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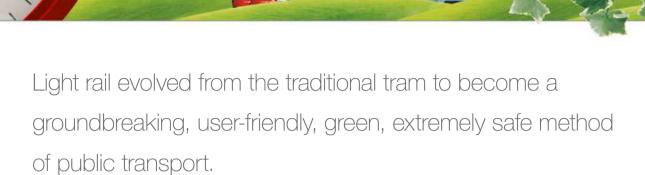




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1. Railway systems





W ithin metropolitan railway systems, it is trams and light rail that currently arouse most interest with respect to their deployment in medium-sized cities with an average population density and metropolitan areas.

# 1.1 Light rail, a cosmopolitan transit system

Light rail evolved from the traditional tram to become a groundbreaking, user-friendly, green, extremely safe method of public transport.

Light rail runs on a reserved but not exclusive track, enabling it to operate overground sharing traffic with other vehicles. Although this reserved platform separates it from private vehicles, it allows for level crossings with pedestrians and the rest of the traffic, fitting seamlessly into the city. The incorporation of new technologies enables it to benefit from priority at traffic lights, to offer real time information and to offer greater passenger safety.

# 1.2 The advantages of cutting-edge transport

# **INTEGRATED**

Designed to save space in cities and to improve quality of life, winning back space for pedestrians and public transport.

### **INTERMODAL**

It allows passengers to link up easily with all the methods of transport in the Autonomous Community of Madrid during its operating hours from 6 a.m. to 1.30 a.m.

### **PUNCTUAL**

It avoids traffic congestion and saves time of looking for a parking space. Its transit signal priority also guarantees timetable reliability.

### SAFE

For a substantial portion of the journey, it travels along a platform that is separated from road traffic, its operation is monitored and managed from a Central Control Centre (CCC) and it is programmed to adapt its speed to the section it is running in.

# **USER FRIENDLY**

The vehicles are adapted to ensure they are easy to access and safe, making them suitable for persons with reduced mobility, baby strollers and bicycles.

# **GREEN**

It does not emit gases and its direct contamination is very low. In figures, one single light rail train moves the same number of people as 170 private vehicles.

# **AFFORDABLE**

Passengers can use the Public Transport Pass of the Autonomous Community of Madrid fare system whose prices are very reasonable.





In July 2006, the company was awarded the public works concession contract for a period of 30 years.

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Since 2007, Metro Ligero Oeste (MLO) has been managing the operations of the entire light rail system in the western area of Madrid.

# 2.1 The concession

MLO is a concession awarded by the Autonomous Community of Madrid, which, since July 2007, has linked the municipalities of Boadilla del Monte, Alcorcón, Pozuelo de Alarcón and Madrid up to the Metro, Suburban Rail and City and Intercity bus network managed and coordinated by the Regional Transport Consortium of Madrid.

In July 2006, the company was awarded the public works concession contract for the light rail lines between Colonia Jardín and the stations of Aravaca (ML2) and Colonia Jardín and Puerta de Boadilla (ML3) for a period of 30 years.

The MLO network is formed of two lines, with a total length of over 22 kilometres, 28 stops and a fleet of 27 vehicles.

Since July 2007, MLO has managed the operating (operations and maintenance) of the entire system: works, facilities and rolling stock, employing a workforce of around 231 people. The project represented an initial investment in rolling stock, works, facilities, and technical and human resources of almost 673 million euros.

# 2.2 Shareholder structure

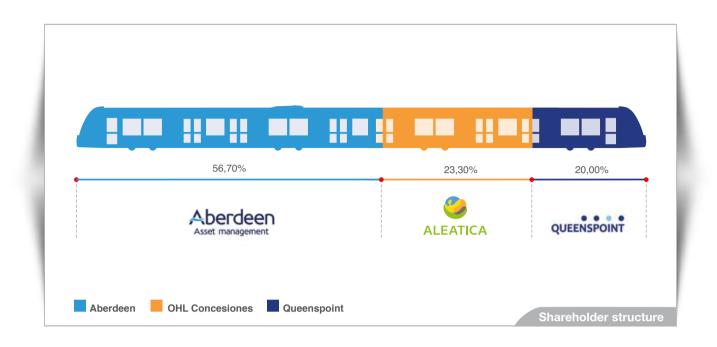
MLO's shareholder structure is comprised of three companies of recognised standing in their respective business areas:





# Aberdeen - 56,70%

- Aberdeen Asset Management is one of the world's largest investment companies. It has a significant global presence and the scale and expertise to help clients meet their investment goals.
- As a leading global asset manager, Aberdeen Standard Investments is dedicated to creating long-term value for their clients. They offer a comprehensive range of investment solutions, as well as the very highest level of service and support.



