM the annual Waste Report, which shall be submitted by AM electronically through the Electronic Waste Register platform (<http://wrm.ypeka.gr/>) stating in detail all the data required by the legislation in force (generated quantities of waste per Energy and Climatic Change (EKA) code, waste collection-transfer, waste acceptance/storage companies, works for waste retrieval/disposal) disposal/management companies, etc.).

All data related to waste management shall be at the disposal of AM at all times.

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The Contractor shall be responsible for the management of any kind of solid and liquid waste with emphasis given on toxic or highly polluting waste. In the Waste Management Plan that the Contractor shall submit within two hundred and seventy (270) calendar days from the signing of the Contract, the waste management methods as well as the types and foreseen quantities of waste shall be described. Moreover, reference shall be made to the cooperation with properly licensed management agencies for the proper environmental management of waste produced by the installations (non hazardous, hazardous, specific waste streams).

The Contractor shall provide daily general cleaning, as well as waste collection services in the areas of the Thessaloniki Metro system. The above shall also include the provision and emptying of waste bins and containers in the designated areas of the system.

Waste shall be disposed in a safe and acceptable way, in compliance with the applicable laws and provisions and as specified by the authorities concerned, in cooperation with the Municipalities concerned.

With regard to the sorting at source, the collection, transportation and management of solid waste, recyclable or not, applicable shall be the provisions of Law 4042/2012 (A' 24), as amended and in force, as well the provisions of the National Plan for the Management of Waste, ratified by the JMD οικ. 51373/4684/2015 (B' 2706) and the provisions of L. 2939/2001 (A' 179), as amended through L. 4496/2017 (A' 170). The collection and transportation of solid urban waste generated from the project's operation shall be ensured either by the Contractor's own means or in cooperation with the Municipality concerned and, in any case, in adherence to the obligations resulting from every applicable legislation related to the sorting at source of the four streams (glass, plastic, metal, paper), as well as of the packaging materials, office material waste (ink, toner, food residue etc.), bio-waste (green waste), train washing plant waste and other stream recycling (batteries, oil etc.).

The Contractor may assign the management and daily disposal of waste to an authorized subcontractor.

The Contractor is also responsible to check the adherence to EYATH's regulation. The discharge of hazardous or toxic waste to EYATH's network is prohibited.

9.3.6 Environmental Management System (EMS)

The Contractor shall be exclusively responsible for the development and implementation of an Environmental Management System, in accordance with the applicable legislation and the international standard ISO 14001. The EMS manual shall be developed per ISO 14001, by applying environmental management and monitoring process related rules.

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The EMS implementation targets during the operation of the project should be impact addressing, prevention and impact control in cases of emergency, follow up of the environmental impact magnitude deriving from the Project activities and posting on the Internet (AM's site) the annual report for monitoring the environmental impact, the activities for controlling/managing the impact and the magnitudes which constitute environmental performance indices.

9.3.7 Insect and rodent control

The Contractor shall ensure that no conditions favouring the development of insects or rodents shall arise in the areas of the Thessaloniki Metro.

At regular intervals, the Contractor shall carry out insect killing/disinfection/mice killing, while if the presence of insects or rodents is noted, the Contractor shall carry out insect killing/disinfection/mice killing further to the approval of AM.

9.3.8 Waste control

The Contractor shall immediately remove all waste, unsuitable materials or debris he has deposited intentionally or unintentionally in any of the Metro network areas. Household waste shall be immediately placed in closing bins or plastic bags for collection by the Municipal Authority. Burning waste materials is strictly forbidden.

9.3.9 Pollution control

The Contractor shall ensure that no conditions causing air, water or soil pollution within the operation boundaries of the network throughout the duration of the Contract shall arise.

If pollution phenomena are noted, the Contractor shall immediately inform AM in order to receive written instructions that will include all necessary measures to stop the pollution and eliminate the reasons causing it.

9.3.10 Urban green protection

The Contractor shall protect and maintain the existing greenery in the area of the network that falls under his responsibility.

In particular, the Contractor shall be responsible for the agricultural care of green spaces that have been configured during the final reinstatement of the stations and shafts at street level as well as of the Depot, while he shall proceed with the replacement of trees/bushes/green in the event they dry out. After the commissioning of the Project, the Contractor shall communicate with the Greenery Department of each Municipality to organize the watering and the care of green spaces as required, with the cooperation between the Contractor and the Municipality.

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Only in the 5 stations of the extension to Kalamaria as well as in the Depot, provision has been made for an irrigation system. No provision has been made for an irrigation system in the 13 stations of the Base Project.

The Contractor shall also ensure that all planted trees/bushes/green inside the Depot shall be properly irrigated, by optimizing the use of the stormwater tank, the 2nd flooding-irrigation tank and the utilization of the collected stormwater, thus minimizing the requirements for the provision of additional water from the network.

9.3.11 Noise and Vibration Control during Operation

This article includes all necessary activities, actions and measures required for the control of the Noise and Vibrations generated from the execution of the Services.

All activities and works of the Contractor shall comply with the applicable provisions of the Greek Regulation related to the restriction of Noise and Vibrations.

Should during the validity of the Contract changes be made to the Greek Legislation in relation to the Noise and Vibration Threshold Limits, the Contractor shall take all necessary actions/measures to ensure his compliance with the above.

The Contractor shall also comply with the thresholds set in the Decisions approving the Environmental Terms of the Project and in the relevant approved Environmental Impact Studies.

Where more than one Noise and Vibration thresholds apply, the Contractor shall adopt the most stringent threshold to comply with and implement.

9.3.12 Airborne and Groundborne Noise and Vibrations Monitoring Plan during the full operation phase of the Project (5.4.2 of M.D. 9714-21/5/2018) – Evaluation Reports of the Noise and Vibrations Monitoring Plan Results during Operation

In order to ensure adherence to the permitted airborne and groundborne noise and vibrations thresholds during the project's full operation, the Contractor shall submit a unified Airborne and Groundborne Noise and Vibrations Monitoring Plan for the entirety of the Thessaloniki Metro network (Base Project and Extension to Kalamaria) based on the minimum requirements of the corresponding Monitoring Plans submitted by the construction Contractor for the revenue service, which will be made available to the Contractor together with the Project Log (see §2.8.6).

This Plan shall include the following minimum proposals:

- Locations for the measurement of airborne noise (ventilation shafts, stations, Depot) and locations for the measurement of groundborne noise

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and vibrations. Controls shall be performed in all locations where the project is in proximity with sensitive indexes (archaeological areas, museums, listed buildings, schools, hospitals, concert halls-theatres, churches, residences, etc.), at crossovers, as well as in locations where in accordance with the results of earlier acoustic designs, the estimated Noise and Vibrations levels were marginally lower than the permitted ones and in locations where special anti-noise and anti-vibration measures are applied, in order to check the effectiveness of these measures. The aforementioned measurements shall be carried out by the Contractor on an annual basis.

- Monitoring equipment to be used. It is noted that the appropriate device system shall be used. These devices shall be installed at the premises closest to the location where vibrations are generated and will ensure measuring and recording of all significant noise and vibrations variables.
- Frequency and duration of measurements.
- Recording of the measurements locations on a topographical diagram.
- Recording form of the measurements' results.
- Content of the Evaluation Reports of the Noise and Vibrations Monitoring Plan Results during operation.

The Monitoring Plan shall be checked by AM and shall be approved by the Department of Climate Change & Air Quality of the Ministry of Energy.

The Contractor shall be responsible to apply the N&V Monitoring Plan, conduct the measurements and prepare the Evaluation Reports of the Noise and Vibrations Monitoring Plan Results. He shall submit these reports to AM in line with the provisions of the Monitoring Plan.

9.3.13 Electromagnetic Interference Control

All the facilities or machinery of the Contractor which could cause or cause interference to radio or television emissions, to the mobile telephony or to other receivers shall be equipped with devices that will reduce these emissions to the permissible thresholds, in line with the applicable provisions and the frequency zones approved by the Hellenic Telecommunications and Post Commission (EETT).

9.3.14 Required Personnel of the Contractor

In order to adhere to the Environmental Terms and the terms included in this article, the Contractor shall appoint a properly trained scientist, as an external contractor, responsible for the adherence to the environmental terms.

This person shall be responsible to periodically advise AM's persons in charge on the progress of AM's Services and on the application of the environmental terms and the terms specified in this article.

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9.4 Status Reports, Documentation and Monitoring of Performance Indicators

9.4.1 Status Reports

The Contractor shall prepare and submit to AM the following regular reports to cover all the services and works executed by the Contractor.

	Daily	Monthly	Yearly
Performance Reports	x		
Status Reports		x	
Performance Report		x	
Annual Follow-up Reports			x
Carbon footprint report			x
Assessment Report of the Results of the Noise & Vibrations Monitoring Program			x
Environmental Impact Monitoring Report			x
Annual Incidents and Accidents Report			x

Table 8 – Regular Written Reports

The form and the exact content of the Reports shall be approved by AM.

9.4.2 Documentation

Performance Daily Report

The daily report shall include, without being limited to, the following:

- Cases of system transition from the Normal Operation Mode.
- All defects, deficiencies or failures related to the rolling stock, the systems or the infrastructures of the system reported on the previous day of operation.
- Corrective maintenance activities that commenced or were completed on the previous day as regards defects, deficiencies or failures of the rolling stock, the systems or the infrastructures of the system.
- Report of the Passenger Counting System.
- Incidents related to the system safety, accidents and near-accidents.
- Interruptions of operation.
- Safety related incidents.
- Environmental incidents.

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The daily report shall be submitted to AM on a daily basis no later than 07.00 and shall concern the previous day of operation.

Apart from the Daily Report, the Contractor must **immediately inform** AM on the following cases:

- a. Emergency / crisis.
- b. Interruption of operation for more than 15 min.
- c. Safety related issue, which requires notification to the Authorities concerned, as mentioned in §4.3.3.2.

Monthly Status Report

The monthly report shall include, without being limited to, the following:

- a. Inspection plan and executed works.
- b. Maintenance plan and executed works (in electronic form as well).
- c. Passenger Counting System Report.
- d. Adherence to the milestones of the Contract.
- e. Corrective actions to be implemented by the Contractor in order to meet the intermediate completion dates.
- f. Energy consumption.
- g. Workforce (by name per section) for the period that constitutes the scope of the report and the scope of scheduling for the next period.
- h. Status of spare parts and consumables for the period that constitutes the scope of the report and the scope of scheduling for the next period. Spare parts and consumables ordered during the period that constitutes the scope of the report and confirmed/unconfirmed delivery dates.
- i. Information required by AM during the next period.
- j. Status of documents of the Quality Management System (QMS), indicating the new versions and modifications.
- k. Photos of works that have been executed.
- l. Report concerning Scheduling, Key and Cost Performance Indicators (SPI, KPI & CPIs) and relevant trend.
- m. Exceeding environmental parameter limits, noise, vibrations, dust and pollutants, strong odours, waste, electronic interference and energy.
- n. Cases of criminal acts, passenger accidents and other indicators foreseen in the Health & Safety Plan.

The monthly report shall be submitted to the Operation Agency and AM within five working days after the end of the month for which the subject report is prepared.

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Monthly Performance Report

The monthly report shall present the quality level of the provided services through certain Key Performance Indicators, covering the entire range of operation, maintenance, cleaning, security and fare management. The Contractor's performance report shall include the complete reports per service provided and shall be in accordance with the requirements and instructions of the Payments Document.

The monthly report shall be submitted to AM within five working days after the end of the month for which it is prepared.

Annual Reporting

The annual reporting shall include, but not limited to, the following:

- a. System Performance Report
- b. Passenger Counting System Report
- c. Inspections Plan
- d. Maintenance Program
- e. Communication Strategy
- f. Service Promotion Program and Evaluation Report
- g. Report on the condition of the trains, spare parts, all fixed assets and infrastructures
- h. Monitoring of the Life Cycle Cost
- i. Report concerning Scheduling, Key and Cost Performance Indicators (SPI, KPI & CPIs) and relevant tendency
- j. Comments and proposals related to the fare policy
- k. Results of QMS inspections.

The annual report shall be submitted to AM within fifteen working days after the end of the year for which the subject report is prepared.

9.4.3 Follow up of Performance Indicators

In order to assess the Contractor's Performance in several sections of his Services, the Contractor shall be under the obligation to systematically monitor the specific Performance Indicators, which have been determined in the Payments Document. These Indicators shall be calculated, evaluated and submitted on a monthly basis along with the Performance Report, while some of the aforesaid KPIs, characterized as of high importance, result in Payments Deduction, if the foreseen objectives are not achieved.

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9.5 Meetings

9.5.1 General

The Article refers to procedures related to project meetings. The meetings shall be attended by representatives of AM, representatives of the Contractor, representatives of the State and/or of other services involved, and/or representatives of other AM contractors, as required each time and in accordance with the stipulations of the following paragraphs.

The subject meetings shall be convened either by AM or by the Contractor.

The meetings shall be held at the premises of the Contractor or of AM, unless otherwise specified.

The purpose of these meetings is to settle issues related to operation and maintenance, as well as procedural matters. The views on contractual issues shall be notified via the regular official correspondence.

The Minutes of Meeting shall be kept at the Contractor's responsibility, who shall see that they are transmitted to AM within 2 days as of the meeting date and that they are approved by AM.

9.5.2 Preparatory Meeting

After the receipt of the necessary signed Contractual Documents, AM shall schedule a preparatory meeting to be held at the premises of AM. The purpose of this meeting is to present the representatives of AM who are responsible for issues related to contract supervision, to present the main executives of the Contractor, to present central points on issues related to safety, quality assurance, energy management, as well as to establish communication channels between the representatives of AM and the representatives of the Contractor.

9.5.3 Kick-off Meeting for the relevant Contract

The kick-off meeting for the relevant Contract shall be scheduled by AM within ten (10) days from the date of commencement of the Contract.

The meeting shall be attended by the following participants:

- The basic personnel of the Contractor.
- Representatives of AM.
- Representatives of State services and/or other services involved, or other AM contractors can also attend the subject meeting.

During this meeting:

- Attendants shall present themselves and shall describe their responsibilities.
- Issues pertaining to the Rule Book, the Operation and Maintenance Procedures and their preparation, based on the relevant applicable Legislation, the requirements

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related to the issuance of permits by public entities and the relevant arrangements shall be discussed.

- Insurance-related issues shall be discussed.
- The required provisions and arrangements related to safety, first aid, actions in emergencies, safety and the full-time representative responsible for safety issues shall be discussed.
- The details on the payment procedures and the monthly payments shall be discussed.
- Issues related to the services provided and to the corresponding indicators for the monitoring of the Contract shall be discussed.
- The issue related to the allocation of the Contractor's personnel, as well as the issue related to the use of the Contractor's areas and offices, of storage areas and of the areas intended for the execution of the services shall be discussed.
- The IT-ERP information system implementation plan to support the operation of the Operation Company shall be discussed.
- The Contractor shall distribute and discuss about the sequence of the time schedule for document submissions and about the subsequent coordination of his services.
- The Contractor shall describe the safety related arrangements, first aid, as well as actions and procedures related to emergencies.

9.5.4 Regular Monthly Meetings

The regular monthly meetings are classified as follows:

- Meetings about Operation reports and performance.
- Meetings about Maintenance reports and performance.
- Coordination meetings with third parties.
- Meetings about reports and performance related to the provision and promotion of passenger services and commercial activities.

The frequency of the subject meetings shall be modified, when deemed necessary, by AM.

Agenda

The Agenda for regular meetings shall be prepared by AM and shall include, indicatively but not limited to, the following:

- Presentation of the attendants and their fields of responsibility.
- Review of the Minutes of previous meetings, correction of Minutes –if necessary- and acceptance of the Minutes.
- Analysis of the operation and maintenance performed as of the previous meetings, operational problems, problems related to the delivery of equipment and spare parts, slippage of the Time Schedules, problems that occur due to the proposed

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modifications, and other situations that can affect the provision of services. The Contractor shall have an updated report on the performance of the system.

- Discussion on the progress of the Time Schedules, presenting the current situation and making a provision for the completion of the Project. The Contractor shall prepare a report about all activities foreseen to be completed upon expiry of the deadlines mentioned in the approved Time Schedule and shall present the means to adhere to the approved Time Schedule.
- Discussion about situations that have changed, time slippage and other relevant issues affecting the progress of services and works.
- Discussion about corrective measures in order to adhere to the Time Schedule.
- Problems related to the passenger service.
- Condition of commercial activities.
- Other issues, as required.

9.5.5 Management Meetings

Issues pertaining to the more general management of Services and requiring decisions to be made by the Management of AM and of the Contractor, shall be settled during the Management Meetings, which shall be scheduled when needed.

9.5.6 Health and Safety Meetings

Issues that concern Health and Safety shall be discussed in the framework of the regular monthly meetings.

9.5.7 Coordination Meetings

The Contractor shall attend, should it be required, the coordination meetings convened by AM with other bodies, with THETA, the Municipality of Thessaloniki, with PUOs or other public services, agencies and emergency services (see para. 4.3.3.2), with other agencies related to the operation of the Public Transport Modes and/or other contractors of AM, which shall be also attended by the other parties involved, in order to ensure the smooth execution of all works and services.

Any questions, requests for information, or requests for the settlement of various problems that occurred during similar meetings shall be responded, if possible, during the meeting. Those not responded during the meeting shall be settled after the end of the meeting at a time specified during the meeting.

9.6 Correspondence and records keeping

9.6.1 General

The Contractor shall submit for approval a correspondence system with AM that will facilitate his work and the cooperation with third parties. Due to the fact that the correspondence and the exchange of data between AM and the Contractor shall be

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mainly based on the new information system IT-ERP, the Contractor shall propose the best communication and correspondence system between him and AM, using also, as required, the original PMIS system in terms of technical documentation or designs or drawings or materials-related issues, etc., that AM will approve.

9.6.2 Submission of Documents

Submitted documents shall be accompanied by a letter including the following information:

- Date of submission
- Title and number of work
- Name and address of Contractor
- Title and number of every written document
- Statement that every submitted document is complete and accurate
- Signature of the Contractor or of his authorized representative.

The codification of the technical documents shall be in accordance with the Drawing Office Manual, the Structural Analysis of the Project Works and the Equipment Codification of AM applicable for the works executed in the framework of Thessaloniki Metro.

Document submission shall comply with the milestones, as these are shown in the Partnership Contract, Table A.

AM shall have thirty (30) calendar days to respond to any document submission (designs, programs, manning, procedures, time schedules, etc.) either by providing its comments or by granting its approval. The Contractor shall then have thirty (30) calendar days for document resubmission. If, further to the resubmission, comments still exist on the part of AM, a meeting shall be held to resolve any open issues for the approval of the 3rd and final resubmission to be granted.

All technical documentation shall be submitted in 3 copies and in electronic format. While the IT-ERP system progresses and it is possible to proceed with electronic document submission and review, the number of the physical copies shall be able to be reduced with the consent of AM.

9.6.3 Keeping Drawing Records

The Contractor shall keep and update throughout the validity period of the Contract the records for any changes made to the initial ("as-built") drawings of the Thessaloniki Metro made available to him.

A hard copy of the approved documents shall be kept onsite the project in an approved area. The complete drawing records (together with the Project Log – in hard copy and electronic format) shall be made available to the Contractor by AM one month after the Contract enters into force, while the Contractor shall return it dully updated and complete to AM at the expiry of the Contract.

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9.6.4 Electronic Deliverables

All the deliverables of the Contract throughout the duration of the Services and up to the end of the Contract shall be also delivered in electronic format, in line with the following guidelines:

- All documents and letters in .pdf, as well as:
 - Texts of any type (reports, letters etc.) in MICROSOFT Word 2016 files or newer version
 - Tables of any type (reports, statistics, diagrams etc.) in MICROSOFT Excel 2016 files or newer version
- The time schedules in PRIMAVERA files or any other type of file to be agreed upon with the Contractor
- The photos must be provided in jpeg files of low compressibility and high quality
- Videos must be stored in high quality mpeg files
- Construction drawings of any type in dwg files (AutoCAD 2018 or newer version)
- The drafts of drawings, logical diagrams or any type of drawings except for the construction drawings in MICROSOFT Visio 2016 files or newer version.

In special cases when the Contractor is using special software (e.g. files of computer-aided design programs software), he shall agree with AM on the open format he will deliver these files, if requested by AM.

9.7 Fire Protection

The Contractor shall organize the active fire protection of the entire project on the basis of the available active fire protection systems (fire detection, fire fighting, automatic extinguishing, smoke exhaust) of the approved detailed final designs for all related systems and the operation manuals of these systems.

In addition, in the depot buildings, the Contractor shall organize fire protection teams to ensure safety of all employees and visitors in case of fire.

9.8 Personal Data Protection

The Contractor shall organize an operational entity (not necessarily full-time), as required, and shall introduce the necessary measures and procedures, to ensure the personal data protection of the employees, passengers and the third parties involved in the project, on the basis of the EU GDPR provisions.

9.9 Press, Social media – web – communications strategy

The Contractor shall organize a Public Relations Department to fulfill the needs of the Company as regards press releases (in printouts and in electronic form), the creation and management of a web-page, the representation and image of the operation company in social media, the web releases and activities and all relevant actions.

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In this context and in cooperation with AM, the communications strategy shall be developed and implemented, while it shall be renewed on an annual or on an as required basis.

9.10 Presence of AM and THeTA Personnel in Pylea Depot

The personnel of AM and of Thessaloniki Transport Authority (THeTA) shall be permanently housed and work on a daily basis in Pylea Depot.

In particular, AM's personnel shall be housed within a section of the Building Complex 1 in Pylea Depot. The members of the personnel shall occupy two (2) floors of office space of a total area of 2000m². It is estimated that initially approximately 80 AM employees, likely to reach 120, shall work in this area. Out of these employees, approximately 30 employees shall work under the supervision and management of the Contractor and the services he provides.

Moreover, THeTA personnel shall be housed within a section of the Building Complex 2 in Pylea Depot; the members of the personnel shall occupy two (2) floors of office space with a total area of 1500m², including ancillary spaces to support the offices operation (meeting room, room intended for servers, etc.), which shall be organized by THeTA at its own cost. It is estimated that 30-50 THeTA employees shall work in this area in the Depot, while in the long run the staff is likely to increase to about 90 employees, as a maximum. THeTA personnel shall be involved in the provision of office administrative services, it shall not be directly involved in the operation of the Metro, except for fare management in all the Modes of Public Transportation in Thessaloniki and not only in the Metro.

The requirements related to the support of all the aforementioned AM and THeTA employees, as regards their safe access to the area intended for them, shall constitute the organization, training and safe management scope of the Contractor in cooperation with AM and THeTA. The personnel of AM and THeTA shall be advised by the Contractor on the area access details, as well as on safe circulation from/to the Depot gate, the cards required to carry with them, the Access Control System (ACC) and the access restrictions applicable to track areas, train stabling and maintenance areas and technical rooms.

The support related cost to be provided to AM's and THeTA's personnel for electricity and water supply shall be estimated on a proportional basis depending on the area (m²) occupied and used, while, as concerns heating and cooling, it shall be calculated on the basis of the m³ occupied and used. The detailed charging coefficients shall be agreed upon with AM, THeTA and the Contractor.

AM's personnel has installed its own independent PABX, equipped with its own telephone devices, PCs and servers.

Moreover, THeTA shall install its own PABX and independent structured cabling in its office spaces, equipped with its own telephone connections, PCs, printers and servers and internet provisions.

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The aforesaid expenses of AM and THETA employees shall be borne on a monthly basis by AM and THETA respectively and the relevant amount shall be credited to the Contractor, based on the expenses report that the Contractor will issue.

9.11 Financial, Accounting and Tax Management

The Contractor shall properly manage his financial services that will manage all financial, accounting and tax related scopes of the Operation Company.

These shall include, indicatively but not limited to, all required mechanisms and personnel who will manage payroll, revenues/expenses, accounting support, tax and insurance requirements, the correlation of the above with human resources, warehouse/spare parts, the sub-contracts – under execution – with sub-contractors or other companies, work orders, shifts, review of expenditure, money orders, financial planning, financial outcomes and financial reports, etc.; requested shall be the maximized electronic (paperless) management of the above, to the extent possible, under appropriate cyber-security protection.

9.12 Corporate Social Responsibility

The Operation Company's (Contractor's) Management, in cooperation with the Public Relations Department and other executives shall organize and implement a diversified CSR activities program (involving tree-planting, cultural events, training seminars, etc.) on an annual basis.

9.13 Risk Management Plan

Within one hundred and eighty (180) calendar days from Contract signing, the Contractor shall prepare a Risk Management Plan based on which he will manage risks. For the preparation of this Plan, he shall take into consideration the list of possible risks and the subsequent safety-related application conditions (SRACs), as these are stated in the RAMS document, and complement or improve them accordingly.

Based on the above, the Contractor shall prepare the following:

- a) Inventory of conditions, scopes, works and actions involving risk (of various grades);
- b) Risk Management Plan, in which the Contractor shall:
 - ✓ demonstrate that he understands the technical, operational and management risks involved and shall present his own approach as to risk management in combination with his organization structure and practices;
 - ✓ explain his concept for addressing and mitigating risks and challenges;
 - ✓ include descriptions of the scheduled audit and measures introduced to address risks.

The Risk Management Plan shall include as a minimum the following:

- An integrated Risk Assessment and Management Report, during the period of the provision of his services, to include the following:

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- ✓ An Organization chart with precise roles and responsibilities, as well as communication lines;
 - ✓ A detailed risk assessment and management approach and methodology;
 - ✓ Risk mitigation strategies and implementation of a “roadmap” and related procedures.
- A risk recording log to include the risks that have been identified by the Contractor.
 - Risks should cover as a minimum:
 - System failure or problems
 - Train failure or problems
 - Trackwork failure or problems
 - Civil works failure or problems
 - Natural phenomena (earthquake, flood, act of God, etc.)
 - Passenger-related issues
 - Blackout
 - Environment
 - Health and Safety
 - Delivery and Acceptance of Assets – non-compliance of the delivered trains and systems with the specifications in terms of performance and characteristics
 - Tests and certificates
 - Legal matters
 - Logistics
 - Permits/Licenses – issues with other state bodies
 - Time Schedule and Planning
 - Supply of spare parts
 - Project Management.