# **ALEATICA - 23,30%**

ALEATICA is a new breed of transportation company.
 Its fit-for-purpose structure as a pure operator of transportation assets allows it to focus exclusively on conceptualizing and operating roads and other transportation assets in Spain and Latin America.

# QUEENSPOINT - 20%

• A joint venture formed by Allianz and Denmark's pension fund Arbeidsmarkedets TillægsPension (ATP).

Queenspoint is a long term investment vehicle and asset manager which acquires, holds and actively operates middle market core infrastructure assets -in fields such as transport, energy, telecommunications, waste, water and others- largely under PPP contractual and risk allocation structures.



# 2.3 Cronología de hitos históricos

2004	August: Construction MM	
2005	February: Construction OC	
2006	•20 April: Bid publication     •25 June: Bid submission     •18 July: Award	30 August: Company incorporation     15 September: Concession contract     12 December: Financing contract
2007	May: End of construction     27 July: Commercial service	
2008	19 April: 5 million users     September: ISO 9K, 14K     and OSHAS 18K certification	• 5 December: 10 million users
2009	• 15 July: 15 million users • September: ISO 27K certification	
2010	March: 20 million users     October: diMLO launched     28 October: 25 million users	October: Association with OHL in preventive management     November: UITP Award
2011	•28 May: 30 million users     •June: MLO takes over preventive maintenance of permanent fixtures and rolling stock	July: ISO/OSHAS recertification     October: OHL Health & Safety Award
2012	Panuary: 35 million users     March: Inauguration of Express Service     May: Activation of 'Salida Oeste' App	April: CRTM Award for the Promotion of Sustainable Mobility and Public Transport     October: 40 million users diMLO launched
2013	January: Passenger Wi-Fi service     June: 10 million km travelled	November: Award for the best European Light Rail Operator of the year
2014	January: Award for the CSR educational project     Il Awards for the Promotion of Sustainable Mobility     and Public Transport	November: 3rd place in international tram drivers contest     December: Award for three innovative initiatives in the 1st edition of the Innova Awards
2015	November: Excellence Award in Maintenance Management 2015, in Infrastructure category	December: Most innovative enterprise in 2nd edition of the Innova Awards
2016	May: Launch of new website and MLO App     June: 60 million users	October: Installation of USB charging points inside vehicles
2017	April: 65 million users     27 July: MLO 10th anniversary	September: Change maintenance vehicle fleet for electric cars
2018	• February: 70 million users • November: 75 million users	December: Project for smart regulation of platform lighting
2019	May: certified in conciliation, MLO is a family responsible entity.     December: 83 millon users	AENOR certified us of the Operational Railway Safety Management System.
		Chronology of historic milestones





# The Metro Ligaro Casta





Since 2007, the public transport system of the Autonomous Community of Madrid has incorporated into its transit network 36 km of light rail divided into four lines.

Imost 200,000 people who live and work in the municipalities of Madrid, Boadilla del Monte, Alcorcón and Pozuelo de Alarcón can use the light rail network managed by MLO.

# Areas serviced ML2

- 1 Colonia Jardín
- 2 Quirón Hospital
- 3 RTVE
- 4 La Finca Business Estate
- 5 Zoco de Pozuelo Shopping Centre
- 6 Somosaguas University Campus
- 7 Aravaca Renfe-Suburban Rail Station

# Areas serviced ML3

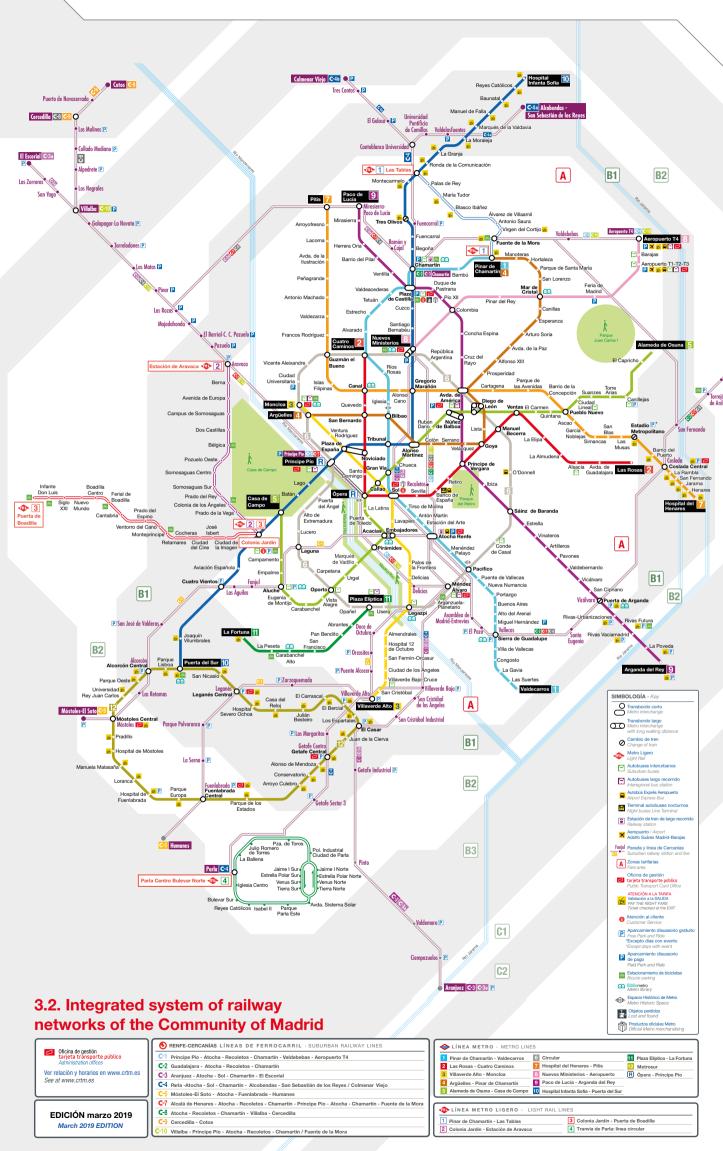
- 1 Colonia Jardín
- 8 Ciudad de la Imagen / Carrefour
- 9 Kinépolis Leisure Centre

# 3.1 MLO zone plan

Since 2007, the public transport system of the Autonomous Community of Madrid has incorporated into its transit network 36 km of light rail divided into four lines.

Since the month of July of that same year, MLO has managed two of them, linking the municipalities of Boadilla del Monte, Alcorcón and Pozuelo de Alarcón up to the Metro, Suburban Rail and City and Intercity bus network managed and coordinated by the Regional Transport Consortium of Madrid.





**B3** 



# 3.3 Main features of the MLO network

The MLO network is formed of two lines: on the one hand, ML2, which links Line 10 of the Metro to the municipality of Pozuelo de Alarcón, has 13 stops from Colonia Jardín to Aravaca station and a length of 8.7 kilometres; and on the other, ML3, which runs between Colonia Jardín and Boadilla del Monte, and has 16 stations and a total length of 13.53 kilometres.



All our stations can be easily accessed by people with reduced mobility

	<b>1</b> 2	<b>₫►</b> 3	
Commencement of works	February 2005		
Commissioning	July 2007		
Length	8.63 km	13.53 km	
Stations or stops	13 (3 underground)	16 (2 underground)	
Interchange stations	2	2	
Average distance between stops	720m	900m	
Total route time	22,5 minutes	32 minutes	
Maximum operating speed	50km/h (urban), 70km/h (suburban), 20km/h (pedestrian)		
Average commercial speed	23,01km/h	25,36km/h	
Vehicle availability at rush hour	10	13	
Frecuency at rush hour	6 minutes		
Track gauge	1,435m		
Standard platform width	7.80m		
Average platform length	45m		
Electrical service connections	3		
Structures	2 bridges and 8 tunnels	4 bridges and 5 tunnels	
Traction substations	4 underground/ 1 surface	4 underground/ 3 surface	
Longest tunnel length	1,150m	880m	
Road crossings	13	49	







LO is a company structured into five operating areas, centred directly on production, and two for support, which play a key role in the development of the company.