The Contractor shall propose the appropriate risk management actions, as well as risk management actions, strategies and risk mitigation measures, so that the residual risks can be reduced to the ALARP – As Low As Reasonably Practicable - level.

The Contractor shall propose an action plan for each of the non-acceptable residual risk.

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Annex A

List of spare parts

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Description of Spare Part	Quantity	Quantity to be provided
ROLLING STOCK		
Carbody		
Glass Reinforced Polyester (GRP) at the front end	1	
Gangway system – completed	1 Train set	
Windshield including sealing	2	
Motor of the windshield cleaning device	4	
Windshield washing device, completed, ready for installation on the vehicle	4	
Iron plate of the windshield cleaning device	4 Train sets	
Headlight assembly, completed, ready for installation on the vehicle	1 Train set	
Tail light assembly, completed, ready for installation on the vehicle	1 Train set	
Exterior assembly of indicative door lights	2 Train sets	
Horn	4	
Bogies		
Motor bogie assembly, completed, ready for installation underneath the vehicle and for immediate operation	2	
Trailer bogie assembly, completed, ready for installation underneath the vehicle and for immediate operation	1	
Motor bogie wheel set with redactor	2	
Trailer Car wheel set	2	
Axle box	4	
Primary spring assembly, completed, ready for installation on the vehicle	8	
Secondary spring assembly, completed, ready for installation on the vehicle	2	
Leveling valve assembly, completed, with linkage	3	
Primary damper	1 train set	
Secondary vertical damper	1 train set	
Secondary lateral damper	1 train set	
Series of elastomer bogie items	3 train sets	
Rotating discs (if used)	1 train set	
Couplers and Draft Gear		
Automatic coupler assembly	1	
Semi-permanent coupler assembly	1	
Draft gear assembly	1	
Car interior		
Exterior destination signal assembly	1	
Interior destination signal	4	
Passenger seat set	1 train set	

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Passenger seat insert set	2 train sets	
Vertical stanchion pole assembly, completed, with all the installation hardware	1 train set	
Interior handle assembly, completed, with all the installation hardware	1 train set	
Passenger handle	1 train set	
Interior finish panels, trim stripes and installation equipment	1 train set	
Rubber floor cover	1 train set	
Floor panels	1 train set	
Lighting fixtures assembly	1 train set	
Passenger cab window assembly, completed, including sealing and frames	2	
Interior signs and plates	1 train set	
Doors and Door Controls		
Passenger side entrance door assembly (2 leafs, right and left side), completed, including weather stripping and glazing, ready to be installed on the vehicle	4 sets on the left side and 4 sets on the right side	
Passenger side entrance door activation assembly, completed, ready to be installed on the vehicle	5	
Door Control Unit	4	
Weather stripping for passenger side entrance door	1 train set	
Rounded protruding edge made of rubber for the passenger side entrance door	1 train set	
Glass panel of the passenger side entrance door, including sealing	1 train set	
Threshold guide of the passenger side entrance door	1 train set	
Threshold of the passenger side entrance door	1 train set	
Heating, Ventilation and Air Conditioning Equipment		
Roof mounted Heating, Ventilation, Air Conditioning Unit, completed, ready for installation on the vehicle and for immediate operation	1	
Total of Heating, Ventilation, Air Conditioning Units, completed	2	
Total of printed circuits of the Heating, Ventilation, Air Conditioning System	2	
Refrigerant compressor assembly of the Heating, Ventilation, Air Conditioning System, including the electric motor	2	
Fan assembly of the evaporator of the Heating, Ventilation, Air Conditioning System, completed with electric motor	2	

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Condenser coil assembly of the Heating, Ventilation, Air Conditioning System	2	
Evaporator coil assembly of the Heating, Ventilation, Air Conditioning System	2	
Brake System		
Brake control module assembly	2	
Total of printed circuits of the brake control unit	2	
Brake control electronic equipment	2	
Brake disc assembly	2	
Brake actuator assembly, completed	2	
Brake pad	150	
Brake actuator flexible hose	4	
Hydraulic brake release unit	2	
Pneumatic and/or Hydraulic Equipment		
Air reservoirs	1 per type	
Total of air control equipment (valves, cutout cocks, strainer, control points, pressure switches etc.)	1 train set	
Air compressor assembly, completed, ready for installation on a vehicle	1 train set	
Hydraulic Pressure Control Module Assembly, completed, ready for installation on a vehicle (if used)	2	
	2	
Propulsion System		
Power conversion equipment assembly, completed, ready for installation on a vehicle	1	
Total of power electronics modules of the converter of the propulsion system	2	
Traction control unit, completed, ready for installation on a vehicle	1	
Total of printed circuits of the traction control unit	2	
Power conversion equipment	2	
Traction motor	4	
Gearbox assembly	2	
Total of speed sensors	10 per type	
Power Distribution System		
Auxiliary supply equipment assembly, completed	1	
Total of printed circuits of the auxiliary power supply equipment	2	
Total of power electronics modules of the converter of the propulsion system	2	
Equipment to regulate the auxiliary power supply equipment, completed (if used)	2	

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HSCB 750 Vdc, completed	1	
Total for overhaul of the HSCB 750 Vdc.	2	
Socket assembly, completed, ready for installation on the vehicle	1 train set	
Current collector shoe	1 train set	
Manual short circuit device	1	
Battery box, completed, no batteries	1	
Battery cells	1 train set	
Other Equipment		
Total of Fault Detection and Diagnosis System equipment	1 train set	
Event recorder	1	
Total of printed circuits of the Fault Detection and Diagnosis System	1 total per type	
Emergency Driving Buttons and Switches	10 per type	
Master controller assembly	1	
Set of master controller switches	1 total per type	
Control relays	10 per type	
Automatic circuit breakers	1 train set	
Timers	10 per type	
Power contactors	1 train set	
Power contactor tips	2 train sets	
Special electrical contactors	3 per type	
Special mechanical fastenings	100 per type	
Oil	1 year	
Grease	1 year	
Insulating materials	1 train set	
Cleaning materials, including detergents	1 year	
Mechanical fastenings	1 train set	
Tunnel Ventilation and HVAC Systems		
A sufficient number of main spare parts shall be provided in order to ensure the availability and safe and reliable operation of all ventilation and HVAC systems mentioned in the following specifications.		
1. MW15500 WATER CHILLERS (CW) – AIR COOLED AND SPLIT TYPE 2. MW15505 HEAT PUMPS (HP) - AIR-TO-WATER, AIR-TO-AIR, SPLIT TYPE 3. MW15510 AIR HANDLING UNITS (AHU) 4. MW15515 CLOSE CONTROL UNITS (CCU) 5. MW15520 FAN COIL UNITS (FCU) 6. MW15525 AIR HEATERS (AH) / AIR CURTAINS (AC) 7. MW15530 CHILLED WATER PUMPS (WP) WITH EXPANSION TANK (ET) AND BUFFER TANK (BT) 8. MW15540 PIPES, VALVES AND		

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ACCESSORIES FOR HVAC SYSTEMS 9. MW15570 CHEMICAL WATER TREATMENT 10. MW15580 BOILERS & BURNERS 11. MW15850 AXIAL FANS 12. MW15855 SMALL CENTRIFUGAL AND AXIAL FANS FOR HVAC 13. MW15860 MOTORIZED DAMPERS 14. MW15865 FIRE DAMPERS 15. MW15870 AIRDUCTS, SUPPORTS AND ACCESSORIES 16. MW15880 AIR FILTERS 17. MW15890 GRILLES, LOUVERS, DAMPERS 18. MW15900 SOUND ATTENUATORS 19. MW15950 TEMPERATURE AND PRESSURE SENSORS		
Traction Power System 750 VDC		
Installed hardware of the PRCS	5%	
Installed hardware of all other programmable systems	5%	
Installed MV cables for each type	10%	
Installed traction cables 750DC	5 km.	
HSCB 750 DC on the line and the Depot	One for each size of breaker installed on the Line or the Depot	
Installed battery items (any type)	5%	
Auxiliary power transformer used in the Project, including the rectifier transformer of the traction substation	One for each size	
Fuses, fuse holders, insulators of fuses and LV miniature circuit breakers, relays, relay bases, motor drive, detectors, hydrostats, thermostats, contactors, alternators, capacitors, coils, diodes, thyristors, connectors, heaters, surge restraint, buttons, modules, printed circuits, line test devices, intertripping devices, switches, contacts, contactor coils, resistances, sockets, LEDs, pilot lights, lamps, bulbs, cubicle lights, meters, test boxes, loading motors, clamps, arc chutes, springs, supports, current and voltage transformers, isolation transformers, throttling coils, converters, controllers, throttle control, bushings, transducers, wheels, horns, operation counters, handrails, and covers of the power provision and distribution system.	Two items for each size and type	
MV 20 KV Power Supply		

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Installed hardware of each programmable system	5%	
Installed MV cables	5% for each type	
Installed MV circuit breakers/ load break switches (LBS)	5% for each type and size	
Auxiliary power transformer	One for each power size used in the projects	
Installed protection equipment	5% of the total of each type	
Fuses, fuse holders, insulators of fuses and LV miniature circuit breakers, relays, relay bases, motor drive, detectors, hydrostats, thermostats, contactors, alternators, capacitors, coils, diodes, thyristors, connectors, heaters, surge arrestors, buttons, modules, printed circuits, line test devices, intertripping devices, switches, contacts, contactor coils, resistances, sockets, LEDs, pilot lights, lamps, bulbs, cubicle lights, meters, test boxes, loading motors, clamps, arc chutes, springs, supports, current and voltage transformers, isolation transformers, throttling coils, converters, controllers, throttle control, bushings, transducers, wheels, horns, operation counters, handrails, and covers of the power provision and distribution system.	Two items for each size and type	
MV Power Distribution (400/230VAC)		
Installed hardware for each programmable system	5%	
LV circuit breakers	One auxiliary circuit breaker of each size up to 5% of the total number of the installed units	
One auxiliary complete UPS for LAS (including batteries) of a size equal to the size of the largest system used in the Project		
Fuses, fuse holders, insulators of fuses and LV miniature circuit breakers, relays, relay bases, motor drive, detectors, hydrostats, thermostats, contactors, alternators, capacitors, coils, diodes, thyristors, connectors, heaters, surge arrestors, buttons, modules, printed circuits, line test devices, intertripping devices, switches, contacts, contactor coils, resistances, sockets, LEDs, pilot lights, lamps, bulbs, cubicle lights, meters, test boxes, loading motors, clamps, arc chutes, springs, supports, current and voltage transformers, isolation transformers, throttling coils, converters, controllers, throttle control, bushings, transducers, wheels, horns, operation counters, handrails, and	Two items for each size and type	

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covers of the power provision and distribution system.		
Fire Fighting, Fire Detection		
1. Deluge valve	1. One for each type	
2. Flow switch	2. One for each type	
3. Automatic deluge valve	3. One	
4. Ventilation valve	4. One for each size	
5. Sprinklers	5. Five for each type	
6. Grooved valve 6"	6. One	
7. Grooved valve 4"	7. One	
8. Grooved valves 2 ½"	8. Five	
9. Complete hose clip 4 x 2 ½ x 2 ½" with check valve and Storz	9. One	
10. Storz couplings	10. Five for each size	
11. Complete fire fighting tool cabinet category III	11. One	
12. Set of tools of the fire station	12. One	
13. Adaptors for 2 ½" in 1 ¾"	13. Five	
14. Fire hydrants	14. Two	
15. Complete set of spare parts for the pumping station (mechanical pump glands, pump & flange pads, pressure switches, motor air filter etc.)	15. One	
16. Automatic extinguishing gas	16. 10% of the quantity	
17. Collector (distributor) with the check valves for the INERGEN system	17. One for each type	
18. Electromagnetic valve	18. One for each type	
19. Detonator for the automatic extinguishing system using CO2	19. One for each type	
20. High pressure water hoses for the automatic extinguishing system using CO2	20. 2% of the installed ones	
21. Breathing apparatus	21. One for each type	
Escalators		

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1. Escalators 2. Control mechanisms of PC boards etc. 3. Door mechanisms - escalators 4. Complete step chain 5. Cylinders, switches, fold units, steps, sensors, emergency buttons 6. Comb plate, handrails, handrail control device	1. 5% of the installed parts, including one (1) motor per type 2. Two 3. Two 4. One 5. Twenty items 6. One	
Lifts		
1. Lifts 2. PC boards for each use, e.g. main, synthesizer, position indicator etc. 3. Door motors 4. Door locks 5. Wire rope etc.	1. 5 % of the installed items, including one (1) motor per type 2. Two 3. Two for each type 4. Five for each type 5. 300m for each type	
Water supply, Storm and Waste water drainage, Pumping Stations		
Pumping system	5% of the installed parts or as a minimum - One motor per type of installed pump - Two for each size and type for rings, glands, collars, screws, nuts, impellers, impeller washers, float switches and wear rings.	
Panels – Platform Screen Doors (PSD)		
The spare parts shall constitute 5% of the installed parts and shall include, as a minimum:		

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1 Complete door mechanism 2 Doors (PSD) 1 Door control unit 1 Local platform door control unit 1 Central door control unit		
Telecommunications		
The Contractor is responsible for the supply of spare parts in accordance with the General Specification requirements, document T_DP15100.		
Signalling System		
ATP, ATO, E-IXL Systems, Track Circuits, Track Axle Meters, data transmission systems 1. Five per cent (5%) from all installed entrance-exit boards. The boards including EPROMDS shall be provided programmable with EPROMS. 2. One from each different type of the main PC board (Motherboard). 3. If the units and/or the frames of the electromagnetic locking have different wiring on the main boards and the units are not replaceable from one position to the other, the Contractor shall provide the different types of the units.		
Line Circuits (trackside equipment) Spare parts equivalent –in terms of value- with the cost of six (6) track circuits of each type. The Service shall specify the exact composition of the spare parts upon receipt of the list of spare parts from the Contractor.		
Wheel axle meter – if used (trackside equipment) Spare parts equivalent –in terms of value- with the cost of four (4) wheel axle meters. The Service shall specify the exact composition of the spare parts upon receipt of the list of spare parts from the Contractor.		
Point Indicators Spare parts equivalent –in terms of value- with the cost of five (5) point indicators. The Service shall specify the exact composition of the spare parts upon receipt of the list of spare parts from the Contractor.		

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Point machines Spare parts equivalent –in terms of value- with the cost of three (3) point machines. The Service shall specify the exact composition of the spare parts upon receipt of the list of spare parts from the Contractor.		
Electromagnets Spare parts equivalent –in terms of value- with the cost of ten (10) electromagnets.		
One full set of on-board equipment		
One full set of equipment of the operator's workstation		
Automatic Train Supervision System (ATS)		
1. Five (5) % of the total of the installed entrance/exit data tables. Tables with EPROMs shall be provided with programmable EPROMs. 2. One from each different type of motherboards 3. If the ATS unit and/or frame has different cabling layouts as regards the motherboard and the various items are interchangeable from one position to the other, the Contractor shall provide different types of items. 4. One unit from each hardware unit. 5. 10% of the matrix video display unit		
Gas Installations		
1. 10% Gas detection sensors with bases 2. One (1) gas detection unit feeder 3. Electronic cards of the gas detection unit		
Compressed Air System		
1. One air compressor coupling system with electric motor 2. Three spare air suction filters 3. One full filter for compressed air discharge of the air compressor unit 4. Three spare filters for the above 5. Three spare oil filters 6. Three spare parts of the air-oil separator of the air compressor		

TECHNICAL DESCRIPTION AND SPECIFICATIONS

7. One full filter for the dryer 8. Three spare filters for the dryer 9. Three blow-off valves for concentrates of each type/size 10. Three spare parts of the air-oil separator of the concentrates' separator 11. Three full units of the filter-regulator with lubricator 12. Ten quick coupling connectors 13. Five sets of flanges, gaskets etc. Concerning maintenance works 14. 20lt container with the proper SAE 10 lubricator for the air preparation unit.		
Building Automation and Control System (BACS)		
At least 10 % -on average- of the installed items – including the following:		
PC for server	At least 1	
Communication processor for PC for servers	At least 1	
PC for workstations	At least 1	
Alarm / Event printer	At least 1	
PLC feeders	At least 2 for each type	
PLC - CPU	At least 2 for each type	
Επεξεργαστής Επικοινωνίας για Η/Υ	At least 2 for each type	
I/O modules	At least 2 for each type	
Optical link module	At least 2 for each type	

Note that a relevant revised final list of spare parts, consumables and special tools is attached to the Project Log (see §2.8.6).

TECHNICAL DESCRIPTION AND SPECIFICATIONS

Annex B

List of Depot Equipment

TECHNICAL DESCRIPTION AND SPECIFICATIONS

S/N	Description	Quantity	Quantity to be provided
1	Heating layout with immersion of the roller bearings	1	
2	Battery Charger, Electric Vehicle with Batteries	10	
3	Battery Charger, Automobile	1	
4	Battery Charger, DM car of the Line	1	
5	Battery Charger, Train	2	
6	Electric Vehicle with Battery, Auxiliary Tractor	1	
7	Electric Vehicle with Battery, Bogie Transporter	1	
8	Electric Vehicle with Battery, Fork Lift of General Use	3	
9	Electric Vehicle with Battery, Lifting Platform	1	
10	Electric Vehicle with Battery, Swivel Loader of Seated Driver	1	
11	Electric Vehicle with Battery, Stacking Vehicle – Pedestrian/Driver	2	
12	Electric Vehicle with Battery, Shunting Road/Rail Tractor	1	
13	Bending and Folding Machine	1	
14	Bending Round Machine	2	
15	Accommodation Bogies	12	
16	Bogie Cleaning Facility	1	
17	Bogie Deformation Control Equipment	1	
18	Bogie Frame Measurement Platform	1	
19	Cleaning Chamber for Housing and Rotor Windings of Traction Motors	1	
20	Cleaning Equipment with Grinding	1	
21	Cleaning Equipment of Air Filters	1	
22	Cleaning Equipment of Bearings	1	
23	Cleaning Equipment of Trains and Workshops (Total)	1	
24	Cleaning Equipment of Small Fittings	2	
25	Cleaning Equipment with soda bath	1	
26	Air Filters Deposition Bed	2	
27	Inverter/Compressor Deposition Bed	2	
28	Traction Motor Deposition Bed	1	
29	Boom Crane	3	
30	Gantry Crane of Bogie Workshop	1	
31	Gantry Crane of Bogie Stabling Area	1	
S/N	Description	Quantity	Quantity to be provided
32	Travelling crane of the E/M Workshop	1	
33	Travelling crane of the machine-shop	1	
34	Travelling crane of Line 14	1	
35	Travelling crane of the Traction Motor Workshop	1	
36	Drilling machine, bench mounted	2	
37	Drilling machine, heavy duty pedestal	1	
38	Radial drilling machine	1	
39	Dynamic balancing machine	1	

TECHNICAL DESCRIPTION AND SPECIFICATIONS

40	Axle bearing puller	2	
41	Fitting of Wire Rope Storage	3	
42	Mobile Support for Train Doors	3	
43	Mobile Support for Train Windows	3	
44	Measurement Devices and Test Equipment (Total)	3	
45	Grinding Machine with Twinned Wheels on a Base	2	
46	Grinding Machine of Flat Surfaces	2	
47	Grinding Machine for Cutting Tools	1	
48	Multi-use Woodworking Machine	1	
49	General Purpose Ladder	6	
50	General Purpose Lathe – Medium Size	1	
51	General Purpose Lathe – Small Size	2	
52	General Purpose Lathe for Wheels and Axles	1	
53	Lifting Accessory of the Traction Motor Rotor	2	
54	Lifting Jacks (Total)	1	
55	Underfloor Bogie Lifting Plant (Total)	1	
56	Underfloor Train Lifting Plant (Total)	1	
57	Lifting Table	2	
58	Traction Motor Processor	4	
59	Pad Thickness Measurement Equipment	1	
60	Measurement Equipment, Wheel set Diagnostic System	1	
61	Milling Machine	1	
62	Oil Supply Station and Tank for Used Oil	1	
63	Oven, drying of traction motor	1	
64	Paint Installations (Total)	1	
65	General Purpose Press	1	
66	Wheel Press	1	
67	Metal scissors	1	
68	Main Warehouse Racking System (Total)	1	
69	Racking System for Various Work Crews	20	
70	Storage Case of the Traction Motor Rotor	2	
71	Rail Crack Detector	1	
72	Equipment for the Replacement of Rails and Line Maintenance (Total)	1	
S/N	Description	Quantity	Quantity to be provided
73	Equipment for re-installation on the Tracks (Total)	1	
74	Hacksaw	4	
75	Sling for Bogie Elevation	2	
76	Sling – General Use	24	
77	Sling for Elevation of the Traction Motor and Traction Motor Rotor	6	
78	Sling for Elevation of Wheel Set	2	
79	Train Access Ladder, High, Fixed	8	
80	Train Access Ladder, High, Movable	12	
81	Train Access Ladder, Low-height, Movable	4	

TECHNICAL DESCRIPTION AND SPECIFICATIONS

82	Traction Motor Rotor Support Base	12	
83	AC/DC Test Bench including Mobile Rectifier	1	
84	Test Bench of Analogue/Digital Equipment	6	
85	Test Bench of Auxiliary Machinery (Total)	1	
86	Test Bench of Braking and Pneumatic/Hydraulic Equipment (Total)	1	
87	Compressor Test Bench (Total)	1	
88	Door Mechanism Test Bench (Total)	1	
89	Fare Collection Equipment Test Bench (Total)	1	
90	Heating, Ventilation, Air Conditioning Test Bench (Total)	1	
91	Platform Door Equipment Test Bench (Total)	1	
92	Attenuator Test Bench	1	
93	Signalling Equipment Test Bench (Total)	1	
94	Test Bench for Multi Purpose Springs	1	
95	Telecommunications Equipment Test Bench (Total)	1	
96	Traction Motors Test Bench (Total)	1	
97	Non Destructive Tests' Equipment (Total)	1	
98	General Purpose Tools (Total)	5	
99	Tools for Personal Use (Total)	100	
100	Special Tools (Total)	1	
101	Transverser	1	
102	Bogie for Mobile Battery Charger	1	
103	Bogie for Battery Transport	2	
104	General Purpose Bogie, Trailer	2	
105	Vehicle, Road/Rail Tractor	1	
106	Road Vehicle, General Purpose Truck	1	
107	Road Vehicle with Covered Back Side	2	
108	Road Vehicle with Uncovered Back Side	1	
109	Train Washing Plant	1	
110	Auxiliary Equipment of Welding Workshop (Total)	1	
111	Electric Arc Welding Equipment	3	
112	Gas Welding Equipment	2	
S/N	Description	Quantity	Quantity to be provided
113	Inert Gas Welding Equipment	1	
114	Underfloor Wheel Lathe	1	
115	Work Bench	40	
116	Workbench Cabinet	60	
117	Support Base for Bogie Frames	4	
118	Support Bases of Carbody Structures	6	
119	Cleaning Installation underneath the Frame of the Railway Vehicle	1	
120	Track Motor Car	2	
121	Service Wagon, Level	1	
122	Service Wagon for Cleaning the Line, Level	1	
123	Service Wagon, Immersed	1	
124	Service Wagon, Workshop	1	

TECHNICAL DESCRIPTION AND SPECIFICATIONS

Annex C

Glossary

TECHNICAL DESCRIPTION AND SPECIFICATIONS

ABBREVIATIONS:

Greek Government and Non-Government Organisations and Abbreviations

AM	ATTIKO METRO S.A.
EETT	Hellenic Telecommunications & Post Commission
EIS	Environmental Impact Assessment Studies
ELOT	Hellenic Organisation for Standardisation
EMP	Environmental Monitoring Program
EYATH	Public Water Company of Thessaloniki
GCTS	Greek Concrete Technology Standard
GGI	Government Gazette Issue
N&V	Noise and Vibrations
O&M	Operation and Maintenance
OSE	Greek Railway Organisation
OSETH	Thessaloniki Transport Work Organization
OTE	Greek Telecommunication Organisation
PPC	Public Power Utility (PPC)
PUO	Public Utility Organization
WDA	Waste Disposal Area
YPEHODE	Ministry of Environment, Physical Planning and Public Works
YPEN	Ministry of Environment and Energy
YPOME	Ministry of Infrastructures and Transport

General Technical Terms and Project Management Terms

Abbreviation	Term
A/C	Air Conditioning
ac or AC	Alternating Current
ACD	Advanced Concept Design
AFC	Automatic Fare Collection
AM	Automatic Mode
ATC	Automatic Train Control
ATIM	Automatic Ticket Issuing Machine
ATO	Automatic Train Operation

TECHNICAL DESCRIPTION AND SPECIFICATIONS

ATP	Automatic Train Protection
ATS	Automatic Train Supervision system
BACS	Building Automation Control System
CAR	Corrective Actions Request
CCR	Central Control Room
CCTV	Closed Circuit Television
CH	Chainage
CW	Civil Works
CWR	Continuous Welded Rail
dc or DC	Direct Current
DFD	Detailed Final Design
ECR	Emergency Control Room
ECS	Environmental Control System
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
E-IXL	Electronic Interlocking
FAI	First Article for Inspection
FAM	Fire Alarm Management
FAT	Factory Acceptance Test
FB	Fireman's Box
FCR	Field Change Request
FCU	Fan Coil Unit
FMEA	Failure Mode and Effect Analysis
FMECA	Failure Modes, Effects and Criticality Analysis
FO	Fibre Optics
FRACAS	Failure Reporting, Analysis and Corrective Action System
FRP	Fire Resistance Period
FTA	Fault Tree Analysis
GFD	Final Design
GOA4	Grade of Operation 4
GS	General Specifications

TECHNICAL DESCRIPTION AND SPECIFICATIONS

HV	High Voltage
HVAC	Heating, Ventilation, Air Conditioning
LAS	Lighting and Auxiliaries Substation
LRU	Line Replaceable Unit
LV	Low Voltage
MCBF	Mean Cycle Between Failures
MDT	Maintainability Demonstration Testing
MMI	Man Machine Interface
DFD	Detailed Final Design
MSS	Material Submittal Sheet
MTBF	Mean Time Between Failures
MTCF	Mean Time to Catastrophic Failure
MTBSF	Mean Time Between Service Failures
MTTM	Mean Time to Maintenance
MTTR	Mean Time To Repair
MV	Medium Voltage
NCR	Non Conformance Report
NTP	Notice to Proceed
OCC	Operations Control Centre
O&M	Operation and Maintenance
OTE	Over Track Exhaust
PA	Public Address
PCB	Printed Circuit Board
PID	Platform Information Display
PIS	Passenger Information System
PLC	Programmable Logic Controller
PM	Permissive Mode
PMIS	Project Management Information System
PPE	Personal Protective Equipment
PRCS	Power Remote Control System
PS	Power Supply
PSAT	Partial Stand Alone Test

TECHNICAL DESCRIPTION AND SPECIFICATIONS

PSATC	Partial Stand Alone Test Certificate
PSN	Persons with Special Needs
QA	Quality Assurance
QC	Quality Control
RAMS	Reliability, Availability, Maintainability and Safety
RC	Remote Control
RDP	RAM Demonstration Plan
RDT	Reliability Demonstration Testing
RM	Remote Monitoring
RS	Rolling Stock OR Rectifier Substation
RTP	Reliability, Availability and Maintainability Test Plan
SAF	Supply Air Fan
SAP	System Assurance Plan
SAT	Stand Alone Test
SATC	Stand Alone Test Certificate
SCADA	Supervisory Control and Data Acquisition
SE	Structure Earth
SIG	Signalling
SIL	Safety Integrity Level
SIT	System Integration Test
SM	Station Master
SMM	Supervised Manual Mode
SMR	Station Master Room
SMS	Safety Management System
SP	System Performance
SPI	System Performance Index
SPT	System Performance Tests
T&C	Testing and Commissioning
TCR	Traction Current Removal
TE	Traction Earth
TETRA	Terrestrial Trunked Radio
TLC	Telecommunications

TECHNICAL DESCRIPTION AND SPECIFICATIONS

TOR	Top of Rail
TRT	Trial Running Tests
TVC	Ticket Validator / Cancellor
TW	Track Work
UPS	Uninterruptible Power Supply
VDU	Visual Display Unit
WM	Washing Mode

Definitions

This section defines terms used in this document and subsequent specifications.

Term	Definition
Activation	Activate system for the first time.
Application Safety Case	Builds on the Generic Safety Case, justifying that the design of the system and its physical realization, including installation and test phases, for a specific class of application, meet safety requirements,
Audio Frequency Track Circuit	Track circuit energised by electrical current in the audio frequency range.
Automatic Train Control (ATC)	A former abbreviation of a system similar to ATP (Automatic Train Protection). In this specification used as an overall term for ATP and ATO, as well as the similar function of ATS and Interlocking.
Automatic Train Operation (ATO)	The subsystem of Automatic Train Control, on-board the train, that performs functions of speed regulation, programmed stopping, door opening and other functions, thus, substituting the work assigned to the train driver.
Automatic Train Protection (ATP)	The subsystem of Automatic Train Control that, through train detection, train separation and speed limit enforcement maintains safe train operation.
Automatic Train Regulation (ATR)	The subsystem of Automatic Train Supervision that provides various function for train regulation in compliance with time table.
Automatic Train Supervision (ATS)	The central main system of traffic regulation that monitors and provides control necessary to direct and manage the operation of a system of trains in order to maintain intended traffic patterns and minimise the effects of train delays on the operating time table. In addition, it constitutes the interlocking central control system.
Availability	The ability of a product / system to be in a state to

TECHNICAL DESCRIPTION AND SPECIFICATIONS

perform a required function under given conditions at a given instant of time or over a given time interval, assuming that the required external resources are provided.

Balise	A passive transponder mounted on the track, which can communicate with a train passing over it.
Ballast	An integral part of the ballasted track structure, composed of crushed stone, in which the sleepers and bearers are embedded.
Bearer	A transverse member of the track form structure at turnouts or crossovers, which supports the rails.
Block	A method of controlling the separation between trains by dividing the line into sections with, normally, no more than one train in each section. The block can either be a fixed block or a moving block.
Braking Distance (service)	The distance in which a train is capable of stopping, from a given speed, at such a deceleration for a passenger train that the passengers do not suffer discomfort or alarm or at an equivalent deceleration in the case of non-passenger trains.
Branching	An arrangement of crossings and points with closure rails that permits trains to divert to another track.
Calibration	Verification by means of the pertinent review and objective information that the specific requirements for a specific intended use have been met.
Cant	Raising of the level of the outer rail relative to that of the inner, on horizontally curved track. Also referred to as track super-elevation.
Cant Gradient	The rate at which the raising or lowering of the outer rail level (relative to the inner) is applied or removed on horizontally curved track.
Car	Continuous lengths of an inflexible car body also Vehicle (Rolling Stock).
Civil Speed (Limit)	The maximum speed allowed in a specified section of track as determined by physical limitations of the track structure, train design, and passenger comfort.
Commissioning	The process of verifying that the delivered Equipment meets the functional performance defined in the contractual specifications.
Console	A desk with a concentration of controls and indications from which an operator can supervise operations and give commands. These controls and indications may be mounted on a number of panels located on the console.

TECHNICAL DESCRIPTION AND SPECIFICATIONS

Collision Point	The place where a vehicle standing on a converging line would come into contact with a vehicle on the other line.
Criticality	The point at which a failure or a number of failures renders the system unusable and/or unsafe.
Cross acceptance	The product suitability presumption in case, based on the European standards, the said product has been made acceptable by an Authority and will be made acceptable by other Authorities as well, without requiring any further evaluation.
Crossing	A portion of a turnout, where the point of divergence occurs between the two tracks.

Crossovers

Single	Two turnouts, with plain track placed between the crossings and arranged to form a continuous passage between two adjacent parallel or diverging tracks.
Double	Two single crossovers, which intersect each other between two adjacent parallel or diverging tracks, forming a connection between them. Also referred to as a "scissors" crossover.
Diamond	One double crossover or "scissors" crossover of two parallel tracks.
Circular curve	Horizontal curve, defined by an arc and specified by a radius.
Transition curve	A spiral curve (clothoid) connecting a tangent to a circular curve, or two adjacent circular curves.
Vertical curve	A parabolic curve connecting different profile grades.
Data Acquisition	A general term for the capture of data from various sensors and the processing of the data for presentation to the operator in the form of VDU displays, printed logs, charts, etc.
Design Profile ATP Speed	The maximum speed allowed by the ATP system in any area which will still permit achievement of the specified headway requirements. This speed will be as close to the civil speed limit as possible.
Design Profile Speed	The speed of an ideal train which permits the design headway, not exceeding maximum authorised speeds (MAS).
Dynamic Test	This term refers to train-concerned individual item's test or interface tests during system integration test when the third rails are energized, and the trains are running on the tracks.
Door operation	A complete opening-closing operation of a door set.

TECHNICAL DESCRIPTION AND SPECIFICATIONS

cycle

Down Time The time interval during which a product is in a down state/IE 60050(191).

Dwell Time The elapsed time from when a train stops alongside a platform until it starts again.

Electromagnetic Compatibility (EMC) The ability of equipment and systems to function as designed without degradation or malfunction in the intended operational electromagnetic environment, without adversely affecting or being adversely affected by any other equipment, Systems, or the outside environment.

Emergency Brake Stopping of a train by an application of the emergency brake, which after initiation cannot be released until the train has stopped.

Emergency Brake Rate (safe) The value of deceleration for ATP safety calculations, taking into account brake tolerances, brake reaction times and downgraded brake performances.

Emergency braking distance; The distance in which a train is capable of stopping in an emergency, dependent upon train speed, train type, braking characteristics, train weight and (soil) gradient.

Error A deviation from the intended design, which could result in unintended system behaviour or failure.

Factory Acceptance Tests (FAT) Tests performed by the Contractor at Contractor's or manufacture's facilities, prior to shipment to verify compliance with specifications and quality standards.

Fail-safe A characteristic of a system which ensures that a fault or malfunction of any element affecting safety shall cause the system to revert to a state that is safe; alternatively, a system characteristic which ensures that any fault or malfunction shall not result in an unsafe condition.

Fail-safe or fail-to-safe A design philosophy, which results in any, expected failure maintaining or placing the equipment in a safe state.

Failed Train Trip The trip that has not commenced until the scheduled time for the departure of the subsequent train (commencement failure) or the trip that terminates before completing 75% of the trip (withdrawal from circulation).

Failure Rate The failure rate of an article is the ratio of the total number of independent article failures to the total article operating hours.

Floating Slab Track (FST) A concrete slab mounted on resilient bearings supporting the trackform, so as to dampen noise and vibrations.

TECHNICAL DESCRIPTION AND SPECIFICATIONS

Fouling Point		The position at the convergence or divergence of two tracks where the kinematic envelopes of trains, (one on each line), would align.
Functional Design		The design of the functional units of a system restricted only to its functional aspects as opposed to the physical ones.
General Scenario	Safety	The scenario justifying that the system, as designed and regardless of its implementation, does satisfy the safety related requirements.
Headway		The time separation between two trains travelling in the same direction on the same track including station dwell time, measured from the instant the head end of the leading train passes a given reference point until the head end of the train immediately following passes the same reference point. Both trains must be travelling at the Design Profile ATP speed. At the main line this reference point is the end of the station's platforms with the additional assumption that the second train is not braking in the tunnel.
Impedance Bond		An assembly having low resistance and relatively high reactance that provides a continuous or shunting path for the return propulsion current and provides an impedance match for audio frequency track circuits.
Insulated Joint (IRJ)	Rail	A joint in running rails, placed between abutting rail ends to insulate them from each other electrically.
Interlocking		A general term employed to set and release "signals" and "crossovers", so as to prevent the emergence of dangerous conditions and the equipment that "executes" the aforesaid function.
Interrupt		A suspension of a process caused by an event external to that process and performed in such a way that the process can be resumed.
Isolation		The electrical separation of two or more circuits by the use of isolating devices such as isolating transformers or optical couplers. Usually employed as a safety feature for the protection of circuit components or as a means of increasing the common mode voltage tolerance of a circuit.
Kinematic Envelope		The cross-section profile which may be occupied by a train under all "worst case" conditions of loading, suspension, speed, track and rolling stock condition, etc.
Loop		Track mounted device for the transmission of data between track-to-train. Also a train trip from a Terminal A to Terminal B and return to Terminal A

TECHNICAL DESCRIPTION AND SPECIFICATIONS

Main Line	All tracks over which trains carry fare paying passengers, including all platforms, plus sidings and connections between, up to the limits leading into a yard.
Maintainability	The probability that a given active maintenance action, for an item under given conditions of use can be carried out within a stated time interval when the maintenance is performed under stated conditions and using stated procedures and resources.
Maintenance Action	Any type of maintenance activity, whether it involves a preventive or repair action.
Maintenance	The combination of all technical and corresponding administrative actions intended to retain an item in or restore it to, a state in which it can perform its required functions.
Manual Operation/Mode	Control of a process or system by manual methods, e.g. in the event of failure of automatic control.
Metro Railway System	The premises and land in use for the operation of the Metro and ancillary purposes including station approaches and forecourts where these are owned by AM. It shall also mean the extensions from the trial running date.
Message	The combination of application data and protocol data that is transmitted by balise, loop or radio.
Mission	An objective description of the fundamental task to be performed by a system. For trains, a predefined quantity of loops within a defined time.
Most Restrictive Speed Profile	The speed, which a train must not exceed. It is the lowest speed taking into account all the various speed profiles.
Moving Block	A block where the distance between two trains respects always the safe braking distance of the second train at the actual speed, while the first train is considered to come to a stop at zero time
Network	An interconnected grouping of partially independent units or subsystems.
Non-vital	A description applied to those parts of the signalling system whose failure or non-availability does not directly endanger rail traffic or reduce the integrity of the signalling system.
Normal Direction	The prescribed direction of train traffic as specified by the rules; usually, the direction in which all regularly scheduled revenue service operations are conducted.
Operating System	Software for controlling the execution of computer programs and that may provide scheduling, debugging,

TECHNICAL DESCRIPTION AND SPECIFICATIONS

	input-output control, recording, storage, data management and related services.
Override	The temporary suspension of an automatic control function and its replacement by manual control.
Performance	The functional effectiveness obtained by a component, system, person, team, or other entity, as specified.
Pilot Line	A conductor or slot cable, laid in or beside the track in a defined manner, which performs track-to-train and train-to-track- transmission functions. Normally the Pilot line is also used for train borne measurement synchronisation of passed distances.
Point Machine	An electric motor for remote control of a turnout switch or derailing device.
Preconditioning	Energising a switch control relay for an opposing position in a route that has been cleared for a train.
Preventive Maintenance	The maintenance carried out at predetermined intervals or corresponding to prescribed criteria, and intended to reduce the probability of failure or the performance degradation of an item.
Provisions For	Future functions/requirements not needed for initial procurement, but for which compatibility, software, cutouts, space, and wiring etc. shall be provided to accommodate them when needed.
Quasi-Moving Block	A moving block system, where a train can follow another train in a distance of the minimum block length – as described for the moving block system - plus an additional length due to the uncertainty of location of the first train ahead within the track circuit or loop section.
Qualification Test	A test performed by the Contractor prior to production to verify that the components proposed meets the requirements of this Contract.
Rails	
Contact Rail	An electrical conductor located alongside the track, intended to supply the energy requirements of the trains. Also referred to as conductor rail or 3 rd rail.
Continuous Welded Rail (CWR)	Sections of rail welded together at their ends, to form a continuous length of track, of infinite length without physical breaks or discontinuity.
Running Rail	A rail which supports and guides the flanged wheels of the rail vehicle.
Inside Rail	On horizontal curved track, the running rail closest to the curve centre; the running rail with the smaller radius.

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	Also referred to as the "low rail."
Outside Rail	On horizontal curved track, the running rail farthest from the curve centre; the rail with the largest radius. Also referred to as the "high rail."
RAM Program [Reliability Availability Maintainability] (or here: Availability)	- A documented set of time scheduled activities, resources and events serving to implement the organizational structure, responsibilities, procedures, activities, capabilities and resources that together ensure that an item will satisfy given RAM- (or here: Availability-) requirements relevant to a given project or contract.
Redundancy	The provision of one or more identical elements, to achieve availability if one or more of those elements "malfunctions".
Relay	An electric device that is designed to interpret input conditions in a prescribed manner and after specified conditions are met, to respond to cause contact operation or similar abrupt change in associated electric control circuits.
Relevant Service Delay	An incident causing a temporary disruption to passenger train service by the time of twice the minimum headway in minutes.
Reliability	The probability that an equipment item or system can perform a required function under given conditions for a given time interval.
Remote Control	Control of equipment from a remote location. Remote control necessarily involves remote indication.
Response Time	The elapsed time between the arrival of a stimulus to a system and the start of the response.
Reverse Direction	Train movement opposite to the normal direction.
Reverse Running	Operation of a train in the reverse direction.
Right Side Failure	A failure that does not result in the level of protection normally provided by the signalling system being reduced.
Risk	The probable rate of occurrence of a hazard causing harm and the degree of severity of the harm.
Safe Braking Distance	The distance in which a train under normal operating conditions can be absolutely guaranteed to be brought to rest.
Safety Case	The documented demonstration that the product complies with the specified safety requirements
Safety Integrity	One of a number of defined discrete levels for specifying

TECHNICAL DESCRIPTION AND SPECIFICATIONS

Level (SIL)		the safety integrity requirements of the safety functions to be allocated to the safety related systems. Safety Integrity Level with the highest figure has the highest level of safety integrity.
Safety (limit)	Speed	The maximum speed at which a train can continuously safely negotiate a given section of track under the conditions prevailing at the time of passage (the safety speed limit may be less than or equal to the civil speed).
Scheduled Speed		The speed at which a train must operate to comply with the timetable; mathematically, the distance from terminal to terminal divided by the time scheduled for the trip (including station stops).
Section		A part of the movement corresponding to one or more signalling blocks.
Service		ATTIKO METPO S.A. (AM)
Service(s)		The scope of Thessaloniki Metro Operation and Maintenance. The overall technical and functional requirements for Thessaloniki Metro network Operation and Maintenance.
Shunting movement		The movement of trains or vehicles other than normal passage along running lines. When vehicles are moved without train data available.
Signal Bond		A conductor of low resistance placed around rail joints, crossings, and switch points to ensure continuity of track circuits.
Sleeper		A transverse member of concrete or timber, which supports the rails on plain track. Applicable to ballasted and non-ballasted track forms.
Sleeping Mode		An ATC mode that is used for the onboard equipment in slave engines controlled by a leading engine. Also the status of both leading engines during stabling waiting for awakening by the system.
Spot transmission (or intermittent transmission)		Track-to-train or train-to-track transmission that can only take place when the train passes the information point (balise or loop or radio).
Stand-Alone Tests		On-site tests performed by the Contractor to verify proper installation and operation of equipment and subsystems.
Station		A place where trains stop, where passengers can embark and disembark the trains and where assistance may be available.
Sub-ballast		Materials, superior in composition to the sub-grade material, which provide layers between the track ballast

TECHNICAL DESCRIPTION AND SPECIFICATIONS

	and the sub-grade or formation.
Sub-system	A major part or an assembly of parts of a vehicle, or of another system, as indicated.
Support Bracket	An assembly that supports the conductor rail cover-board.
Switch or Point Detection	Checking of the position of the switch rail.
Switch Rail or Point	A tapered moveable rail, which diverts the wheel flanges to the desired track.
Systems Design	The process of defining the hardware and software architecture, components, modules, interfaces and data for a system to satisfy specified requirements.
Terminal Platform	A platform from which trains can depart in one direction.
Systems Integration Tests (SIT)	On-site tests performed by the Contractor to ensure that Project systems and facilities function properly together. A stage when two or more systems are being tested in the mean time to verify that the interface functions among concerned systems are correct and reliable, and that the entire combined operations are also correct.
System	A configuration of hardware, people, or software subsystems that are integrated to perform a specific operational function or functions. Its is stressed that the system concerns all projects and systems, as well as the entire rolling stock of Thessaloniki Metro (Base Project and Extension to Kalamaria).
System Commissioning Test	This term refers to respective system's site running test after energized by the temporary or permanent power supply. It includes the unit -functional tests and safety tests of the system's sub-systems and equipment.
System Performance Tests (SPT)	Tests performed by the Contractor to prove the overall functionality and compliance with the overall System performance specifications.
Temporary speed restriction	A planned speed restriction imposed for temporary conditions such as track maintenance.
Terminal Station	Station, where turn back moves are normally made, at the beginning or end of the revenue section of line.
Testing	The process whereby the Contractor and the Customer verify that components, equipment, subsystems, systems, and interfaces function as specified and interface safely and properly with each other.
Theoretical	Shortest possible theoretical headway on a line without

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Design Headway	station dwell-times.
Signalling	
Theoretical Design Headway	Shortest possible theoretical headway on a line with station dwell-times.
-	
Traction Power	
Train	One or more vehicles.
Transceiver	A transmitter and a receiver combined device.
Trial Run (TRT)	One stage before the revenue service in which the Construction Contractor, along with the Metro operation Departments, perform operation tests on trains without passengers in view of familiarizing the personnel with the system environment, improving their capacities as regards the equipment operation and proving the overall functionality and compliance with the Operational system performance specifications. It includes operation under normal headways and simulations of hypothetical incidents.

Track

Block Support (BS) Track	Rail whose support is achieved by means of pre-cast concrete blocks (sleepers), embedded in track-bed.
Ballasted Track	Track laid on ballast.
Direct Fixation (DF) Track	Rails directly attached to a concrete surface through fasteners.
Non-Ballasted Track	Track resiliently laid on a concrete base or cast in-situ. Also referred to as concreted track.
Trackbed	The track embedment or/and supporting medium.
Track Circuit	A part of a track, insulated electrically from the rest of the track in order to be able to detect occupancy by an applied electrical circuit.
Track isolation (General term, which is not related only to the rail-track isolation)	The electrical isolation between the running rail and the electrical ground required to prevent harmful levels of stray traction power current from damaging metallic structures.
Tractive Effort	Propulsion or braking force developed by the vehicle.
Train Driver	The Metro employees on board the train having direct and immediate control over the movement of the train.
Train integrity	The level of belief in the train being complete and not

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		having left coaches or wagons behind.
Transceiver		Combined Transmitter and Receiver equipment.
Trial Running Tests (TRT)		Tests performed by the Contractor with the AM's Operations staff to prove the overall functionality and compliance with the Operational system performance specifications.
Trip		A trip is the journey of a passenger train from its planned starting station to the planned end station of its planned service.
Turn back Move		The reversal of the direction of a train at an interlocking.
Turnout		An arrangement of points and crossings with closure rails that permits trains to be diverted from one track to another.
Turnouts		Section of a track equipped in such a way permitting, trains to converge and to divert.
Verification		Confirmation by examination and provision of objective evidence that the specified requirements have been fulfilled.
Vital		See Safety.
Wayside		Area between and adjacent to the tracks within the right-of-way.
Wheel slide		When a braked wheel loses adhesion with the rails and under rotates.
Wheel slip		When a traction-driven wheel loses adhesion with the rails and over rotates.
Wrong Failure	Side	An equipment failure tending to cause danger to rail traffic.

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ANNEX D

Job Descriptions of Key Personnel

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1 GENERAL MANAGEMENT

1.1 Managing Director

Title: Managing Director	
Duties and Responsibilities	
- Responsible for the provision of the required services to the passengers and the city of Thessaloniki, the achievement of the company's objectives and performance goals, as well as for the overall administration and realization of the activities concerning the Operation and Maintenance Contractor (Contractor), on the basis of the guidelines as to policy related matters, as these guidelines are given by AM, and the pertinent obligations of his, as these derive from the contract documentation. - Supervises, either directly or by assigning various responsibilities, all operation issues of the Contractor, including consultants' and consultants' firms' activities. - In cooperation with AM, communicates to all company's personnel the Regulations Book, the Procedures and the Operation and Maintenance Instructions and ensures strict adherence to the above by all Contractor's personnel. - Develops, agrees with and manages in a robust manner strategic plans, on an annual basis, aiming at achieving the company's objectives. - Conducts regular reviews of the strategic plans, follows up and intervenes, as required, in order to ensure achievement of the company's objectives, while, in this framework, timely submits reports to AM containing accurate data and information. - Develops and implements short- and long-term objectives, business plans, as well as operational strategic business plans, placing emphasis on transport related needs. - Manages regulatory risks, as well as risks related to the safety and reputation of AM, concerning incidents and/or failures pertinent to the provision of services, important or critical services to the public. - Develops and guides, on a constant basis, the operation and maintenance team to respond correctly in case of failure. - Evaluates the alertness of the Contractor to handle severe incidents and emergencies and acts as the leader in crises or emergencies. - Ensures that the operation and maintenance team focuses on constant enhancement, that the information received from passenger surveys are assessed and that the requirements as to Key Performance Indices (KPIs) are either met or exceed the predetermined values. - Keeps and develops strong relationships with third party's and government agencies' executives, in order to ensure the necessary support in view of the effective operation of the Metro. - Represents the Contractor of Thessaloniki Metro during his meetings with cities' organizations and associations, stakeholders, economic operators and the public in order to improve the reputation of the company and to promote the spirit of	

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cooperation with various agencies.

- Is responsible for the optimum services that have to be provided to the public and for the promotion of the company's continuous improvement, to ensure best quality of the services provided.
- Leads the Company in such a way that employees understand and enrich the company's plans/programs, as appropriate, and are motivated to achieve their objectives.
- Ensures that contracts signed with third parties are structured, processed and completed in the best way.
- Supervises contract related budgets and documentation for construction, maintenance, and/or provision of services for transit facilities.
- Supervises and monitors the activities of budget preparation and control, labor relations, operations system support and technical training for all organizational elements within the Contractor's organization.
- Serves as the Contractor's principal representative before committees, the Ministry of Transport, local authorities, business communities, labor organizations, and the public.
- Promotes the positive image of Metro network in the city of Thessaloniki.

Qualifications

Knowledge/Skills:

- Detailed knowledge of the main operation and maintenance aspects of a driverless Metro System.
- Understanding of all safety and environmental aspects related to Metro/Railway operations.
- General knowledge of the relevant Greek and Community Legislation, the Public Procedures and of the generally acceptable principles and practices on public opinion managing.
- Understanding and ability to interpret and apply laws, rules, regulations, policies and procedures that govern the O&M Contractor activities and apply to the provision of services and the operation of the field of transportation.
- Ability to develop and implement objectives, policies, procedures, work standards and in-house inspections; ability to plan, organize and control the activities concerning the operation of a public transport organization in which may specialties are involved.
- Exceptional skills for leadership, communication, personnel management, organizational development and provision of incentives to the personnel.
- Strong language and efficiency when communicating with government agencies, board members, mass media/press, other contractor and personnel.
- Skills required for communication with labor unions.

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- Ability to present detailed documentation and to make decisions on complex issues.
- Ability to turn problems into opportunities and to make effective management under pressure.
- Ability to contribute effectively to business management strategy issues.
- Highly skilled influencer with excellent negotiation skills.
- Ability to manage a defined budget, ensuring cost effectiveness and the best quality / price ratio (value for money); ability to predict and prepare team budget plans and to manage the amounts spent against the respective objectives.
- Experienced, with the ability to interpret economic figures and to perform financial management of high standards in a complex organization.

Experience :

- 15 years of experience, as a minimum, in general management out of which 10 years of experience, as a minimum, in a public or private transport organization holding the position of a high-ranked executive in a modern railway organization or Metro organization in the fields of operation and maintenance, while a part of the aforesaid experience (50%) can involve the fields of design and construction of similar projects.
- Documented special experience in financial and commercial issues, in business development and HR acumen to support the continuous improvement of business performance (minimum 3 years).
- Experience in leading/managing complex business organizations for at least 3 years.
- Comprehensive knowledge of health and safety and contract requirements relating to railway operations (minimum 3 years).

Education:

- Holder of University degree in an engineering (Civil/ Mechanical/ Electrical/ Traffic Engineer) or related discipline.
- A post graduate degree in relevant discipline is preferable.