The General Management are supported by an Integrated Management System, which enables them to monitor business performance from different perspectives, ensuring correct strategic decision-making.

The operating system (operations and maintenance) is managed in its entirety by MLO: works, facilities and rolling stock and currently employs a workforce of around 230 people.

# Mission

To offer a safe, punctual, user-friendly, sustainable mobility service.

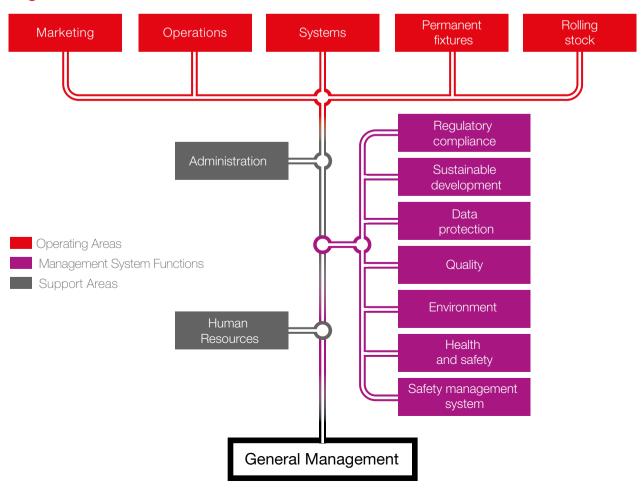
### **Vision**

To become a national benchmark in the passenger transportation industry and in sustainable mobility, standing out on account of its dedicated commitment to its stakeholders.

### **Values**

Professionalism, motivation, integrity, teamwork, respect, pride in belonging to the organisation, the quest for excellence, stakeholder centricity, social responsibility and compliance.

# **Organisational structure**





# 4.1 Operations

The Operations division employs around 129 people (drivers, inspectors, CCP (Central Control Center) operators and customer service staff).

The scope of its management includes:

# THE LINE

# TRANSPORT SERVICE PRODUCTION

- Service planning
- Driving and provision of the public transport service
- Inspection and fraud control
- Training and continuous professional development for the corresponding operating positions

# **SAFETY**

- Deployment of a Safety Management System (SMS) that serves to monitor regular risk factors, to prevent or mitigate them, and to guarantee a safe, reliable service.
- Definition and monitoring of a Self-Protection Plan that serves to manage potential emergency situations, coordinating own and external support teams (firefighters, police, etc.).

# SURVEILLANCE

# Control of surveillance service provision

- Preventive surveillance of facilities and their accesses
- User surveillance and support for operating staff
- Management of CCTV circuits
- Collection and transportation of securities



# Control of the operating system and customer information

- Traffic management and real-time information for customers
- Remote control and surveillance of system operating mechanisms
- Coordination of maintenance procedures
- Incident management and coordination for service resumption





# TOOLS

The Central Control Centre (CCC) uses the following tools to perform its tasks:

SCADA Supervision and control of the energy system.

**OAS** Operation Assistance System: vehicle location and frequency management.

CTC Centralised route and railway signalling control system.

**Communications** (radiotelephony, interphone, public address, telephony).

UTC Road traffic light control.

 ${\bf CCTV} \ {\bf Surveillance} \ {\bf system}.$ 

SRC Station remote control including:

- Lifts
- Escalators
- Fire detection

- Pump wells and tunnel ventilation
- Tunnel ventilation
- Ticketing

# MANAGEMENT INDICATORS

- Availability (% of kilometres completed/ planned):
- 99.76% in 2019
- Punctuality (journeys without delays of over 1 minute):
- 97.16% in 2019
- Accident rate (collisions):\*
  - Average since 2008: 4.0 accidents x 106 km
  - Past 12 months: 3.12 accidents x 10<sup>6</sup> km
- \* This indicator refers to collisions with third parties, in which it is important to note that no serious injuries occurred in any of the cases and none were the result of errors or transgressions by MLO drivers.



# Works 2008 and depois



Storage



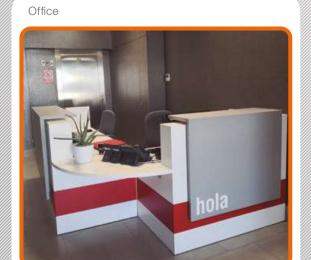
Washing tunnel



Parking building









# 4.2 Rolling stock

MLO employs a group of around 26 professionals who manage the integrated maintenance of 27 vehicles and the workshop equipment located in the depots.