1.2 Public Relations and Customer Service Manager

JobTitle: Public Relations and Customer Service Manager	Department: Public Relations and Customer Service
Duties and Responsibilities	
• Leads the Contractor Organization, as regards the development of the relevant Public Relations and Customer Service programme and the organization of any event for all projects that have been commissioned or are to be initiated. • He/she is the central point of contact for the organization of any event. He/she organizes regular meetings with external stakeholders including venue and transport operators ensuring that the correct information is used and	

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communicated.

- Proactively manages and prepares a list of lessons learnt/conclusions derived from similar activities in other Metro projects, related to every-day operations, risks & actions and produces high level brief reports to ensure that all feedback is accurately captured and incorporated or rectified in future events.
- Produces Operational Plans for all events and special services and ensures that all parties are sufficiently engaged & briefed in order that they are fully prepared for the pertinent event.
- Leads and organizes planning meetings, testing sessions & workshops as well as post event reviews.
- Regularly engages with external stakeholders (e.g. agencies, emergency services and other third parties) to ensure that all plans/programs are agreed upon and are based on the latest information.
- Plans and elaborates on actions scheduled for event planning & delivery and follows up the overall progress of the specific actions, resolving issues emerged; identifies risks, evaluates cost & resource implications and initiates corrective action, as appropriate.
- Supports the Contractor's team in building the companies a vivid relationship among all parties involved, namely, Public Organizations, private companies, the relevant Safety Authorities (Police, Special Suppressive Antiterrorist Unit - EKAM) and the wider business community.
- Guides and advises the Managing Director on operational incidents and emergencies and their management, as regards the information to be provided to the public and the management of the subject incidents by the public
- In cooperation with the Health, Safety, Quality and Environment (HSQE) Manager and the Operations Manager, he/she assesses ongoing risks and undertakes inspections, as required.
- Defines and verifies train service timetable and customer service requirements in relation to special event planning.
- He/she is responsible for the production & distribution of operational plans to operators and third parties, detailing the plans, resources & contingency arrangements to be implemented by the O&M Contractor.
- Ensures that all Contractor's plans are sufficiently developed, tested, analysed, budgeted for and communicated prior to commencement.
- Holds an active key-role in communication with the Press and advises the Managing Director under their request.

Qualifications

Knowledge/Skills:

- Thorough understanding of all aspects of railway operations safety related issues.

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- Thorough knowledge of Metro Systems operation characteristics, especially as concerns passengers.
- Flexibility to cope with unexpected incidents and other changes to normal schedules.
- Ability to work under pressure.
- Excellent organization skills.
- Experience in communicating, motivating and developing staff.
- Highly motivated and flexibility to work in a time-sensitive environment to respond quickly and effectively to unanticipated high workloads, events and emergencies.
- Excellent analytical reasoning ability and capable of making decisions on complex matters.
- Advanced professional proficiency in English

Experience:

- 10 years of experience in managing stakeholders and public relations, holding a managerial position.
- Proven experience in Transportation Systems' environment (minimum 3 years).

Education:

- As a minimum, holder of an undergraduate degree; a post graduate degree in relevant discipline is counted as an additional asset.

1.3 Safety – Protection - Security Manager

Job Title: Safety – Protection - Security Manager	Department: Safety – Protection - Security
Duties and Responsibilities	
• Develops and implements the security strategy for Thessaloniki Metro. • Provides Thessaloniki Metro wide leadership and direction in all areas of security, loss control, security best practices, security programs, passengers' and personnel security, including strategic planning for security and its development on an as-needed basis. • Collaborates with Thessaloniki Metro administration and external groups and authorities (Police, Fire Brigades, EKAM, etc.) to effectively resolve security related issues and to provide protection against eventual incidents. • Establishes and implements short and long term organizational goals, objectives, strategic plans, policies, standards and operating procedures, monitors and evaluates effectiveness, and effects changes required for improvement that will ensure the highest level of security and assets and the lowest risk of loss and	

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liability to the Contractor and the supervising agency.

- Designs, establishes and maintains an organization structure and staffing to effectively accomplish the organization's goals and objectives, recruits, employs, trains, supervises, and evaluates staff.
- Develops, manages and monitors the Security Department budget and annual long range Facilities Improvement budget planning cycle.
- Monitors security conditions and conducts ongoing analysis of data received from both external and internal sources, and advises administration on appropriate risk mitigation strategies.
- Develops and implements a security training strategy for the Thessaloniki Metro and ensures that the appropriate steps are implemented to ensure security compliance.
- Oversees and provides direction for major security related projects and physical security technologies including, but not limited to, various card key access systems, alarm systems, video surveillance systems, security services, IT and data security systems and various other related systems.
- Sees to the introduction of the appropriate measures to ensure cyber-security as concerns both the Thessaloniki Metro operation and the overall scheme of the operation company/agency and their managerial activities.
- Oversees and directs security efforts across Thessaloniki Metro to identify security initiatives and standards.
- Interprets security laws, regulations, and contract requirements directs his/her subordinates in enforcing compliance and maintains relationships with law enforcement authorities, regulatory agencies, and other issuers of security requirement.
- Oversees security incident response planning and investigation of any breaches, assists with disciplinary and legal matters associated with such breaches.
- Supervises and manages security Subcontractors.

Qualifications

Knowledge/Skills:

- Strong working knowledge of essential security metrics and experience in providing tracking and reporting of those metrics to the Management.
- Strong working knowledge of information technology and security best practices in this area.
- Comprehensive business and technical knowledge and organizational skills to oversee highly complex projects with high visibility and high impact on the company/agency.
- Excellent written and verbal communication skills and organization skills.
- Ability to handle various security procedures and having decision making skills.

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- Having leadership skills.
- Having investigation and incident evaluation skills.

Experience

- Ten (10) years of relevant experience, as a minimum, in safety – protection - security, policy making and management fields, holding a managerial position.
- Previous experience in Transportation Systems environment (minimum 3 years).

Education:

- University Degree in the following disciplines: Engineering, Information Systems, Public Security, Computer Science, Police Science or related subjects.

1.4 Legal Department Manager

Title: Legal Department Manager	Department: Legal
Duties and Responsibilities	
• Supervises the Legal Department, ensuring the timely and effective coverage of legal needs. • Analyses the legal risks emerging from the Contractor's and the supervising agency's work. • Handles all legal matters and/or distributes same among the employees of the Legal Department. • Offers advice on managing the sub-contracts. • Reviews, organizes and works upon resolving legal cases of the company. • Provides legal advice to the Management. • Analyses the risks when signing new business deals. • Analyses legal information and does the essential paper work. • Handles litigation management with companies, passengers and personnel. • Reviews contracts and agreements and verifies their compliance with the legal norms. • Deals with state's and external law authorities and represents the Contractor in courts.	

Qualifications

Knowledge/Skills:

- Ability to address major emerging needs on a large-scaled company, including the creation of departmental priorities that align strategic direction of the legal department and the overall business objectives.
- Ability to identify and remedy complex legal issues without the need for external

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legal advice.

- As a minimum, advanced professional proficiency in English language.
- Exceptional communication skills required.
- Managerial abilities required.
- Ability to work under stressful situations and high workload.
- Experience in representing bogies/companies in the courts.

Experience

- Fifteen (15) years of experience, as a minimum, in a large-scaled company, preferably as a Senior Legal Counsel.
- Ability to demonstrate success-stories into leading negotiations on complex contracts and agreements of a cost of millions of EURO.
- Previous experience in Transportation Systems environment (minimum 3 years).

Education

- University degree in Law studies.
- Post-graduate degree in relevant field will be positively evaluated.

1.5 Health & Safety, Quality and Environmental Manager

Job Title: Health & Safety, Quality and Environmental Manager	Department: Department of Health & Safety, Quality and Environment
Duties and Responsibilities	
• Responsible for developing the Health, Safety, Quality and Environmental (HSQE) plan suitable for the Thessaloniki Metro. • Leads the organization' operating procedure, in line with the quality (ISO 9001) and environmental (ISO 14001) international systems to obtain accreditation of the quality and environmental systems and establish a positive culture to achieve continuous improvement in HSQE. • Manages and oversees the HSQE Department and coordinates human resources including hiring and management of qualified staff. • Oversees compliance with policies and Greek legislation on occupational health, safety, and environmental matters. • Leads the operating procedures of both the Contractor and the supervising agency, as regards compliance with the acknowledged Quality and Environmental systems. • Manages the auditing and inspecting of the maintenance activities and facilities to determine the compliance with the organization's HSQE policies and systems.	

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- Prepares HSQE reports about pertinent matters, improvements, new practices, new technologies, new Standards and constraints.
- Conducts incident investigation and reports and keeps the Hazard Log and Register.
- Identifies and assesses the system risks associated with passengers, employees, environment and maintenance activities and works with the Department Managers for identification of mitigation measures.
- Builds and maintains a strong culture of commitment to HSQE within the organization through training and organization development activities.
- Attends meetings with other department units, sub-contractors, clients and other third parties on HSQE issues.
- Provides support and assistance to higher management as required.
- Reports to the Managing Director and follows his/her directions / instructions.
- Manages the budget of the department according to corporate finance procedures.
- Sets safety policies, plans and procedures.
- Organises safety awareness campaigns and training courses.
- Acts as the safety leader in Thessaloniki Metro.

Qualifications

Knowledge/Skills:

- Expert knowledge in Health, Safety, Quality and Environment.
- Solid knowledge of Greek legislation related to Safety, Quality and Environment.
- Politically incisive in communicating effectively with third parties and media.
- Thorough understanding of all aspects of safety and environmental issues related to railway operations.
- Ability to multi-task and analyse situations promptly and without bias so as to determine the proper course of action or alternatives without jeopardising human safety, quality and the committed performance targets.
- Experience in obtaining quality and environment certification.

Experience

- Minimum 10 years of management experience in health, safety, quality and environmental management in a managerial position, out of which at least 3 years in the field of Transportation Industry.
- Experience in the management and implementation of international recognised Standards (minimum 3 years).

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Education:

- Engineer - holder of a University degree.
- Health and Safety Certification.
- Recognised professional qualifications in HSQE.

1.6 Chief of Technical Department

Job Title: Chief Technical Engineer	Department: Engineering
Duties and Responsibilities	
• Ensures that, due to their planning and the way they operate in practice, the reliable and safe operation of all Metro E/M and railway systems and facilities is assured. • Provides engineering fault management services, ensuring maximization of revenue system availability through proactive maintenance support management. • Provides system performance management information and leads continuous system performance improvement. • He/she is responsible for the Integration and Assurance of the reliable and safe operation of the Systems, in combination with the Civil Works and the Architectural Finishes, as required. • Ensures compliance with maintenance standards through a programme of product audits and in process checks. • Ensures that changes in the E/M and Railway systems, through procedure modifications and / or contractual amendments, are implemented through an effective change management processes. • He/she is responsible for the management and recording of the asset configuration, and changes. • He/she is responsible for the ongoing development of the Maintenance Management System, in cooperation with the Maintenance Department. • Recommends technical solutions for emerging technical or functional problems, in cooperation with the companies-suppliers and/or engineers involved. • Acts and executes his/her duties, in line with the directions / instructions of the Managing Director as agreed upon with him. • Perform and carry out duties as instructed/directed/agreed with.	

Qualifications

Knowledge / Skills:

- General understanding of all aspects of safety issues related to railway projects, and especially with E/M and Railway Systems, and their interface with operations and maintenance activities.

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Skills:

- Ability to think laterally, analyze technical matters and assess a range of information.
- Ability for effective communication with the Management, engineers, contractors and personnel.
- Highly motivated and flexible to work in a time-sensitive environment to respond quickly and effectively to unanticipated high workloads, events and emergencies.
- Ability to multi-task and analyze situations promptly and without bias so as to determine the proper course of action or alternatives without jeopardizing human safety, quality and the committed performance targets.
- Ability to deal with environmental issues/problems related to operating projects and to recommend relevant suggestions for their solution and management.

Experience

- 10 years of experience, as a minimum, in planning, preparing technical specifications, budgets, operation and maintenance procedures, programmes, as required, in the position of Manager or Chief.
- Experienced in holding a position involving the implementation of procedures in operation and maintenance critical systems (minimum 3 years).
- Experience in Transportation Systems environment (minimum 3 years).

Education:

- University Degree in the disciplines Electrical or Mechanical Engineering.
- Postgraduate degree holders in similar fields are highly desirable.

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2 ADMINISTRATION & FINANCE DEPARTMENT

2.1 Chief Administrative and Financial Officer

Job Title: Chief Administrative and Financial Officer	Department: Administration & Finance
Duties and Responsibilities	
• Responsible for delivering financial management services including financial planning, budgeting, accounting, control and reporting typically required in a railway system in operation. • Responsible for the overall management of Human Resources of the Contractor. • Manages and oversees the Administration and Finance Department. • Provides directions to subordinates for the resolution of complex issues, compliance issues and potential problems in financial and personnel related issues. • Ensures outputs are delivered based on appropriate standards and practices, within the planned schedules and budget. • Assists in defining, managing and controlling the financial resources of the Organization, as required, meeting the requirements in delivery of maintenance and operation services. • Manages and controls the allocated budget and manpower to deliver services under his/her responsibilities. • Supervises and gives directions as regards the electronic management in total of the financial and administrative activities in combination with the requested operation and maintenance of the Thessaloniki Metro system. • Makes justified proposals for contracting with external consultants for important and unique work related to his/her field of responsibility, for higher management approval. • Executes his/her duties in accordance with the instructions or directions of the Managing Director. • Makes justified proposals for the hiring of, extension of contract for, or end of contractor personnel of his/her Department, for higher management approval. • Manages the budget of the Department and of the Contractor in total and according to the corporate funding and financing management procedures. • Signs the annual balance sheets as required by the legislation.	

Qualifications

Knowledge / Skills:

- Extensive knowledge of financial and accounting management.
- Knowledge of basic aspects of the Labor law.
- Knowledge on how to manage Human Resources.

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- Ability to plan, organize, lead, manage and develop teams to implement activities within his/her scope and responsibilities.
- Ability to set directions, plans and systems for the Administration and Finance department.
- Ability to develop solid relationships and cooperation with the Contractor appropriate in-house executives or stakeholders and the supervising agency.
- Committed to continuous improvement in his/her work and in the evolution of the employees.
- Highly motivated and flexible to work in a time-sensitive environment.
- Ability to respond promptly and effectively to unanticipated high volume of works and work under pressure.
- Ability to multi-task and analyse situations promptly and without bias so as to determine the proper course of action or alternatives.
- Implements safety policies, rules and procedures within his/her own team.
- Encourages the personnel holding managerial positions to participate in safety related campaigns and activities.
- Knowledge of electronic management of companies and ability to handle the electronic management system of the Contractor and of the supervising agency.

Experience

- Fifteen (15) years -as a minimum- of experience in a managerial position, in finance or accounting experience, with ten (10) years of experience in financial management.
- Previous experience in Transportation Systems Environment (minimum 3 years).

Education:

- University degree in accounting, finance or any other business related discipline.
- Recognised/well-documented economics/ accounting/ finance qualifications.

2.2 Chief Financial Officer

Job Title: Chief Financial Officer	Department: Administration and Finance
Duties and Responsibilities	
• Provides accurate and timely financial information and reports to facilitate the decision making process and functions. • Provides monthly information and analysis for the Management. • Ensures adequate controls are in place, i.e. policies, procedures, to ensure safe and transparent financial management.	

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- Responsible for the annual budget process, provides monthly reviews, implements Business plans and provides monthly and quarterly reporting, as required by the Bank, ensuring covenants are met.
- Provides analysis of cash flow, operating costs and other programs.
- Establishes financial systems/applications, process, templates and work instructions concerning the Contractor's procedures.
- Performs financial planning, controlling and reporting activities.
- Produces annual budgets, accounts, and profit/loss reports.
- Produces financial management reports, such as patronage and revenue analysis, cost and expenditure analysis, investment appraisals and risk assessment.
- Manages invoicing and payment effectively and within the required deadlines.

Qualifications

Knowledge / Skills:

- Ability to coordinate the Company's annual audit.
- Excellent problem solving and analytical skills, sets and prioritizes goals and liaises with legal representation on corporate issues. Review of legal contracts as requested.
- Review of standard costs, including appropriate overhead allocations.
- Ensures adequate insurance coverage is in place, thereby minimizing risks for the Contractor.
- Establishes and maintains reliable and mutually beneficial relations with Banks.
- Strong leadership and supervisory skills.
- Excellent communication skills and ability to work in a team environment.
- In depth knowledge of financial, MRP/ERP and integrated accounting systems and electronic management of financial issues.
- Proficient in MS Office, with advanced Excel skills.

Experience:

- Ten (10) years related experience—as a minimum- in managerial position or Chief position in a company/organization with an annual turnover over 30 million euros, in the management of financials manufacturing accounting systems, standard cost accounting, budgeting and treasury functions.

Education:

- University Degree – Economics or Commerce.

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2.3 Chief of Administration and Human Resources

Job Title: Chief of Administration and Human Resources	Department: Administration & Finance
Duties and Responsibilities	
• Is responsible for all administrative procedures and Human Resources of the Contractor. • Plans and coordinates administrative procedures and systems and establishes ways to streamline processes. • Implements the personnel hiring procedures, takes all necessary measures for the training of personnel and specifies the responsibilities and office or maintenance spaces for the specific personnel. • Assesses staff performance and provides coaching and guidance to ensure maximum efficiency. • Manages schedules and deadlines as regards the required works in relation to the available personnel. • Monitors the cost for the personnel and its support, the relevant expenses and assists in the preparation of budgets of the Contractor. • Supervises in terms of labour the personnel responsible for the operation, maintenance and all activities of the Contractor. • Keeps abreast with all organizational changes and business developments. • Ensures HR resources are sourced, organised and utilised effectively and efficiently to enable HR and business objectives to be achieved according to plans. • Ensures that the HR team is appropriately developed to ensure success and is developing/improving based on objectives under evaluation. • Organizes and conducts the personnel evaluations of the Contractor. • Advises the management on personnel recruitment and selection strategies. • Negotiates the terms and conditions of employment with staff. • Provides advice and assistance to the personnel and the Management on labor issues and issues related to policies, procedures, legislation, and enterprise agreements. • Oversees the training processes. • Provides active support to the personnel in case of difficulties/accidents/illness etc.	

Qualifications
Knowledge/Skills: • In-depth understanding of personnel management procedures, the relevant policies, the respective legal aspects and the different labour conditions and

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characteristics of the work positions at the various Sections of the Contractor.

- Solid knowledge and experience of the Labor Law.
- Knowledge of the best practices on personnel recruitment and selection.
- Leading initiatives and approaches designed to build employee engagement.
- Familiarity with financial and facilities management principles.
- Proficient in MS Office and able to understand the personnel electronic management software.
- An analytical mind with problem-solving skills concerning the personnel.
- Ability to operate effectively in a complex and diverse environment.
- Ability to use an HR information system including, accessing, inputting and use of data, compiling the verbal communication skills to communicate with various groups, personnel evaluation etc. based on optimum use.
- Written communication skills to produce succinct correspondence and reports.
- Ability to write and present information.
- Excellent knowledge of the English language.
- Experience in providing advisory services and support to higher ranking executives in terms of personnel strategic management.

Experience:

- Ten (10) year-experience –as a minimum- in Human Resources in companies with over 200 staff.
- Proven managerial experience in administrative positions (minimum 3 years).
- Desirable or previous experience in Transportation Systems Environment.

Education:

- University Degree in Business Administration, Human Resources Management or other relative field of business studies.
- Post graduate qualification in the broader field of Business Administration preferred.
- Accreditation in or completion of recognised HR development programs.
- Law studies are highly regarded.

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2.4 Chief of Information Technology (IT)

Job Title: 1.Chief of Information Technology (IT)	Department: Information Technology
Duties and Responsibilities	
• Manages the Information Technology and Computers Department. • Plans, organizes, controls and evaluates the Information Technology and electronic data operations. • Designs, develops, implements and coordinates systems, policies and procedures with emphasis on the general electronic management system of the Contractor. • Ensures data safety, network access and back-up file creation systems, ensures cyber-security in the IT systems of the O&M Contractor in cooperation with the supervising agency. • Acts in line with the user needs and the system's functionality, so as to contribute to the organizational policy. • Manages the IT staff by recruiting, training and coaching employees, by communicating job position expectations and by evaluating the performance of employees. • Identifies problematic areas and implements strategic solutions in time. • Inspects systems and assesses their outcomes. • Keeps assets, information security systems and control structures. • Preserves data through the application of the appropriate back-up strategy. • Manages the IT Department annual budget and ensures optimum cost-benefit effectiveness. • Keeps the log and/or the list of required repairs and maintenance. • Makes recommendations on the purchase of hardware (computers, printers, servers, switches, etc.) and application software, as required. • Researches current and potential resources and services.	

Qualifications
Knowledge / Skills: • Excellent knowledge of technical management, information analysis and of computer hardware/software systems. • Expertise in data centre management and data management. • Hands-on experience in computer networks, network administration and network installation. • Personnel management skills. • Troubleshooting on technology, equipment and software issues. • Granting network access rights to all staff.

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- Installs work stations.
- Connects and sets up hardware.
- Loads all required software.
- Provides network users accounts and passwords as required.
- Monitors the security of all technical equipment/hardware.
- Eye for detail in the reporting of financial audits to the benefit of the company.
- In-depth knowledge on accounting, ideally holder of a professional certification.
- Ability to work productively within a team, even under stressful conditions.
- Accuracy and quality-driven.
- Expertise in the use of software programs, excellent knowledge of MS Office.
- Excellent communication skills and ability to develop good relations also with fellow auditors and senior auditors.
- Complies with the targets assigned in a timely and accurate manner.
- Excellent professional proficiency in English.

Experience:

- Proven 10-year experience in Information Technology, out of which 5 years of experience, as a minimum, in a position of IT Manager or Chief.
- Hands-on experience in addressing IT issues raised in the Company Departments (minimum 3 years).

Education:

- Holder of a University degree in IT/PC or in Mechanical/Electrical Engineering.

2.5 Chief of Contracts and Procurement

Job Title: Chief of Contracts and Procurement	Department: Contracts and Procurement
Duties and Responsibilities	
• Manages tender processes for outsourcing services related to the operation and maintenance of the Thessaloniki Metro or sections thereof. • Manages tender processes for the purchase of equipment, materials and software. • Evaluates contract risk and develops contract solutions, establishes long-term partnerships. • Trains the Contract Officer on corporate policy and procedures. • Applies lean methodology to streamline and improve the contract life cycle management (CLM) process. • Advises Leadership on contract risk and obligations. Provides interpretation of the	

TECHNICAL DESCRIPTION AND SPECIFICATIONS

terms and conditions of each contract.

- Tracks Key Performance Indicators (KPIs) as required.
- Drives the vision of customer satisfaction and the efficient operation of contract lifecycle management (CLM).
- Carries out other duties as instructed/directed by the Chief Financial Officer.
- Supervises and oversees all aspects of procurement activities for the Thessaloniki Metro.
- Supervises the Procurement team, ensuring that the team is performing to the required standards and in compliance with the standard procedures.
- Works with all members of the Thessaloniki Metro management team to identify and resolve eventual contractual problems with the contracting parties.
- Works with the managers to develop their commercial understanding and abilities, including hosting training workshops and educational co-operations.
- Ensures that all new starters receive a full departmental induction and all necessary training for them to become competent in their role within their probation period in conjunction with the Training Department.

Job Qualifications

Knowledge / Skills:

- Legislation on public contracts.
- Contract administration techniques.
- Procedures and requirements for developing professional, private and service contracts.
- Basic principles of third party liabilities insurance and safety regulations.
- Computer software, including word processing, database and spreadsheet programs, principles and practices of supervision/training/performance evaluation.
- Strong contract modeling software skills.
- Robust skills in MS Office software.
- Knowledge in ERP (Enterprise Resource Planning) and PC literacy skills are essential.
- Skilled in communicating with and in motivating staff, as well as in ensuring the staff's further development.
- Highly motivated and flexibility to work in a time-sensitive environment to respond quickly and effectively to unanticipated high workloads, events and emergencies.

Experience:

- At least 10 years of experience, out of 5 years of working experience, as a minimum, in the position of Manager or Chief, in activities related to major

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procurement contracts for technical or similar goods, including the management and administration of contracts.

- Experience in the preparation of procurement tender documentation, procedures, technical specifications, as required, for at least 3 years.
- Proven experience and ability to organize contract documentation and ability to negotiate with companies (e.g. subcontractors, contractors, suppliers, consultants etc.) – minimum 3 years.

Education:

- Holder of a University Degree or Technical Institution title in the field of engineering or business administration or logistics or in any other related field.

3 OPERATION DEPARTMENT

3.1 Operation Manager

Job Title: Operation Manager	Department: Operation Department
Duties and Responsibilities	
• Provides leadership, direction and supervision for the Operation and management over activities on the line, in stations, in trains, in the OCC and the ECC. • Prepares in cooperation with AM and communicates the Operation Procedures and Directives and ensures that they are followed by the personnel of the Operation Department. • Ensures the effective implementation of various operating plans and schedules for the line and the trains, including special events. • Assists in the planning, development, management and implementation of policies, ensures the enforcement of safety policies and programs, reviewing problem or potential areas in order to ascertain the need for changes, develops scheduling and control procedures for the Metro system operation. • Manages the effective implementation of contingency plans in the event of an emergency, and that properly trained personnel and appropriate equipment is available to respond on a timely basis in order to rectify a problem and resume normal operation, ensures the operation of the Metro system is maintained to the highest standards and in accordance with all applicable codes. • Prepares and presents oral and/or written reports/recommendations within areas of assigned responsibility as may be appropriate, as required. Prepares periodic reports to determine possible problems, trends or other items of concern to be brought to the Managing Director's attention. • Prepares annual or long-range forecasts of Operation activities for budgetary or other management purposes. Estimates staffing and material requirements, production efficiency and the need for equipment upgrading. • Evaluates, analyzes and monitors the performance of the system operations. Provides recommendations and assists in the development of corrective actions to be taken to increase efficiency and effectiveness. Provides effective consultation and guidance. Manages the personnel and renders performance appraisal	

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evaluations in accordance with the company's personnel manual and guidelines.

- Identifies the training needs of the entire personnel of the Operation Department and coordinates the implementation of effective training programs for all specialties of the Department.
- Assists the Maintenance Department in developing, planning and implementing programs for preventive maintenance, component overhaul, rehabilitation and replacement.
- Serves as representative of the Department, responsible for ensuring that all new installations related to the line, the trains and the Control Centre are state-of-the-art and respond to the needs of the railway system and the users.
- Establishes procedures ensuring that communications between operating, maintenance and support areas result in the most efficient and safe rail service.
- Ensures that operations, service and maintenance work is carried out in accordance with the safety scenarios of the Operation Department and the applicable rules and procedures.
- Manages the station and train teams in order to ensure the provision of passenger-oriented safe, reliable and high quality services.
- Plans, manages and oversees the resources of the Operation Department in order to ensure the provision of passenger-oriented safe, reliable and high quality services in stations and trains.
- Ensures that the entire personnel of the Operation Department has been adequately trained for the position he/she occupies, providing additional training and support when necessary.
- Monitors the services provided and manages the various operations in stations and trains in view of achieving the performance targets that have been set.
- Informs the Managing Director about problems concerning the Operation Company – Contractor of Thessaloniki Metro system in due time and in due diligence.
- Approves and implements actions resulting from incident / emergency or safety investigations.
- Communicates and submits detailed incident reports to the highest ranked executives and the personnel of the Public Relations.
- Contributes to the development and maintenance of standard operating procedures and work orders with the broader management team.
- Approves the operation related issues of the Rule Book.
- Assists in the development of safe work methods and related activities.
- Follows safe work methods personally, wears the necessary protective equipment as required, taking -at the same time- all necessary actions to ensure the safety of others.

Qualifications

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Knowledge/Skills:

- Thorough understanding of the operations of the stations and trains, the management of the station personnel, the train attendants, the OCC, the preparation of programs, the train operations and the general operation of the Depot.
- Proactive and responsible approach for work related issues with initiative and problem solving capability.
- Ability to liaise with the personnel of all levels of the organization, showing the necessary professionalism and providing incentives.
- Good communication skills and ability to manage multiple tasks efficiently and work productively in a fast-paced, team-oriented environment.
- Strong organizational skills, detail oriented and ability to handle multiple priorities.
- Excellent leadership skills and motivational skills. Ability to achieve goals and objectives through the assignment of duties to others and ability to communicate effectively with other disciplines, proven people management skills are paramount.
- Good language and numerical skills and excellent knowledge of the English language.

Experience

- Ten (10) years as a minimum of leading a team of Station and/or Train Operation in providing transport services.

Education:

- University Graduate – Electrical or Mechanical Engineer.

3.2 Chief of Stations Operation

Job Title: Chief of Stations Operation	Department: Operation Department
Duties and Responsibilities	
• Manages and oversees the Station Masters' team to deliver passenger-oriented safe, reliable and high quality services. • Plans, manages and leads the workgroups of each station in order to ensure a passenger-oriented safe and reliable high quality station environment. • Ensures that the Station Masters are adequately trained in their field of activities, providing additional training and support when necessary. • Monitors the services provided and manages the Station Masters in view of achieving the pursued performance targets. • Informs the Operation Manager about problems concerning the services provided by the station in due time and in due diligence. • Approves, implements and introduces improvement measures resulting from investigations and/or practical experience.	

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- Communicates and informs the Management and the personnel of the Public Relations about various incidents, providing detailed information.
- Contributes to the development and maintenance of standard operating procedures and work orders with the broader management team and the Operation Manager.
- Performs and carries out other duties in accordance with the instructions/directives of the Operation Manager.
- Develops, implements and enforces safe work methods for the stations' operations and related activities.
- Implements safe work methods personally, wears the necessary protective equipment as required, taking -at the same time- all necessary actions to ensure the safety of others.
- Be able to organize immediately the response to emergencies at stations, with the immediate assistance of the Police, the Fire Brigade etc.
- Manages the cleaning services Sub-Contractors (if any).

Qualifications

Knowledge/Skills:

- Thorough understanding of the station operations and of associated activities.
- Proactive and responsible approach to work with initiative and problem solving capability.
- Ability to liaise in a professional and persuasive manner with personnel at all levels in the organization.
- Good communication skills and ability to manage multiple tasks efficiently and work productively in a fast-paced, team-oriented environment.
- Good language and numerical skills.
- Ability to understand complex systems and good PC skills.
- Strong organizational skills, attention to details, ability to handle multiple priorities.
- Very good knowledge of the English language for professional purposes.

Experience

- Five (5) years-as a minimum- of proven management experience in the supervision of personnel groups whose scope is the provision of services to passengers in Metro or Railway stations or other Transportation Systems, holding the position of Manager or Chief.

Education:

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- University Graduate or Technological Institute Graduate – Electrical or Mechanical or Civil Engineer.

3.3 Chief of OCC Operation

Job Title: Chief of OCC Operation	Department: Operation Department
Duties and Responsibilities	
• Supervises and manages all aspects of activities of the Operations Control Centre (OCC) and of the Emergency Control Room (ECR). • Monitors the services provided and manages the personnel and resources of the OCC. • Advises the Operation Manager about problems concerning the provision of services in due time and in due diligence. • Decides the switching of operation from the OCC to the ECR and vice versa, if required for any reason whatsoever (failure, fire, earthquake, act of terrorism etc.). • Coordinates and oversees all aspects of the OCC activities with the Maintenance Department as regards the subcontracting works on the main line about issues related to track, stations, tunnels and the Depot. • Recommends, approves and implements the required actions to deal with emergencies or safety incidents and investigations concerning operation related issues. • Communicates and informs the Public Relations management and personnel about various incidents, providing detailed information. • Develops operating procedures and work orders with the OCC personnel, other Managers of the Organization and the Operations Manager. • Ensures that all OCC operators are adequately trained, assessed and certified in their sector, providing additional training and support as necessary. • Conducts daily and weekly reviews as regards the effectiveness of the provided services and prepares reports and provides data for the Operation Manager on related information. • Carries out other duties as instructed / directed by the Operation Manager. • Provides information about safe work methods as regards the operations and relevant activities at the OCC. • Participates as required in conferences about safety for high-ranked executives, informing accordingly the personnel of the OCC on safety issues. • Implements the Organization's safety rules and procedures to promote, create and maintain a safe and healthy work environment.	
Qualifications	
Knowledge/Skills: • Thorough understanding of the supervision and control/surveillance in matters of normal operation of stations and trains, train regulation, manual route settings,	

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remote supervision and control of Electromechanical and railway systems.

- Dealing with emergencies on the line or in stations, evacuation in case of emergency and relevant actions in the OCC environment, including communication and cooperation with the Police, the Special Suppressive Antiterrorist Unit (Greek: EKAM), the Fire Brigade, the Disaster Management Special Unit (Greek: EMAK), the National First Aid Centre (Greek: EKAB) and other agencies related to health and safety.
- Knowledge of critical safety related operations.
- Good language and analytical skills and good knowledge of the English language.
- Ability to understand complex systems and good PC skills.
- Good communication skills and ability to manage multiple tasks efficiently and work productively in a fast-paced, team-oriented environment.
- Strong organizational skills, detail oriented, and ability to handle multiple priorities.

Experience

- Minimum experience of 15 years, out of which five (5) years of experience as traffic controller or traffic planner in traffic controls in a fixed track system or in an urban network, holding the position of Manager or Chief.
- Both control room and management experience, minimum 3 years, is required with regard to central control systems (traffic regulation and/or SCADA).

Education:

- University Graduate or Technological Institute Graduate – Electrical or Mechanical Engineer.

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4 MAINTENANCE DEPARTMENT

4.1 Maintenance Manager

Job Title: Maintenance Manager	Department: Maintenance Department
Duties and Responsibilities	
• Develops strategy and exercises effective leadership in the planning, development, and management of the Thessaloniki Metro Maintenance Department. The position includes achievement of contractual and in-house safety related goals, maintenance activities, service reliability, cleaning standards, supervision of maintenance contractors, environmental management, human resources management, financial targets, legal and stakeholder management. • Provides leadership, direction and management of maintenance activities in the following areas: infrastructures including Civil Works and architectural finishes, trackwork-tracks, Electromechanical and railway systems, Rolling Stock and Depot equipment. • Prepares in cooperation with AM and communicates maintenance regulations. Assists in the planning, development, management and implementation of maintenance policies. Ensures the enforcement of maintenance safety policies and programs. Examines problematic sectors or sectors that could entail problems to ascertain the need for changes. Develops scheduling and control procedures for tracks, structures and for the maintenance of rolling stock and systems. Coordinates the maintenance works in and out of office. • Manages the mobilization, technical training and deployment of the maintenance team prior to and during the Project's revenue service. • Leads and participates in the updating of operation and maintenance procedures and instructions due to changes made in the system's maintenance. • Provides strategic direction, planning, and managing the development and implementation of policies and procedures for minimizing the maintenance cost, maximizing the life cycle of systems and rolling stock, maximizing the availability of facilities and systems, the safety of systems, maximizing reliability and providing adequate protection for employees, facilities, equipment and spare parts. • Provides direction to lower-ranked executives on engineering activities and maintenance works in the fields of their responsibilities. • Manages the Maintenance Department to ensure outputs delivered are to an appropriate standard on time and within the allocated budget. • Develops the appropriate approach regarding safety during the operation of systems and during their maintenance. • Provides input into the development of health and safety policies, management of systems, procedures and instructions to ensure a safe and comfortable environment for Thessaloniki Metro passengers, employees and subcontractors. • Ensures that the maintenance staff has been trained, examined and certified competent to perform tasks that have an impact on safety and the environment. • Performs other duties as instructed / directed by the Operation Manager.	

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Qualifications

Knowledge/Skills:

- Knowledge of the methods, equipment and techniques used in the design, development, maintenance and operation of rail systems.
- Thorough understanding of all aspects of safety issues related to railway systems maintenance services.
- Solid knowledge of the RAMS system (Reliability, Availability, Maintainability and Safety) and of the RAMS demonstration related activities.
- Sufficient knowledge of the operation principles and of the relevant procedures for the maintenance of the rolling stock and the railway systems, such as traction, signaling, telecommunications, power supply distribution systems, Platform Screen Doors (PSD), trackwork and turnouts, control systems, E/M and building complexes, as well as rolling stock.
- Proven skills as regards communication, motivation and evolution of the personnel.
- Politically incisive in communicating effectively with government agencies, members of the Board of Directors, passengers, Contractors and personnel.
- Highly motivated and flexibility to work in a time-sensitive environment to respond quickly and effectively to unanticipated high workloads, events and emergencies.
- Ability to make well considered decisions based on complex information, including the cost (on a short-term and long-term basis).
- Ability to execute multiple tasks at the same time and ability to analyze situations promptly and impartially to determine the proper course of actions or alternatives without jeopardizing human safety, quality and the specified performance targets.

Experience

- Fifteen (15) years of experience, ten (10) out of which –as a minimum- in managerial positions as concerns the management of maintenance works in railway projects or in Metro projects.

Education:

- University Graduate – Electrical or Mechanical Engineer

4.2 Chief of Railway Systems Maintenance (SGN, TEL, AFC, PS)

Job Title: Chief of Railway Systems Maintenance (SGN, TEL, AFC, PS)	Department: Maintenance Department
Duties and Responsibilities	
• Leads the maintenance teams to provide comprehensive maintenance services covering: • Train Traction, Medium Voltage – 20 KV, Traction and Power Distribution Substations, Signaling (Systems: Automatic Train Control (ATC), Automatic Train Supervision (ATS), Automatic Train Protection (ATP), Automatic Train Operation	

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(ATO), Passenger Information System (PIS), Telecommunications (PABX, DLT, TETRA), Data Transmission System (DTS), Closed TV Circuit (CCTV), Public Announcement System (PA), Clocks and Time Distribution System, Information Technology (IT) Infrastructure System, Safety and Protection Systems (SMS, ACC, DTS), Intercommunication System, Automatic Fare Collection System (AFC), Uninterrupted Power Supply Systems (UPS) – Batteries, Power Remote Control System (PRCS), Cable and Fiber Optic Networks and in any other sub-system required.

- Provides instructions to the personnel for the preventive and corrective maintenance, so that the aforementioned systems can operate with a high degree of integrity and in a safe and reliable manner for the Thessaloniki Metro.
- Supervises and oversees the existing engineers in the execution of maintenance activities and of their routine duties in the corresponding sections.
- Investigates failures to all the aforementioned systems and organizes their repair.
- Follows the relevant procedures and work orders to ensure compliance with the relevant requirements.
- Ensures the required training, support and guidance to the personnel on matters of maintenance of all the aforementioned systems.
- Assists the Maintenance Manager in providing strategic directions, in planning, and managing the development and implementation of policy and procedures for minimizing the life cycle maintenance cost, maximizing the availability of facilities and systems, providing for system safety, maximizing reliability and providing adequate protection for employees, facilities, equipment and spare parts.
- Conducts frequent visits to repair areas to ensure work progress and prepare the relevant reports for the management and the Directors of the Contractor,
- Gives guidance to system technicians to maintain accurate maintenance records of all systems, the equipment performance, the works that have been accomplished and other information using a computerized maintenance management system.
- Provides technical support to other staff for the implementation of complex systems or new projects.
- Manages ordering of maintenance tools and spare parts, as well as the relevant repairs.
- Investigates false system alarms, improperly displayed signals and activation failures.
- Carries out 24-hour on-call responsibility for incidents and emergency within his/her field of responsibilities.
- Performs shift and emergency duties, when required.
- Prepares Incident Investigation Reports, as requested by the Health, Safety, Quality and Environment (HSQE) Service.
- Carries out duties as instructed/directed by the Maintenance Manager.

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Qualifications

Knowledge/Skills:

- Extensive knowledge of each one of the aforementioned systems.
- Thorough understanding of all aspects of safety issues related to railway operations.
- Knowledge of the RAMS system and of the RAMS demonstration related activities.
- Skilled manager in communicating, motivating and developing staff.
- Highly motivated and flexibility to work in a time-sensitive environment to respond quickly and effectively to unanticipated high workloads, events and emergencies.
- Ability to multi-task and analyze situations promptly and impartially, so as to determine the proper course of action or alternatives without jeopardizing human safety, quality and the committed performance targets.
- Solid knowledge of Transit Systems operations.
- Thorough understanding of the use, calibration and care of various electronic test equipment and ability to interpret instructions in a variety of written, verbal, pictorial forms in order to carry out the maintenance activities as required.
- Thorough understanding of all safety issues related to railway operations.
- Knowledge of the Standards concerning systems, their operation, the relevant procedures as well as the relevant Quality & Safety Standards.
- Good verbal and written communication skills in both Greek and English.
- Ability to compile technical reports, routine business correspondence, prepare documents and drawings as required.
- Possesses good communication skills and ability to manage multiple tasks efficiently and work productively in a fast-paced, team-oriented environment.
- Strong organizational skills, detail oriented, and ability to handle multiple priorities.
- Ability to multi-task thinking and analyze situations promptly.

Experience

- Ten (10) years of experience –as a minimum- out of which five (5) years of relevant work experience in the maintenance of railway systems, holding the position of Manager or Chief.
- Supervisory and management experience as regards the maintenance personnel with the ability to manage different maintenance sections for at least three (3) years.
- Experience in maintenance planning and organization, in equipment life cycle cost and in preparing maintenance budget and maintenance plans for at least 3 years.

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Education:

- University Graduate – Electrical Engineer.

4.3 Chief of Rolling Stock & Depot Equipment Maintenance

Job Title: Chief of Rolling Stock & Depot Equipment Maintenance	Department: Maintenance Department

Duties and Responsibilities

- Plans, manages, allocates resources and provides effective services for the maintenance and technical support of Rolling Stock, Rolling Stock maintenance and repair equipment and the overall management of the Depot.
- Ensures well-organized management/ recording of faults/failures and related problems, as well as rapid response services to support rolling stock operation.
- Supervises the engineers and the technical staff carrying out maintenance works at the relevant sections.
- Adheres to the relevant procedures and work instructions, so as to ensure compliance to the requirements.
- Manages the supply of spare parts and special tools, as required.
- Provides training, support and guidance on maintenance services, on rapid response services for rolling stock availability on the track and on rolling stock maintenance to the Maintenance Department and the Contractor in general.
- Assists the Chief of Maintenance in revising the applicable Work Instructions and the Standard Operating Maintenance Procedures further to maintenance procedures changes.
- Assists the Chief of Maintenance in providing strategic guidance, in planning and managing the development and implementation of the policy and procedures for minimizing the life cycle maintenance costs, maximizing availability of facilities and systems, ensuring system safety, maximizing reliability and providing adequate protection for employees, facilities, equipment, and parts in terms of rolling stock and depot equipment.
- Assumes 24-hour responsibility for incidents and emergencies within its section.
- Ensures that the safety procedures are fully observed and implemented during all maintenance activities on rolling stock and the first-line maintenance activities implemented by the Contractor or by the subcontractors involved (if any).
- Conducts regular administrative review on the management of health, safety, quality and environmental-related issues to assess performance adequacy and to recommend any modifications to the procedures.
- Adheres to the procedures for safe work execution, as required, and sees to the safety of the maintenance personnel responsible for rolling stock and depot equipment.
- Is well-aware of the Standards related to rolling stock and its systems.
- Is well-aware of the Quality and Safety Standards related to rolling stock and

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maintenance works, which will be applied and established in line with the company's policy and safety regulations.

- Carries out duties, as these are dictated by the Maintenance Manager.

Qualifications

Knowledge/Skills:

- Rolling stock and rolling stock subsystems maintenance.
- Depot equipment maintenance.
- Thorough understanding of all safety aspects related to railway and rolling stock operations and maintenance.
- Skilled in communicating with and in motivating staff, as well as in ensuring the staff's further development.
- Decisive and efficient in communicating with subcontractors and the personnel.
- Highly motivated and demonstrating flexibility to work in a time-sensitive environment, in order to be able to respond quickly and effectively to unanticipated high workloads, events and emergencies.
- Drafts technical reports, standard business correspondence, documents and drawings, as required.
- Good verbal and written communication skills in both English and Greek.
- Good communication skills and ability to efficiently manage multiple tasks and work productively in a fast-paced, team-oriented environment.
- Strong organizational skills, detail-oriented, capable of handling multiple priorities.
- Lateral thinking, ability to analyze and assess a wide range of information.

Experience:

- Ten (10) years of experience, as a minimum, out of which 5 years of experience in the position of Manager or Chief with supervisory and managerial duties as regards rolling stock and Depots.
- Experience in maintenance planning as well as in preparing maintenance budget, maintenance plans and procedures and technical specifications for at least 3 years.

Education:

- Holder of a university degree - Electrical or Mechanical Engineer.

4.4 Chief of E/M Installations Maintenance

Job Title: Chief of E/M Installations Maintenance	Department: Maintenance Department
Duties and Responsibilities	
	• Supervises the execution of preventive and corrective maintenance activities in all levels and the execution of minor modifications on E/M systems in buildings covering tunnel ventilation and HVAC, lifts and escalators, platform screen doors,

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fire detection/fire-fighting, lighting/sockets (after the Low Voltage General Switchboard in LAS), drainage, sewage and pumping stations, Building Automation and Control and the corresponding Depot building systems.

- Provides instructions to the personnel for preventive and corrective maintenance with a view to ensuring operation of the aforementioned systems in high integrity level, as well as their safety and reliability in the framework of the Thessaloniki Metro.
- Supervises and oversees the subordinate engineers and technicians during the execution of maintenance-related activities and their routine duties within the respective sections.
- Investigates failures in all the aforementioned systems and organizes their reinstatement.
- Observes the relevant procedures and work instructions, so as to ensure compliance with the requirements.
- Ensures the required training, support and guidance of the personnel in maintenance-related issues on all the aforementioned systems.
- Ensures that the tools and maintenance equipment are in good condition.
- Supervises and diagnoses the cause of any electrical or mechanical malfunction or failure of the operating equipment, replaces defective equipment and delivers/returns it to the electromechanical equipment repair workshop for repair.
- Supervises the execution of operation tests, failure detection tests, assembly / disassembly tests, as required, while he repairs and replaces defective parts in the respective equipment.
- Assists his subordinates and familiarizes them with their scope of work.
- Prepares and keeps detailed data concerning the maintenance of building services and E/M installations, equipment performance, completed works and other information using a computer-aided maintenance management system.
- Assumes 24-hour responsibility for incidents and emergencies within its section.
- Performs shifts and emergency duties when required.
- Carries out duties as instructed/ directed by the Maintenance Manager.

Skills

Knowledge/Skills:

- Working knowledge in inspecting, maintaining and repairing motors, fans, pumps, air conditioning units, drive belts, coils, gearboxes, lighting fixtures, dampers, valves, impellers, air handling units, chilled water system, fire pumps, diesel engines, etc.
- Knowledge of RAMS and RAMS demonstration activities.
- Thorough understanding of the use, calibration and maintenance of various types of electronic test equipment and ability to interpret instruction given in a variety forms (written, verbal, pictorial), for being able to proceed with the maintenance

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activities, as required.

- Ability to compile technical reports, standard business correspondence, prepare documents and drawings, as required.
- Good verbal and written communication skills in both Greek and English.
- Good communication skills and the ability to efficiently manage multiple tasks and work productively in a fast-paced, team-oriented environment.
- Strong organizational skills, detail-oriented, and capable of handling multiple priorities.
- Lateral thinking and the ability to analyze and assess a range of information.

Experience:

- Ten (10) years of experience – as a minimum- out of which 5 years of experience in the position of Manager or Chief in the field of maintenance and repair of the E/Mequipment.
- Experience in supervising maintenance groups of E/M and building installations in railway or Metro systems for at least three years.

Training:

- Holder of a university degree or Electrical or Mechanical Engineer.

4.5 Chief of Infrastructures & Trackwork Maintenance

Job Title: Chief of Infrastructures & Trackwork Maintenance	Department: Maintenance Department
Duties and Responsibilities	
• Plans, manages and allocates resources to every maintenance-related activity in the fields of Civil Works and Trackwork, including: Main line and Depot trackwork, drainage system and wayside pedestrian walkways, building infrastructures, including stations, shafts, Depot, auxiliary building structures, substations, backfilling, walls, signage & ground surfaces, bridges, architectural finishes and structures at the stations' street level (sheds, skylights, etc.). • Investigates failures in civil works, which also include architectural finishes, organizes reinstatement procedures, implements reinstatement thereof and resolves problems. Special emphasis is given in waterproofing problems and reinstatement thereof. • Observes the relevant procedures and work instructions, so as to ensure compliance with the requirements. • Ensures the required training, support and guidance of the personnel in maintenance-related issues on all the aforementioned Civil Works and Trackwork. • Supervises and oversees the activities and the subordinate engineers and technicians during the execution of the maintenance works and their routine duties.	

TECHNICAL DESCRIPTION AND SPECIFICATIONS

- Assists the Maintenance Manager in updating the relevant operation and maintenance procedures and instructions further to modifications in the layout of the system, the equipment's maintenance policy, the health, safety, quality and environment policy and the client's requirements.
- Assists the Maintenance Manager in providing strategic guidelines, in planning and managing the development and implementation of a policy and procedures for minimizing the cost of the maintenance life cycle, maximizing the availability of facilities and systems, ensuring the system's safety, maximizing reliability providing adequate protection for employees, facilities, equipment and spare parts.
- Assists the Maintenance Manager in addressing environmental issues related to Civil Works and Trackwork, building structures and landscaping.
- Manages the maintenance sections falling under the Civil Works and Trackwork disciplines, so as to ensure that the data provided are compliant with the adequate standards, are delivered on time and fall within the maintenance budget foreseen for the maintenance of the corresponding sections.
- Executes his duties in line with the instructions/ directions of the Maintenance Manager.

Skills

Knowledge/Skills:

- Maintenance of Civil Works, Architectural Finishes and Trackwork, ability to address relevant problems and failures.
- Preventive and corrective maintenance for maintenance works by taking initiatives and by evaluating the available equipment.
- Ability to address environmental issues in relation to Civil Works and Trackwork, building structures and landscaping.

Experience

- At least 10 years of experience, out of which 5 years of working experience as a Manager or Chief in the maintenance of Civil Works & Trackwork in railway or Metro projects.
- Maintenance planning, preparation of the maintenance budget, maintenance plans and procedures and technical specifications, for at least three (3) years.