# THE VEHICLES

MLO vehicles belong to Alstom's Citadis range, model TGA 302.

This is a fully low-floor vehicle measuring 32 m long and with a capacity for more than 200 passengers. It has specific areas for persons with reduced mobility and 4 double and 2 single doors on either side. It can reach a maximum speed of 70 km/h, accelerating to 1.20 m/s2,

and braking with a deceleration of 3 m/s2 in the event of an emergency stop.

All the vehicles are equipped with an Internet connection for mobile devices thanks to their Wi-Fi network and USB chargers.

### THE DEPOTS

MLO depots have the facilities required to carry out the integrated maintenance of the vehicle fleet throughout its useful life, including major inspections.



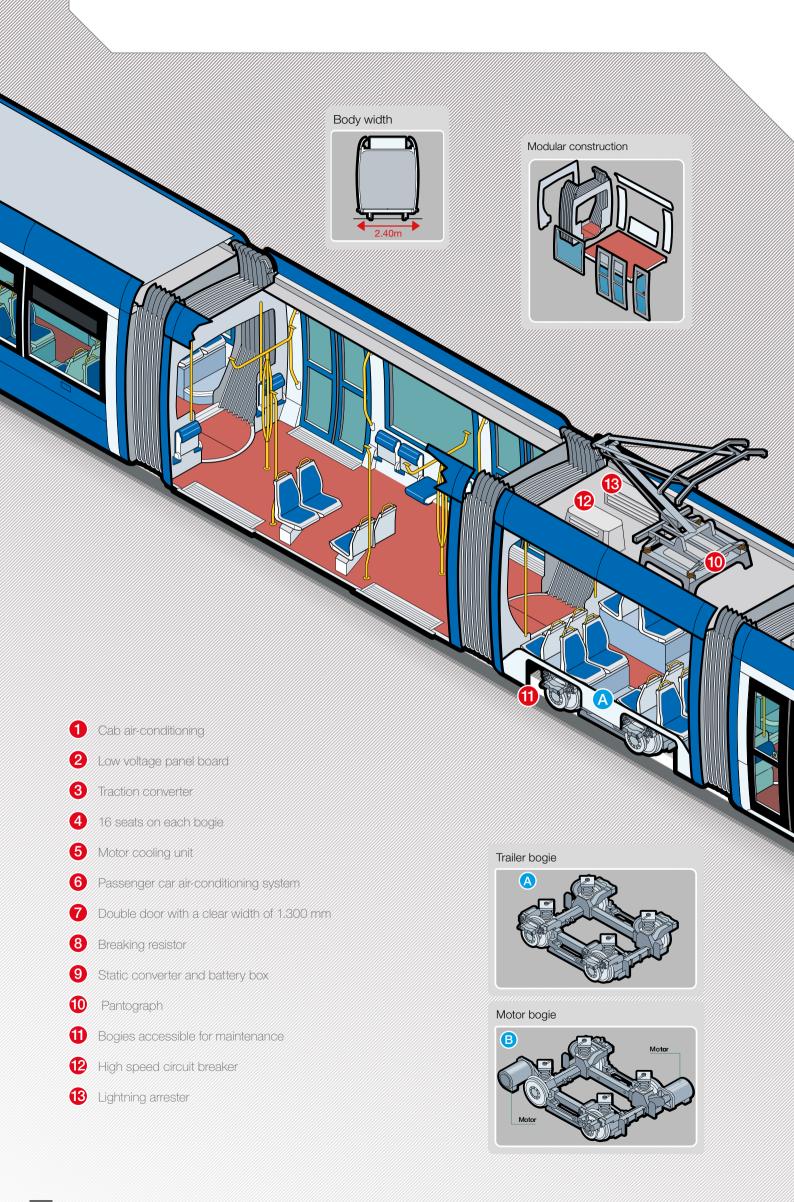
The most noteworthy elements of the facilities are:

- A washing tunnel
- A sand hopper with a 30 mt silo
- A wheel lathe
- Lifting jacks
- Overhead cranes
- Train roof access platforms
- An underside washing area

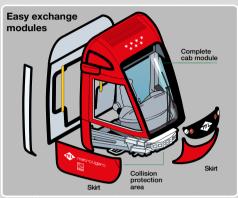
# MANAGEMENT INDICATORS

- 99% fleet availability.
- 98% fleet availability.