Training:

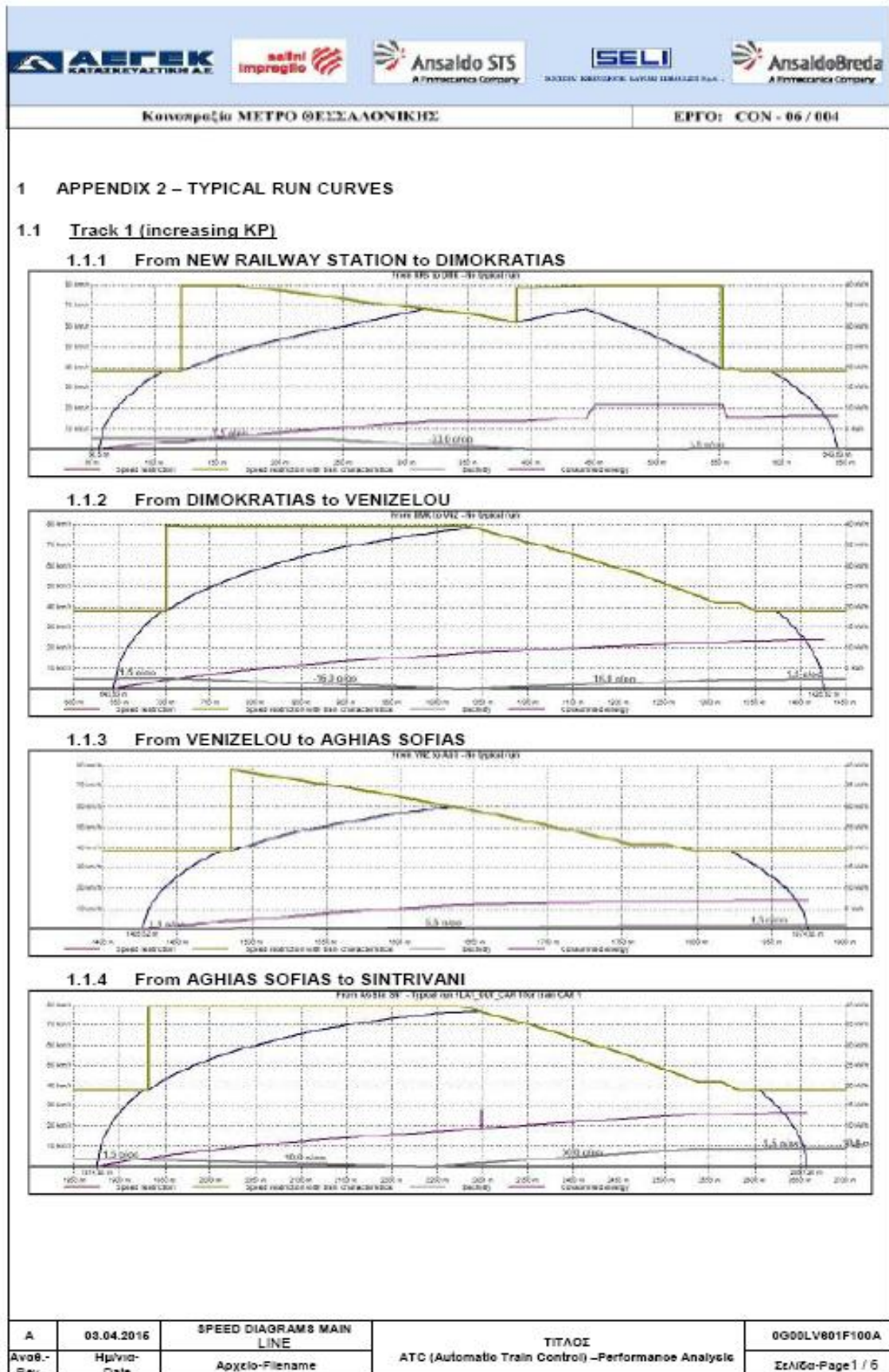
- Holder of a university degree - Civil Engineer.

TECHNICAL DESCRIPTION AND SPECIFICATIONS

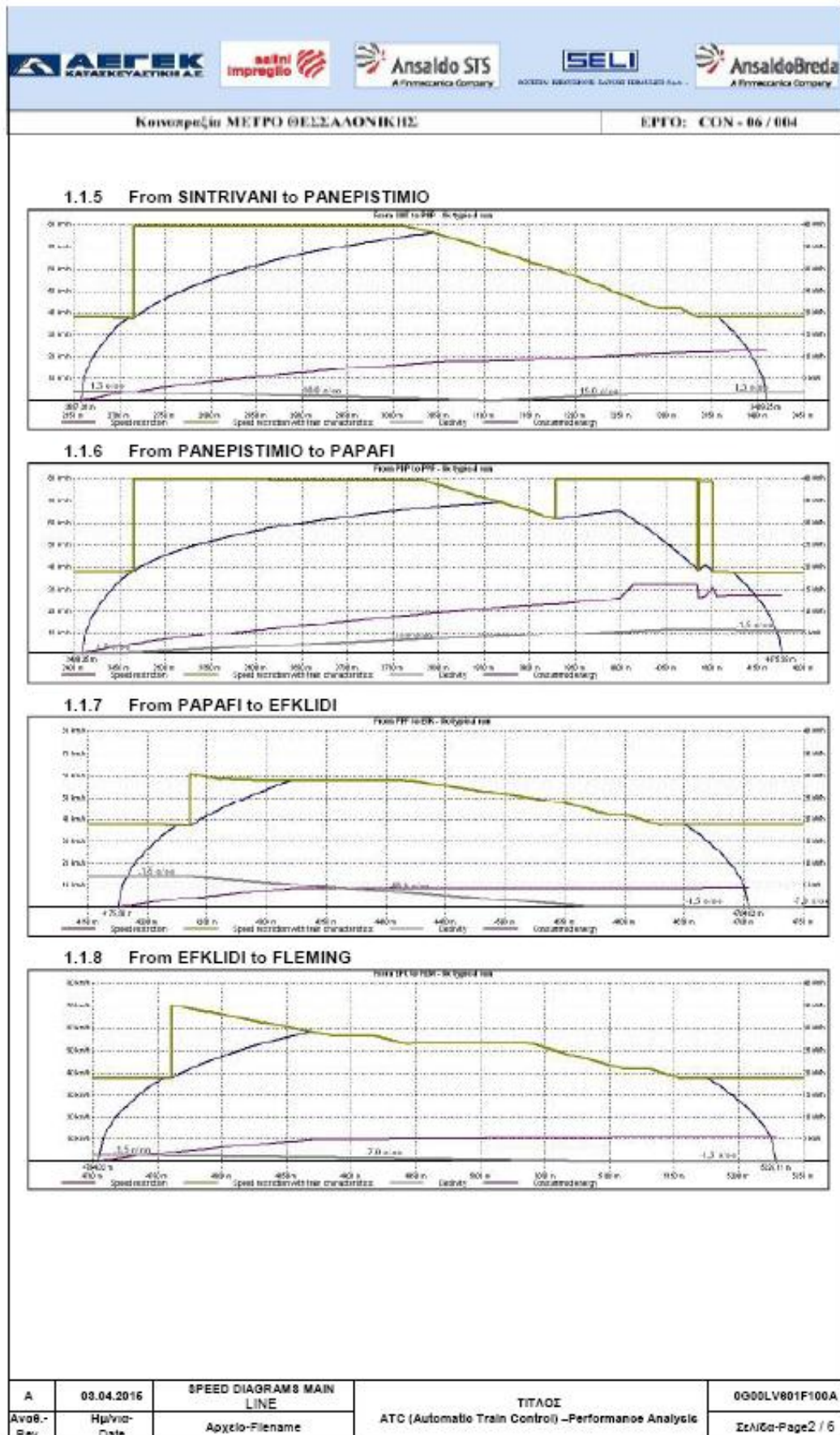
Annex E

Speed Diagrams – K.P.

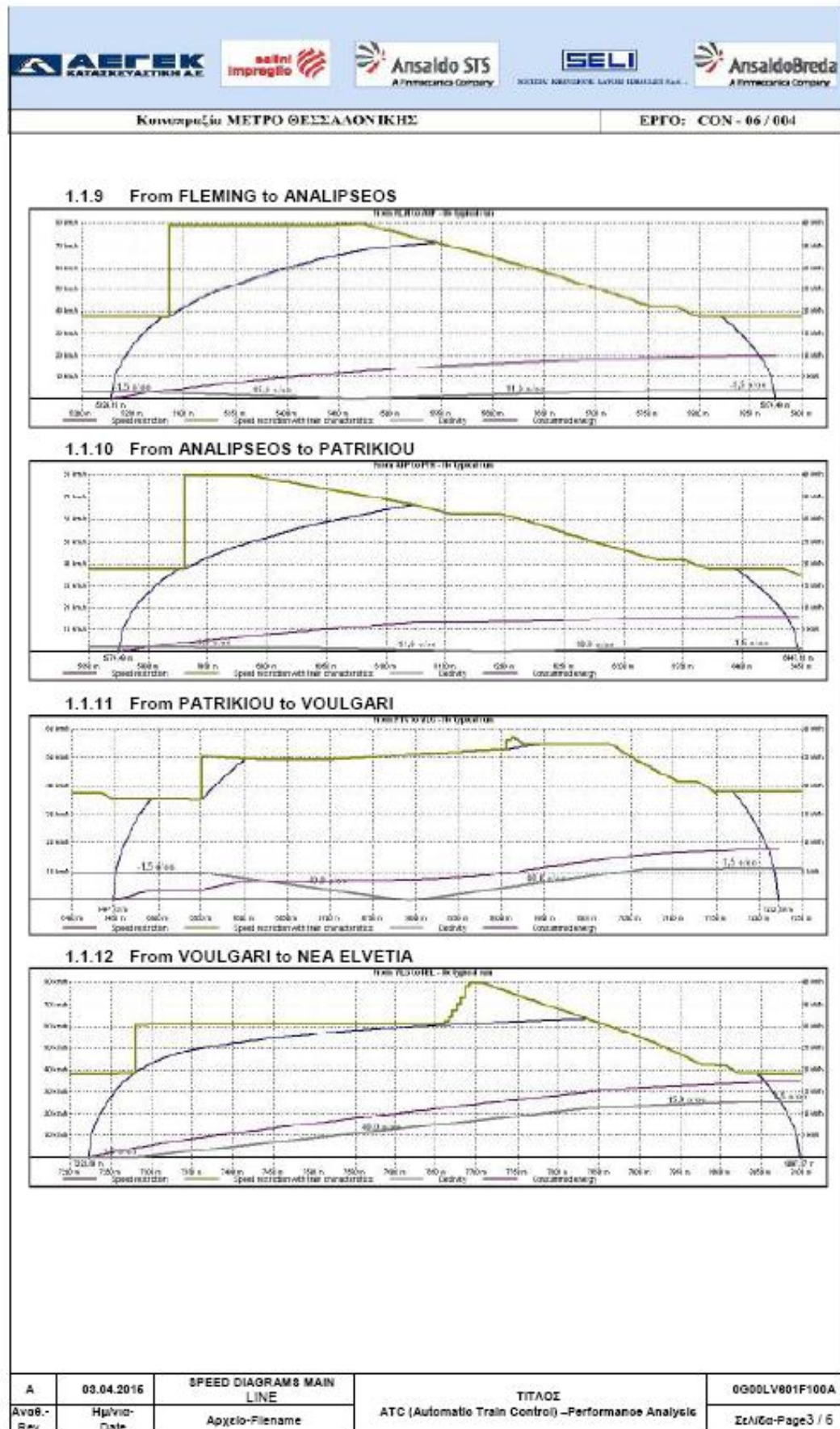
TECHNICAL DESCRIPTION AND SPECIFICATIONS



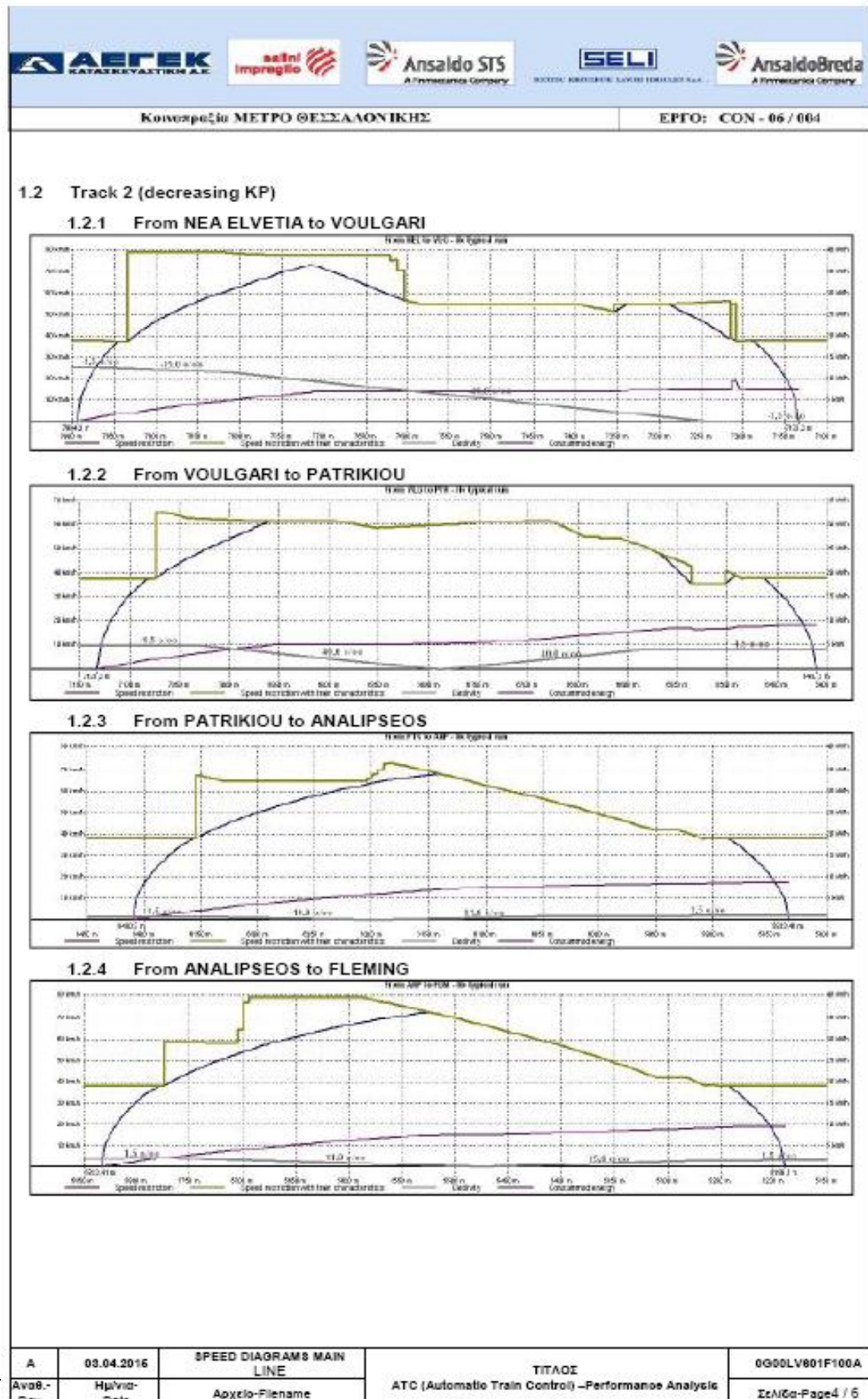
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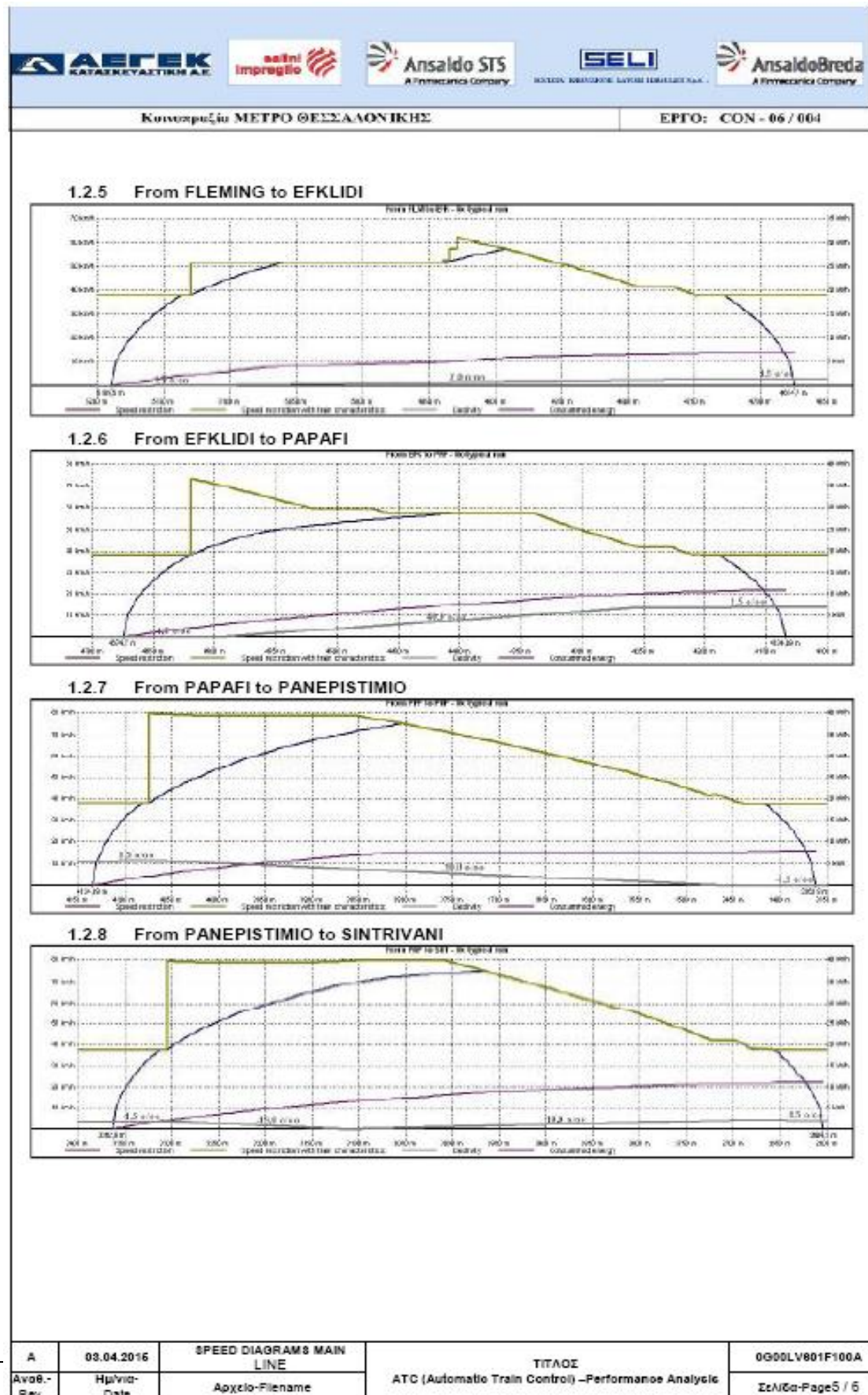
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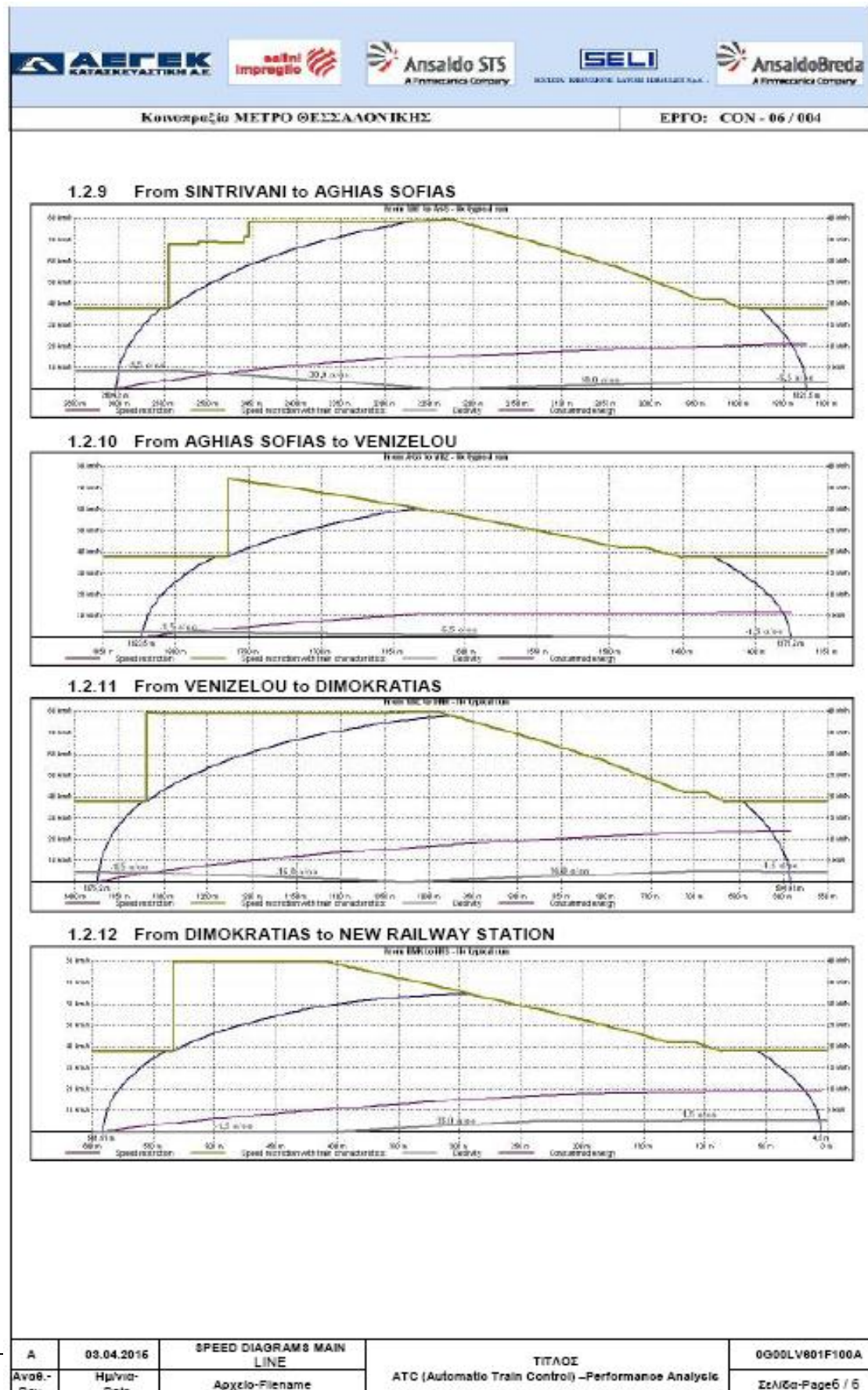
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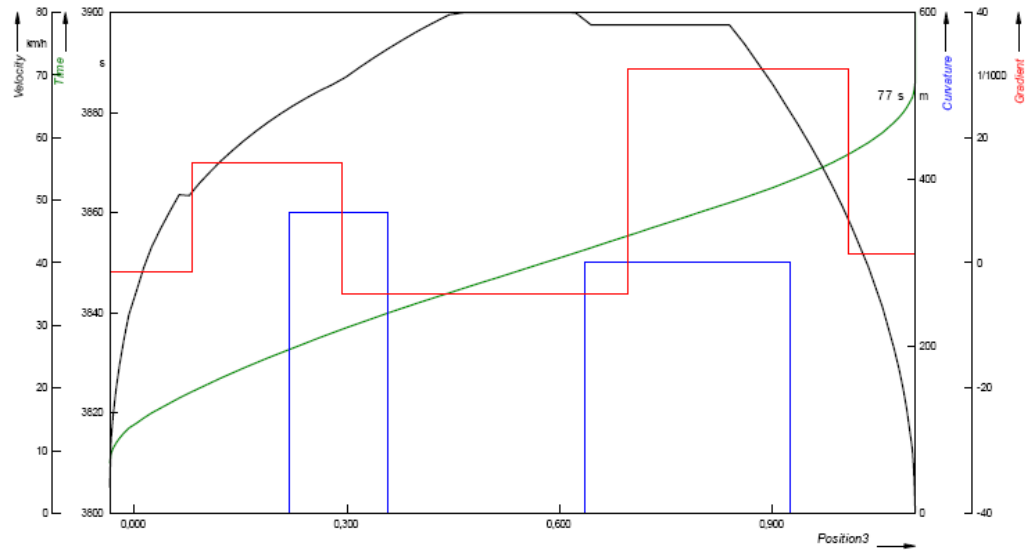


TECHNICAL DESCRIPTION AND SPECIFICATIONS



TECHNICAL DESCRIPTION AND SPECIFICATIONS

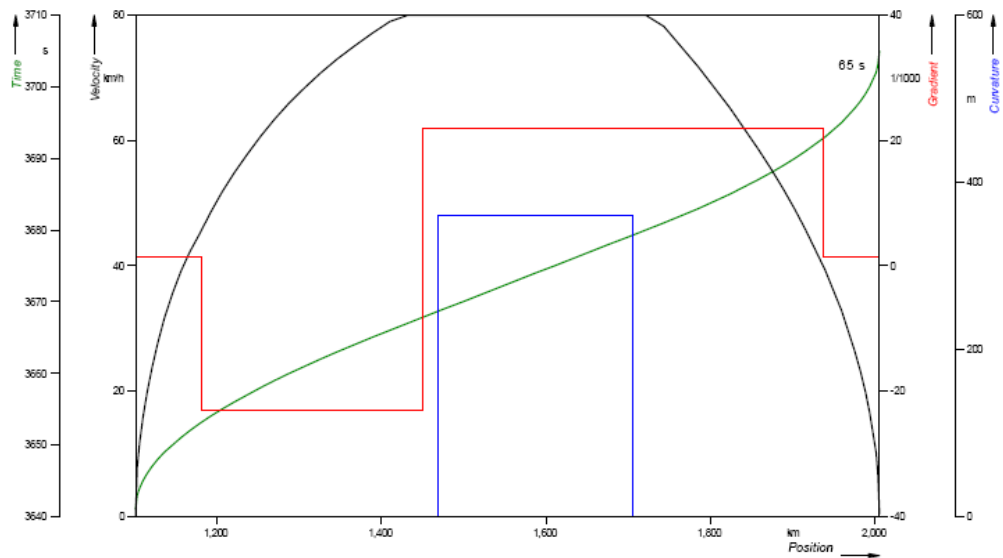
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ATTIKO METRO AE – Project CON-002/13	IC SG RE	AM Document-No.:	1
Description/Title	Date	1GE0PS100R100A	of
Train data versus way between Patrikiou and Nomarchia	14.02.14	Int. Ref.: Attachment 08	12

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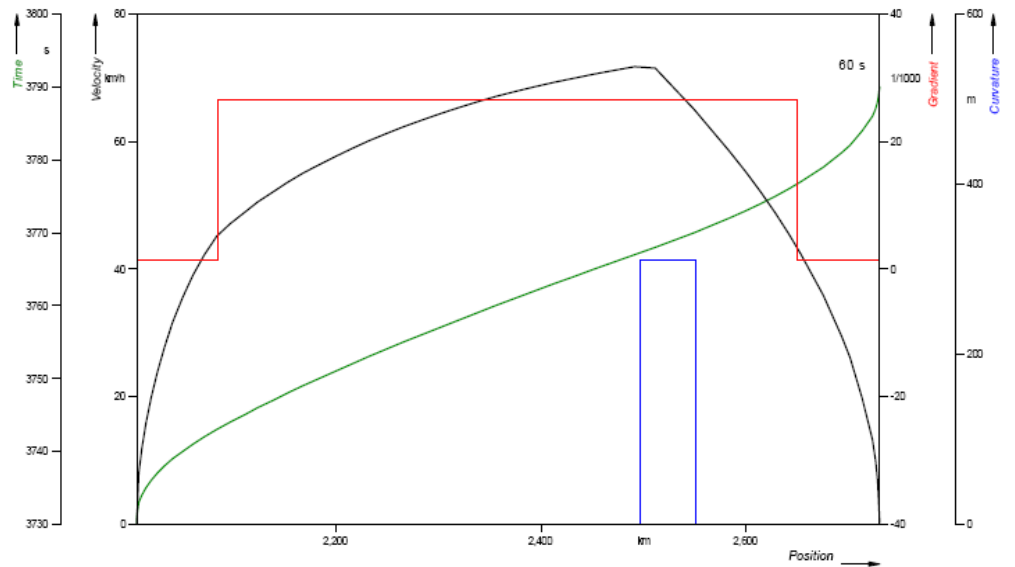


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Description/Title	Date	1GE0PS100R100A	of
Train data versus way between Nomarchia and Kalamaria	14.02.14	Int. Ref.: Attachment 08	12

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TECHNICAL DESCRIPTION AND SPECIFICATIONS

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ATTIKO METRO AE – Project CON-002/13
Description/Title
Train data versus way between Kalamaria and Aretsou

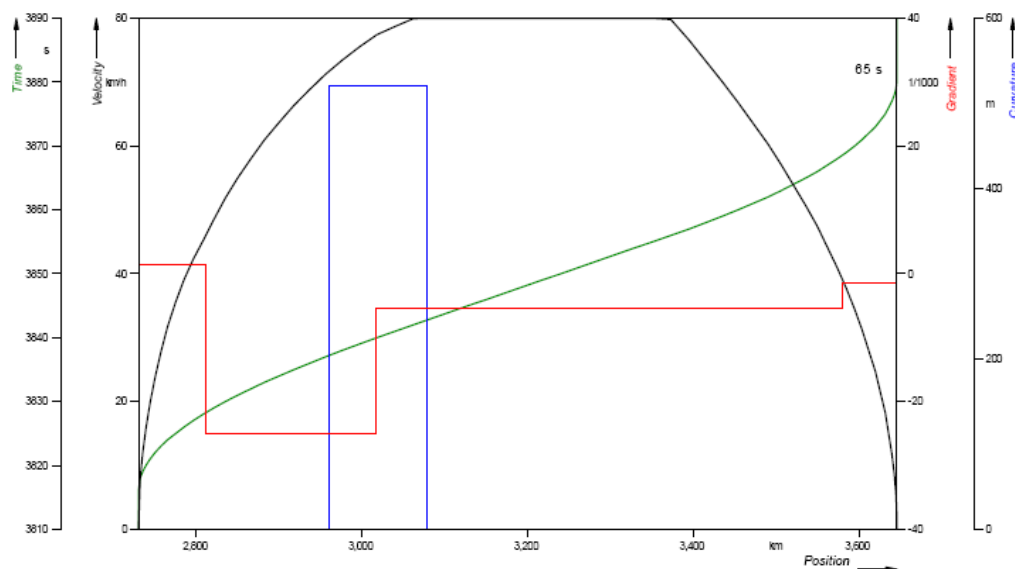
IC SG RE
Date
14.02.14

AM Document-No.:
1GE0PS100R100A
Int. Ref.: Attachment 06

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ATTIKO METRO AE – Project CON-002/13
Description/Title
Train data versus way between Aretsou and Nea_Krini

IC SG RE
Date
14.02.14

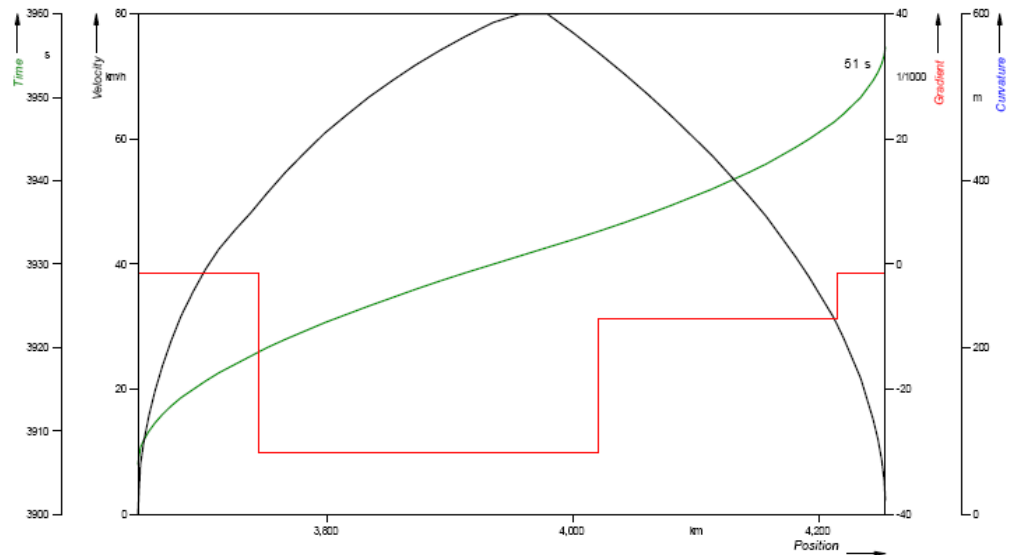
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Int. Ref.: Attachment 06

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TECHNICAL DESCRIPTION AND SPECIFICATIONS

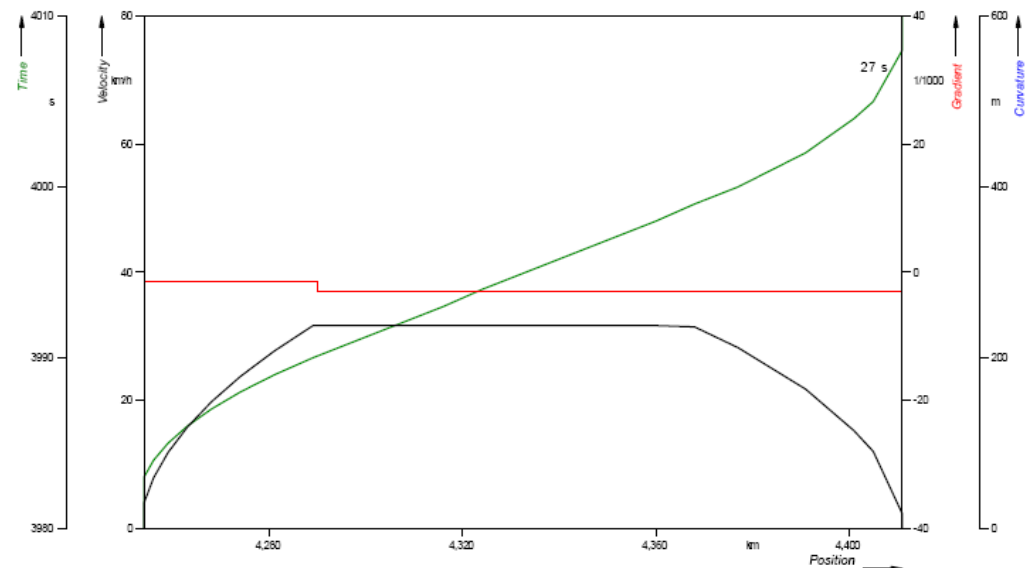
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ATTIKO METRO AE – Project CON-002/13	IC SG RE	AM Document-No.:	5
Description/Title	Date	1GE0PS100R100A	of
Train data versus way between Nea_Krini and Micra	14.02.14	Int. Ref.: Attachment 06	12

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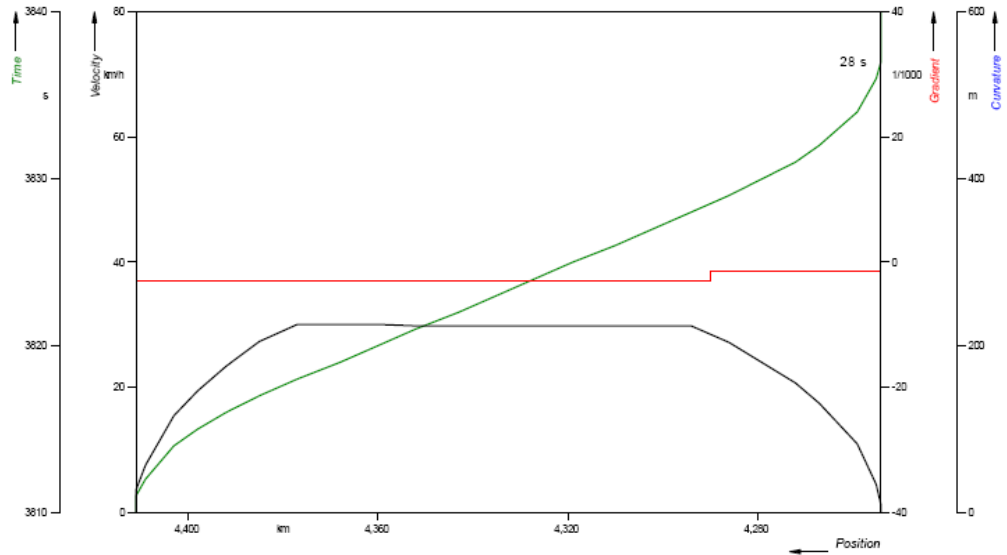


ATTIKO METRO AE – Project CON-002/13	IC SG RE	AM Document-No.:	6
Description/Title	Date	1GE0PS100R100A	of
Train data versus way between Micra and Turn over Kalamaria	14.02.14	Int. Ref.: Attachment 06	12

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TECHNICAL DESCRIPTION AND SPECIFICATIONS

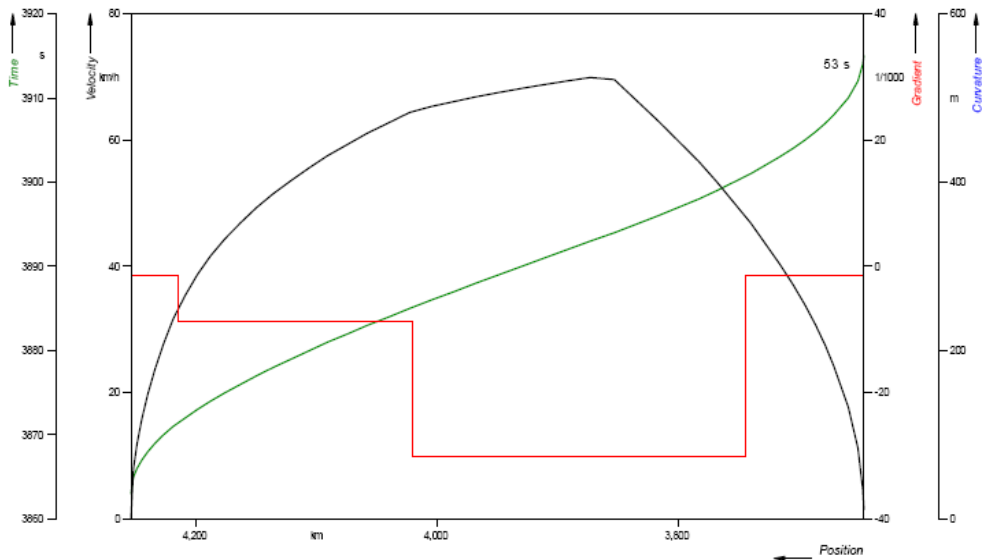
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ATTIKO METRO AE – Project CON-002/13	IC SG RE	AM Document-No.:	7
Description/Title	Date	1GE0PS100R100A	of
Train data versus way between Turn over Kalamaria and Micra	14.02.14	Int. Ref.: Attachment 06	12

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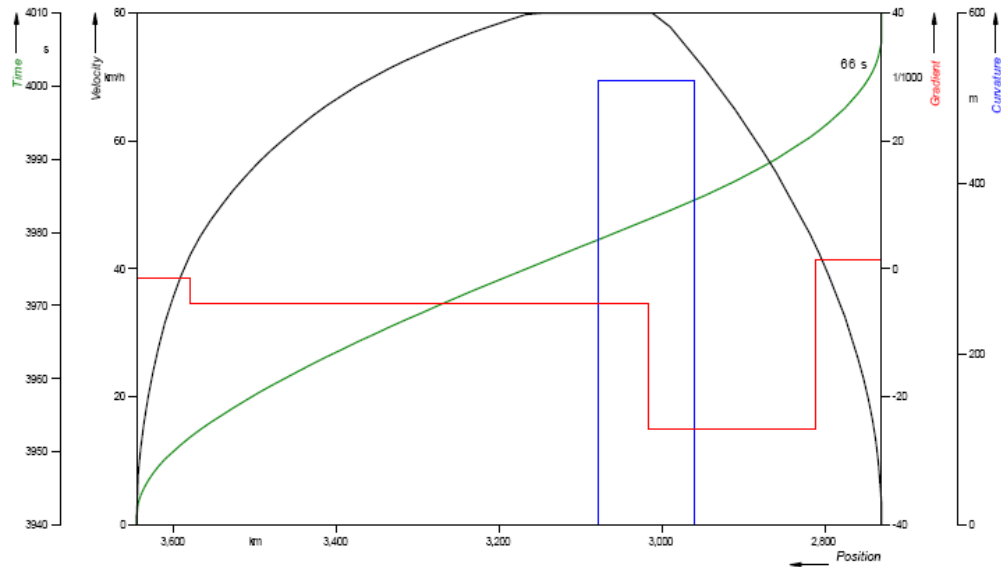


ATTIKO METRO AE – Project CON-002/13	IC SG RE	AM Document-No.:	8
Description/Title	Date	1GE0PS100R100A	of
Train data versus way between Micra and Nea_Krini	14.02.14	Int. Ref.: Attachment 06	12

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TECHNICAL DESCRIPTION AND SPECIFICATIONS

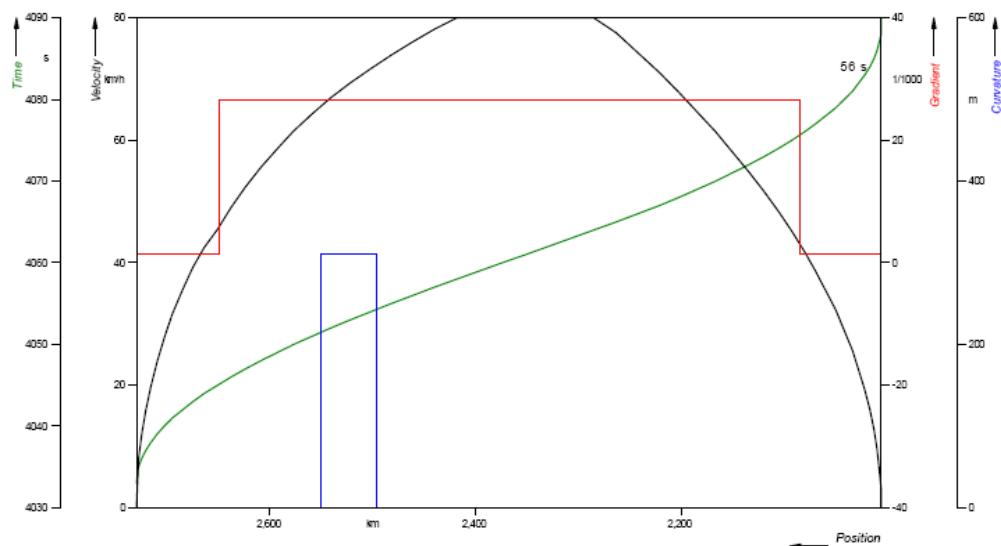
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ATTIKO METRO AE – Project CON-002/13	IC SG RE	AM Document-No.:	9
Description/Title	Date	1GE0PS100R100A	of
Train data versus way between Nea_Krini and Aretsou	14.02.14	Int. Ref.: Attachment 08	12

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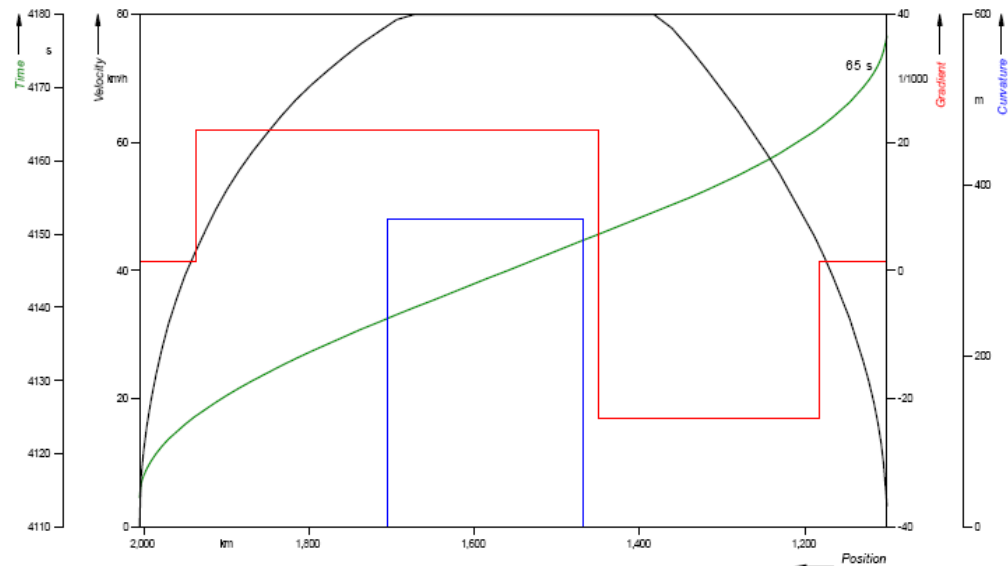


ATTIKO METRO AE – Project CON-002/13	IC SG RE	AM Document-No.:	10
Description/Title	Date	1GE0PS100R100A	of
Train data versus way between Aretsou and Kalamaria	14.02.14	Int. Ref.: Attachment 08	12

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TECHNICAL DESCRIPTION AND SPECIFICATIONS

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ATTIKO METRO AE – Project CON-002/13
Description/Title
Train data versus way between Kalamaria and Nomarchia

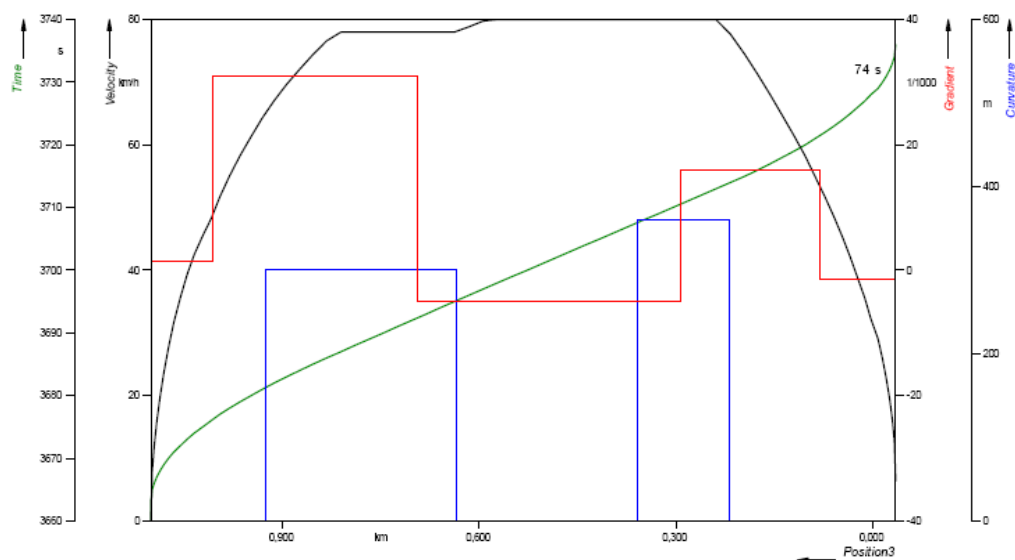
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Date
14.02.14

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Int. Ref.: Attachment 06

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ATTIKO METRO AE – Project CON-002/13
Description/Title
Train data versus way between Nomarchia and Patrikiou

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TECHNICAL DESCRIPTION AND SPECIFICATIONS

Annex F

Table of the Contractor's Personnel



International Tender based on the Open Procedure for the Conclusion of a PPP Contract concerning the Operation and Maintenance of Thessaloniki Metro Network

RFP-427/22
A.Σ. 164503

TECHNICAL DESCRIPTION AND SPECIFICATIONS

	MANAGEMENT	SECURITY - PROTECTION	REVENUE INSPECTION	REVENUE INSPECTORS SUPERVISOR	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0	-	-	-	-		0	-	-	-	-		0	0	0	0	0	
	MANAGEMENT	SECURITY - PROTECTION	REVENUE INSPECTION	REVENUE INSPECTORS	1	2	5	6	1	5	5	5	5	5	5	0	0	0	0	0	0	0	0	1	1	1	1		0	-	-	-	-		0	0	0	0	0
	MANAGEMENT	TECHNICAL	N/A	TECHNICAL DEPARTMENT MANAGER	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-	-	-	-		0	-	-	-	-		0	0	0	0	0
ADMINISTRATION & FINANCE	ADMINISTRATION & FINANCE	N/A	N/A	CHIEF ADMINISTRATIVE & FINANCIAL OFFICER	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0	-	-	-	-		0	-	-	-	-		0	0	0	0	0	
	ADMINISTRATION & FINANCE	N/A	N/A	PERSONAL ASSISTANT	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0	-	-	-	-		0	-	-	-	-		0	0	0	0	0	
	ADMINISTRATION & FINANCE	ADMINISTRATION & HUMAN RESOURCES	A & HR	HEAD OF ADMINISTRATION & HUMAN RESOURCES	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0	-	-	-	-		0	-	-	-	-		0	0	0	0	0	
	ADMINISTRATION & FINANCE	ADMINISTRATION & HUMAN RESOURCES	HR	HUMAN RESOURCES OFFICER	2	1	2	3	0	0	0	0	0	0	0	2	2	2	2	2	2	0	-	-	-	-		0	-	-	-	-		0	1	1	1	1	
	ADMINISTRATION & FINANCE	ADMINISTRATION & HUMAN RESOURCES	ADMINISTRATION	ADMINISTRATION OFFICER	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0	-	-	-	-		0	-	-	-	-		0	0	0	0	0	
	ADMINISTRATION & FINANCE	ADMINISTRATION & HUMAN RESOURCES	TRAINING	HEAD OF TRAINING	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0	-	-	-	-		0	-	-	-	-		0	0	0	0	0	
	ADMINISTRATION & FINANCE	ADMINISTRATION & HUMAN RESOURCES	TRAINING	TRAINING OFFICER	2	1	2	2	0	0	0	0	0	0	0	2	2	2	2	2	2	0	-	-	-	-		0	-	-	-	-		0	0	0	0	0	
	ADMINISTRATION & FINANCE	FINANCE	FINANCE & ACCOUNTING	CHIEF FINANCIAL OFFICER	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0	-	-	-	-		0	-	-	-	-		0	0	0	0	0	
	ADMINISTRATION & FINANCE	FINANCE	FINANCE & ACCOUNTING	HEAD ACCOUNTANT	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0	-	-	-	-		0	-	-	-	-		0	0	0	0	0	
	ADMINISTRATION & FINANCE	FINANCE	FINANCE & ACCOUNTING	ACCOUNTANT	2	1	2	2	0	0	0	0	0	0	0	1	2	2	2	2	2	0	-	-	-	-		0	-	-	-	-		0	0	0	0	0	
	ADMINISTRATION & FINANCE	FINANCE	PAYROLL	PAYROLL OFFICER	2	1	2	3	0	0	0	0	0	0	0	2	2	2	2	2	2	0	-	-	-	-		0	-	-	-	-		0	1	1	1	1	
	ADMINISTRATION & FINANCE	FINANCE	FINES	FINES OFFICER	1	1	1	2	0	0	0	0	0	0	0	1	1	1	1	1	1	0	-	-	-	-		0	-	-	-	-		0	1	1	1	1	
	ADMINISTRATION & FINANCE	ADMINISTRATION	COST CONTROL	COST CONTROL & REPORTING SUPERVISOR	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0	-	-	-	-		0	-	-	-	-		0	0	0	0	0	
	ADMINISTRATION & FINANCE	IT	IT	HEAD OF IT	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0	-	-	-	-		0	-	-	-	-		0	0	0	0	0	
	ADMINISTRATION & FINANCE	IT	IT SUPPORT	IT OFFICER	4	1	4	5	0	0	0	0	0	0	0	4	4	4	4	4	4	0	-	-	-	-		0	-	-	-	-		0	1	1	1	1	
	ADMINISTRATION & FINANCE	IT	ERP	ERP OFFICER	2	1	2	3	0	0	0	0	0	0	0	2	2	2	2	2	2	0	-	-	-	-		0	-	-	-	-		0	1	1	1	1	
	ADMINISTRATION & FINANCE	IT	CYBER SECURITY	CYBER SECURITY OFFICER	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0	-	-	-	-		0	-	-	-	-		0	0	0	0	0	
	ADMINISTRATION & FINANCE	CONTRACTS & PROCUREMENT	CONTRACTS & PROCUREMENT	CONTRACTS & PROCUREMENT MANAGER	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0	-	-	-	-		0	-	-	-	-		0	0	0	0	0	
	ADMINISTRATION & FINANCE	CONTRACTS & PROCUREMENT	CONTRACTS	HEAD OF CONTRACTS	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0	-	-	-	-		0	-	-	-	-		0	0	0	0	0	
	ADMINISTRATION & FINANCE	CONTRACTS & PROCUREMENT	CONTRACTS	HEAD OF PROCUREMENT	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0	-	-	-	-		0	-	-	-	-		0	0	0	0	0	
	ADMINISTRATION & FINANCE	CONTRACTS & PROCUREMENT	CONTRACTS	CONTRACTS OFFICER	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0	-	-	-	-		0	-	-	-	-		0	0	0	0	0	
	ADMINISTRATION & FINANCE	CONTRACTS & PROCUREMENT	PROCUREMENT	PROCUREMENT OFFICER	1	1	1	2	0	0	0	0	0	0	0	1	1	1	1	1	1	0	-	-	-	-		0	-	-	-	-		0	1	1	1	1	
	OPERATION	OPERATION	OCC & ECR	N/A	OPERATION SUPERVISOR	1	2,5	5	5	1	5	5	5	5	5	5	-	-	-	-	-	-	0	0	0	0	0		-	-	-	-	-		0	-	-	-	-
		OPERATION	OCC & ECR	N/A	LINE CONTROLLER	1	3	5	6	1	5	5	5	5	5	5	-	-	-	-	-	-	0	1	1	1	1		0	-	-	-	-		0	-	-	-	-
OPERATION		OCC & ECR	N/A	ENGINEERING & POWER CONTROLLER	2	3	10	14	2	10	10	10	10	10	10	-	-	-	-	-	-	0	4	4	4	4		0	-	-	-	-		0	-	-	-	-	
OPERATION		OCC & ECR	N/A	STATION & TRAIN SUPERVISOR	2	2,5	9	13	2	9	9	9	9	9	9	-	-	-	-	-	-	0	4	4	4	4		0	-	-	-	-		0	-	-	-	-	
OPERATION		OCC & ECR	N/A	SECURITY CONTROLLER	1	3	5	7	1	5	5	5	5	5	5	-	-	-	-	-	-	0	2	2	2	2		0	-	-	-	-		0	-	-	-	-	