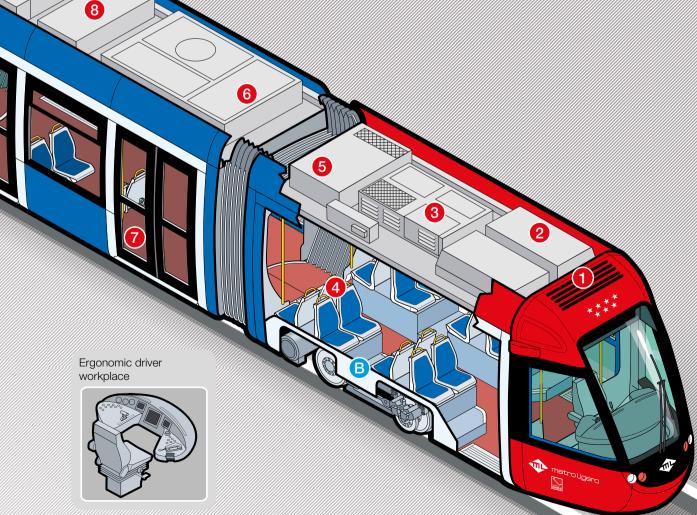




Modular components of the car body for collision safety and easy repair and replacement







# 4.3 Systems

The running of modern transit networks is based on a core technological pillar where IT systems and communications play a key role.

The communication systems and networks that support MLO lines are divided into:

- Communications systems: they enable data, voice and video communications to be established between the Central Control Centre and the different elements spread across the line and the vehicles.
- Control systems: they comprise the supervision and control of all the facilities and vehicles of both lines.
- Integrated ticketing systems in the Regional Transport Consortium of Madrid system.
- Software packages and management applications required for the operating procedures of Metro Ligero Oeste.
- Safety and recovery systems intended for service maintenance and contingency and recovery plans both for data as well as for systems in the case of incidents.

The Systems Maintenance division is responsible for providing technical support for all these systems and for performing the following tasks for them:

- Configuring and managing operating systems, application and database servers, website servers, network architecture design and communication device administration.
- Securing systems and communications.
- Analysing and developing or deploying software solutions.
- Dealing with hardware and software queries and incident troubleshooting.

The Systems Maintenance division employs a team of around 15 professionals to perform all these activities:

- Systems engineers and administrators, whose task is the management and maintenance of the technical equipment, systems and communications in place.
- A software development analyst-programmer, whose task is application development and deployment.
- Systems technicians and operators, whose task is the maintenance of the technical equipment, systems and communications in place in the DPCs (Data Processing Centres) of the Central Control Centre, the line technical rooms and office and customer service workstations.





# MANAGEMENT INDICATORS

The indicators that measure the efficiency of the department are based on the availability of the critical systems with the following breakdown:

- Essential communications:
- Required limit of 99.98%
- Availability achieved in 2018: 99.99%
- Control and communications equipment and Central Control Center system.:
  - Required limit of 99.00%
  - Availability achieved in 2018: 99.87%
- Ticketing, sales, validation and oversight equipment:
  - Required limit of 98.50%
  - Availability achieved in 2018: 99.73%



# 4.4 Permanent fixtures

MLO employs a team of around 43 professionals in a variety of areas, track, electrification and signalling, who carry out the maintenance of the entire infrastructure as well as the engineering of all the modifications.

The MLO system consists of:

- 22.4 km of double track with grooved embedded rail on an accessible concrete platform. A jacketed rail system.
- 24 stops with 45 metre-platforms, exclusive lighting and a covered shelter.
- Three underground stations and one in a cutting and two terminal interchange stations.
- 750 VCC electrification with tram catenary integrated into the urban areas it operates in.
- 12 traction substations with an installed traction power of 12 MW and 18 transformation centres that form two interconnection rings, respectively.
- 62 road junctions to regulate vehicle and light rail traffic, as well as pedestrian crossings, which give transit priority to light rail over road traffic.
- A railway signalling system that guarantees the traffic safety of light rail vehicles through the use of audio frequency track circuits and electro-hydraulic point motors.