TECHNICAL DESCRIPTION AND SPECIFICATIONS

OPERATION	OPERATION	OCC & ECR	N/A	DEPOT CONTROLLER	1	3	5	5	1	5	5	5	5	5	-	-	-	-	-	-	-	0	0	0	0	0	0	0	-	-	-	-	-	0	-	-	-	-	
	OPERATION	OCC & ECR	N/A	HEAD OF OCC MAINTENANCE	1	2	4	4	1	4	4	4	4	4	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	-	-	-	-	-	0	-	-	-	-
	OPERATION	OPERATION	N/A	OPERATION MANAGER	1	1	1	1	1	1	1	1	1	1	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	-	-	-	-	-	0	-	-	-	-
	OPERATION	OPERATION	N/A	HEAD OF OCC OPERATION	1	1	1	1	1	1	1	1	1	1	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	-	-	-	-	-	0	-	-	-	-
	OPERATION	OPERATION	N/A	TIME SCHEDULE OFFICER	1	1	1	1	1	1	1	1	1	1	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	-	-	-	-	-	0	-	-	-	-
	OPERATION	OPERATION	N/A	TRAIN PERSONNEL SUPERVISOR	1	1	1	1	1	1	1	1	1	1	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	-	-	-	-	-	0	-	-	-	-
	OPERATION	OPERATION	N/A	TRAIN ATTENDANT	15	2,5	63	92	15	63	63	63	63	63	-	-	-	-	-	-	-	0	29	29	29	29	29	0	-	-	-	-	-	0	-	-	-	-	
	OPERATION	STATION MANAGEMENT	N/A	HEAD OF STATIONS OPERATION	1	1	1	1	1	1	1	1	1	1	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	-	-	-	-	-	0	-	-	-	-
	OPERATION	STATION MANAGEMENT	N/A	STATION MASTER	13	2,5	54	75	13	54	54	54	54	54	-	-	-	-	-	-	-	0	21	21	21	21	21	0	-	-	-	-	-	0	-	-	-	-	
	OPERATION	STATION MANAGEMENT	N/A	LOST & FOUND PERSON IN CHARGE	1	1	2	2	1	2	2	2	2	2	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	-	-	-	-	-	0	-	-	-	-
	OPERATION	STATION MANAGEMENT	N/A	TICKET OFFICE SUPERVISOR	1	1	1	1	1	1	1	1	1	1	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	-	-	-	-	-	0	-	-	-	-
	OPERATION	STATION MANAGEMENT	N/A	TICKET SELLER	5	2	17	24	5	17	17	17	17	17	-	-	-	-	-	-	-	0	7	7	7	7	7	0	-	-	-	-	-	0	-	-	-	-	
	MAINTENANCE	MAINTENANCE	N/A	N/A	MAINTENANCE MANAGER	1	1	1	1	1	-	-	-	-	-	1	1	1	1	1	1	0	0	0	0	0	0	0	-	-	-	-	-	0	-	-	-	-	
		MAINTENANCE	N/A	N/A	PERSONAL ASSISTANT	1	1	1	1	1	1	-	-	-	-	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-	-	-	-	-	0	-	-	-	-
MAINTENANCE		N/A	N/A	SUPERVISOR OF MAINTENANCE SCHEDULLING	1	1	1	1	1	1	-	-	-	-	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-	-	-	-	-	0	-	-	-	-	
MAINTENANCE		SYSTEM MAINTENANCE	N/A	HEAD OF RAILWAY SYSTEM MAINTENANCE	1	1	1	1	1	1	-	-	-	-	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-	-	-	-	-	0	-	-	-	-	
MAINTENANCE		SYSTEM MAINTENANCE	SIGNALLING & PSD	SIGNALLING & PSD SUPERVISOR	1	1	1	1	1	1	-	-	-	-	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-	-	-	-	-	0	-	-	-	-	
MAINTENANCE		SYSTEM MAINTENANCE	SIGNALLING & PSD	SIGNALLING & PSD CHIEF TECHNICIAN	1	1	1	1	1	1	-	-	-	-	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-	-	-	-	-	0	-	-	-	-	
MAINTENANCE		SYSTEM MAINTENANCE	SIGNALLING & PSD	SIGNALLING & PSD TECHNICIAN	3	1	3	3	1	3	-	-	-	-	1	1	2	2	3	3	0	0	0	0	0	0	0	0	-	-	-	-	-	0	-	-	-	-	
MAINTENANCE		SYSTEM MAINTENANCE	TELECOMMUNICATIONS & SCADA	TELECOMMUNICATIONS & SCADA SUPERVISOR	1	1	1	1	1	1	-	-	-	-	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-	-	-	-	-	0	-	-	-	-	
MAINTENANCE		SYSTEM MAINTENANCE	TELECOMMUNICATIONS & SCADA	TELECOMMUNICATIONS & SCADA TECHNICIAN	3	1	3	3	1	3	-	-	-	-	1	1	2	2	3	3	0	0	0	0	0	0	0	0	-	-	-	-	-	0	-	-	-	-	
MAINTENANCE		SYSTEM MAINTENANCE	ROLLING STOCK	HEAD OF ROLLING STOCK & DEPOT EQUIPMENT MAINTENANCE	1	1	1	1	1	1	-	-	-	-	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-	-	-	-	-	0	-	-	-	-	
MAINTENANCE		SYSTEM MAINTENANCE	ROLLING STOCK	ROLLING STOCK CHIEF TECHNICIAN	6	1	6	6	1	6	-	-	-	-	1	1	3	3	6	6	0	0	0	0	0	0	0	0	-	-	-	-	-	0	-	-	-	-	
MAINTENANCE		SYSTEM MAINTENANCE	ROLLING STOCK	ROLLING STOCK TECHNICIAN	12	1	12	12	1	12	-	-	-	-	3	3	9	9	12	12	0	0	0	0	0	0	0	0	-	-	-	-	-	0	-	-	-	-	
MAINTENANCE		SYSTEM MAINTENANCE	DEPOT EQUIPMENT	DEPOT EQUIPMENT CHIEF TECHNICIAN	1	1	1	1	1	1	-	-	-	-	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-	-	-	-	-	0	-	-	-	-	
MAINTENANCE		SYSTEM MAINTENANCE	DEPOT EQUIPMENT	DEPOT EQUIPMENT TECHNICIAN	4	1	4	4	1	4	-	-	-	-	2	2	3	3	4	4	0	0	0	0	0	0	0	0	-	-	-	-	-	0	-	-	-	-	
MAINTENANCE		SYSTEM MAINTENANCE	POWER SUPPLY & TRACTION POWER	POWER SUPPLY & TRACTION POWER CHIEF TECHNICIAN	1	1	1	1	1	1	-	-	-	-	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-	-	-	-	-	0	-	-	-	-	
MAINTENANCE		SYSTEM MAINTENANCE	POWER SUPPLY & TRACTION POWER	POWER SUPPLY & TRACTION POWER TECHNICIAN	2	1	2	2	1	2	-	-	-	-	2	2	2	2	2	2	0	0	0	0	0	0	0	0	-	-	-	-	-	0	-	-	-	-	
MAINTENANCE **		SYSTEM MAINTENANCE	AFC	AFC CHIEF TECHNICIAN	1	1	1	1	1	1	-	-	-	-	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-	-	-	-	-	0	-	-	-	-	
MAINTENANCE **		SYSTEM MAINTENANCE	AFC	AFC TECHNICIAN	2	2	2	2	2	2	-	-	-	-	1	1	1	1	2	2	0	0	0	0	0	0	0	0	-	-	-	-	-	0	-	-	-	-	
MAINTENANCE	INFRASTRUCTURE MAINTENANCE	N/A	HEAD OF E/M FACILITIES MAINTENANCE	1	1	1	1	1	1	-	-	-	-	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-	-	-	-	-	0	-	-	-	-		

TECHNICAL DESCRIPTION AND SPECIFICATIONS

MAINTENANCE	INFRASTRUCTURE MAINTENANCE	E/M FACILITIES	E/M FACILITIES SUPERVISOR	1	1	1	1	-	-	-	-	-	-	1	1	1	1	1	1	0	0	0	0	0	0	0	-	-	-	-	-	0	0	0	0	0	0	0	-	-	-	-	-						
	INFRASTRUCTURE MAINTENANCE	E/M FACILITIES	E/M FACILITIES CHIEF TECHNICIAN	1	1	1	1	-	-	-	-	-	-	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-	-	-	-	-	0	0	0	0	0	0	0	-	-	-	-	-					
	INFRASTRUCTURE MAINTENANCE	E/M FACILITIES	E/M FACILITIES TECHNICIAN	6	1	6	8	-	-	-	-	-	-	3	3	5	5	6	6	0	0	0	0	0	0	0	0	-	-	-	-	-	0	2	2	2	2	2	0	-	-	-	-	-					
	INFRASTRUCTURE MAINTENANCE	CW	HEAD OF INFRASTRUCTURE AND TRACKWORK MAINTENANCE	1	1	1	1	-	-	-	-	-	-	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-	-	-	-	-	0	0	0	0	0	0	0	-	-	-	-	-					
	INFRASTRUCTURE MAINTENANCE	CW	CIVIL WORKS - STRUCTURES SUPERVISOR	1	1	1	1	-	-	-	-	-	-	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-	-	-	-	-	0	0	0	0	0	0	0	-	-	-	-	-					
	INFRASTRUCTURE MAINTENANCE	CW	CIVIL WORKS - STRUCTURES CHIEF TECHNICIAN	1	1	1	1	-	-	-	-	-	-	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-	-	-	-	-	0	0	0	0	0	0	0	-	-	-	-	-					
	INFRASTRUCTURE MAINTENANCE	CW	CIVIL WORKS - STRUCTURES TECHNICIAN	2	1	2	3	-	-	-	-	-	-	2	2	2	2	2	2	0	0	0	0	0	0	0	0	-	-	-	-	-	0	1	1	1	1	1	0	-	-	-	-	-					
	INFRASTRUCTURE MAINTENANCE	TRACKWORK & THIRD RAIL	TRACK WORK& THIRD RAIL SUPERVISOR	1	1	1	1	-	-	-	-	-	-	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-	-	-	-	-	0	0	0	0	0	0	0	-	-	-	-	-					
	INFRASTRUCTURE MAINTENANCE	TRACKWORK & THIRD RAIL	TRACKWORK & THIRD RAIL TECHNICIAN	4	1	4	6	-	-	-	-	-	-	2	2	3	3	4	4	0	0	0	0	0	0	0	0	-	-	-	-	-	0	1	1	1	2	0	-	-	-	-	-						
	FIRST RESPONSE UNIT	FIRST RESPONSE UNIT	FIRST RESPONSE UNIT	FIRST RESPONSE UNIT SUPERVISOR	1	1	1	1	-	-	-	-	-	-	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-	-	-	-	-	0	0	0	0	0	0	0	-	-	-	-	-				
	FIRST RESPONSE UNIT	FIRST RESPONSE UNIT	FIRST RESPONSE UNIT	FIRST RESPONSE UNIT OFFICER	2	2	7	9	-	-	-	-	-	-	4	4	6	6	7	7	0	0	0	0	0	0	0	0	-	-	-	-	-	0	1	1	1	2	0	-	-	-	-	-					
	ARCHIVES	ARCHIVES	ARCHIVES	ARCHIVES SUPERVISOR	1	1	1	1	-	-	-	-	-	-	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-	-	-	-	-	0	0	0	0	0	0	0	-	-	-	-	-				
	ARCHIVES	ARCHIVES	ARCHIVES	ARCHIVES OFFICER	1	1	1	1	-	-	-	-	-	-	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-	-	-	-	-	0	0	0	0	0	0	0	-	-	-	-	-				
	CLEANING SERVICES	CLEANING SERVICES	CLEANING SERVICES	CLEANING SERVICES SUPERVISOR	1	1	1	1	-	-	-	-	-	-	s/c	s/c	s/c	s/c	s/c	s/c	1	1	1	1	1	1	1	0	-	-	-	-	-	0	s/c	s/c	s/c	s/c	0	0	0	0	0	0					
	CLEANING SERVICES	CLEANING SERVICES	CLEANING SERVICES	CLEANING SERVICES OFFICER	s/c	s/c	s/c	-	-	-	-	-	-	-	s/c	s/c	s/c	s/c	s/c	s/c	0	0	0	0	0	0	0	0	-	-	-	-	-	0	s/c	s/c	s/c	s/c	0	-	-	-	-	-					
	WAREHOUSE	WAREHOUSE	WAREHOUSE	WAREHOUSE & SPARE PARTS SUPERVISOR	1	1	1	1	-	-	-	-	-	-	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-	-	-	-	-	0	0	0	0	0	0	0	-	-	-	-	-				
WAREHOUSE	WAREHOUSE	WAREHOUSE	WAREHOUSE & SPARE PARTS OFFICER	4	2	14	14	-	-	-	-	-	-	4	4	8	8	14	14	0	0	0	0	0	0	0	0	-	-	-	-	-	0	0	0	0	0	0	0	-	-	-	-	-					
				183	118	340	422																																										
				Total per year per category				52	195	195	195	195	195	48	48	68	68	87	87	55	58	58	58	58	58	58	0	69	69	69	69	0	5	5	5	7	0	9	9	9	9								
Note 1: (*) The statement "6th year" implies from the 6th year until the end of the Contract																																																	
Note 2: (**) Personnel noted as "S/C" are considered as the O&M Contractor subcontractors																																																	

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Annex G

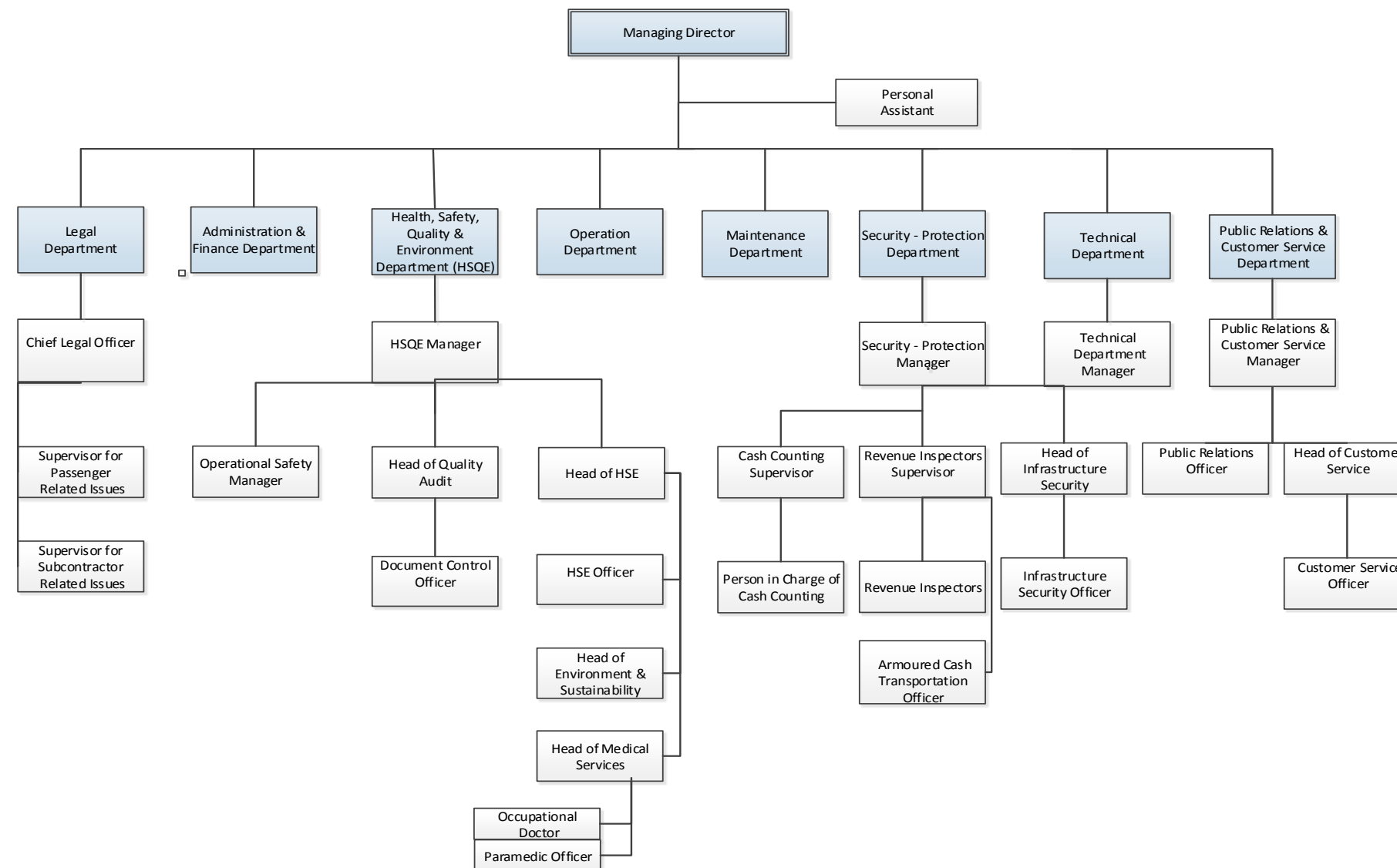
Organization Chart of the Contractor's Personnel



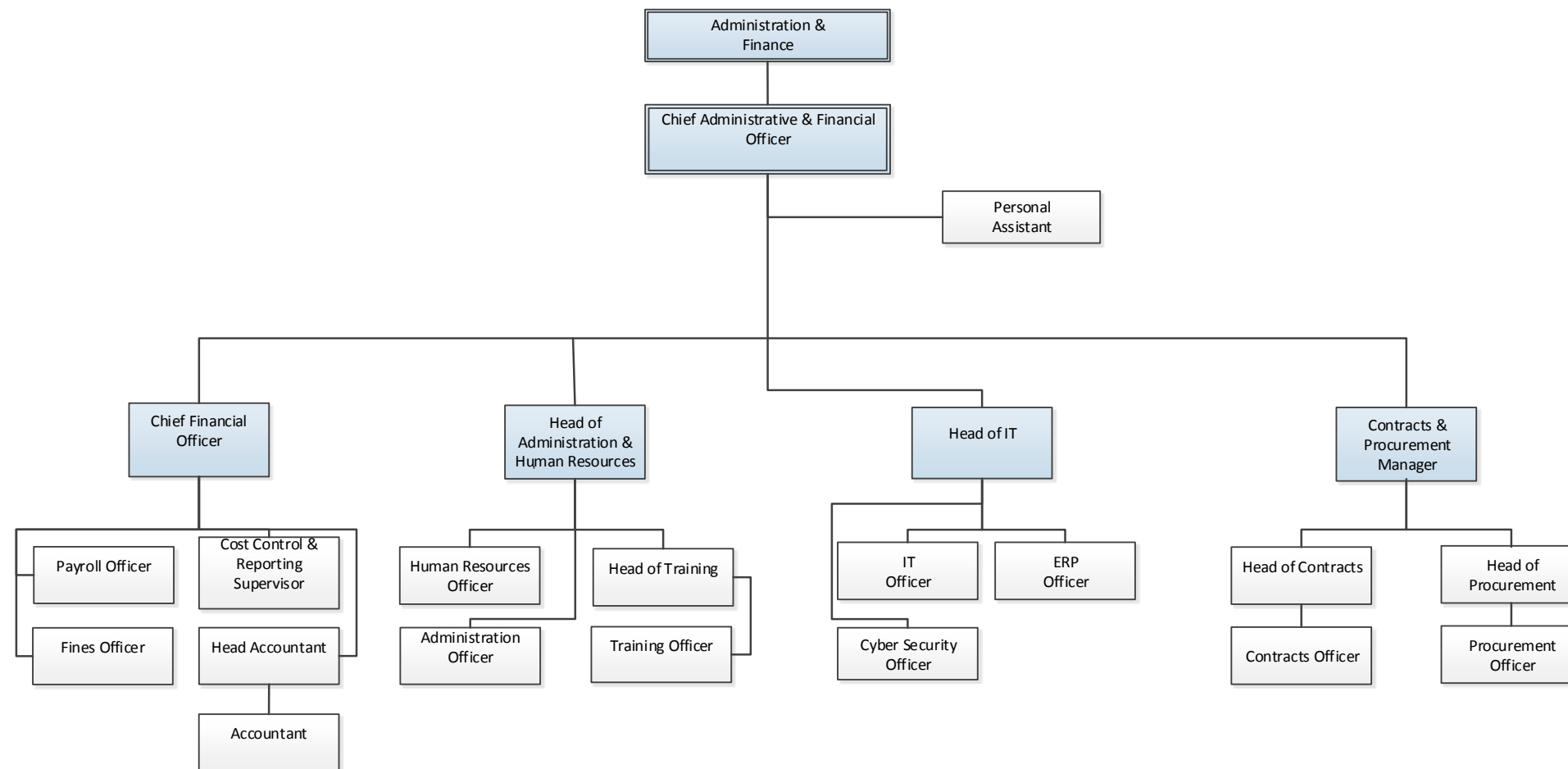
International Tender based on the Open Procedure
for the Conclusion of a PPP Contract concerning
the Operation and Maintenance of Thessaloniki
Metro Network

RFP-427/22
A.Σ. 164503

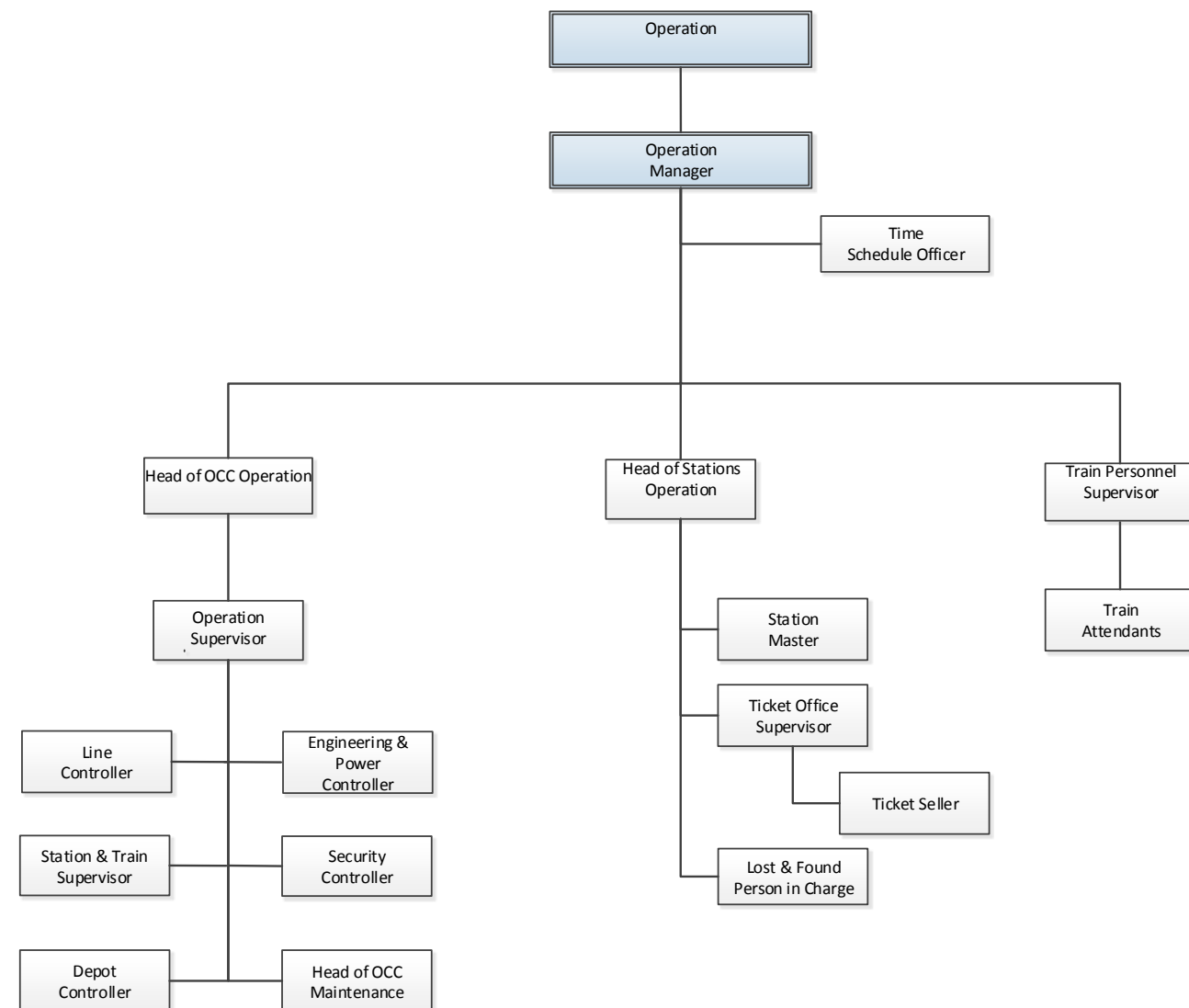
TECHNICAL DESCRIPTION AND SPECIFICATIONS



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