- A fire protection system in all MLO technical rooms, air-conditioning systems, forced ventilation in tunnels, pump wells and rescue systems, as well as generator sets and uninterruptible power supply systems form part of the action area of the permanent fixture department.
- The OAS (Operation Assistance System) informs
  the control room of the position of the entire fleet,
  guaranteeing compliance with scheduled frequency
  in addition to recalculating frequencies should any
  incidents occur.

# INNOVATION

In conjunction with Alstom, the signalling system manufacturer, the department develops the SIDI software tool for the monitoring and remote maintenance of the 6 interlocking machine rooms that form part of the signalling system. Engineering and joint development of the SCADA systems, integrating all the remote systems into Siemens' SCADA WINcc Open Architecture, which allows the equipment in all the technical rooms to be accessed directly and a large portion of incidents to be solved without the need for onsite technical assistance. These new developments will make current systems even smarter, for example, the Tunnel and Platform Smart Lighting Control (CEIPT) and the Tunnel Ventilation Control System (SCVT), which will be used to manage





air quality and temperature in stations and tunnels and to configure ventilation in the event of a fire. The power consumption of the entire network is also managed in real time ensuring its optimisation.

# MANAGEMENT INDICATORS

In 2018, the incidents attributed to Permanent Fixtures affecting operations accounted for a monthly average for all journeys of only 0.6 min. delay/ month and 9.1 km lost/ month.



# 4.5 Marketing

- Customer service
- Market analysis
- Communications and promotion
- Public relations
- Corporate Social Responsibility

# MANAGEMENT INDICATORS

- A total of 465 complaints were recorded in 2019, 4% less than the average of recent years.
- An average response time of 4 days in 2019 for complaints and suggestions received from our users.

# Technological innovation at the service of users

MLO makes a firm commitment to cutting-edge technology and smart mobility in cities.











- Real-time information (App and website)
- Public Transport Pass (PTP)
- Multi-Card

# **WEB MLO**

www.metroligero-oeste.es



# **APP MLO**

Real time service information



# CORPORATE BLOG

www.blog.metroligero-oeste.es

# REAL-TIME INFORMATION DISPLAY SCREENS

Real time service information





# 4.6 Administration

- Financial
- Accounting
- Legal and insurance
- General services

The Administration and Oversight division is responsible for:

- Performing and executing all the tasks resulting from the budgetary, economic, administrative and accounting management of MLO, analysing on a monthly basis the results obtained and making the necessary budget adjustments for the purpose of ensuring that the company's equity position is sound and that the business is profitable for its shareholders.
- Providing the necessary support for the other MLO departments, overseeing the appropriate provision of goods, services and economic resources requested by these departments so that they can perform their tasks properly and always complying with valid tax, commercial, legal and accounting obligations.
- Monitoring personal accidents and acts of vandalism that occur on the facilities.
- Providing the company with communal services, such as a cafeteria, cleaning, courier services, etc.

# 4.7 Human Resources

- Staff
- Health and safety
- Internal regulations

The MLO workforce comprises approximately 230 members of staff with a young, skilled profile.

## Key aspects:

- The firm commitment of MLO to professional development.
- The creation of an Internal Health Promotion Plan, guaranteeing the health and safety of employees and users.
- The Health and Safety Management System, started up in 2007/8, has adapted its procedures to the technical specifications of OHSAS 18001, achieving the certificate one year after the business began.

# MANAGEMENT INDICATORS

• In 2019, our employees received more than 5.530 hours of professional development, rated with a grade of over 9 out of 10.







Firmly committed to ongoing improvement: new Family-Friendly Enterprise and Operating Railway Safety certificates incorporated into our Integrated Management System.

# 5.1 Recognition of achievements

Recognitions vouch for our commitment, rewarding aspects as important as customer satisfaction and environmental sustainability.

We strive every day to strengthen our commitment to our stakeholders, good governance and environmental sustainability. On this basis, we are firmly committed to improving our Integrated Management System, including new Family-Friendly Enterprise and Operating Railway Safety certificates.

In the distinctions section, MLO has also received:

- The Award for the Best Global Light Rail Initiatives (International Light Rail and Tram Conference – October 2010).
- The Award for the Promotion of Public Transport and Sustainable Mobility presented by the Autonomous Community of Madrid 2012 (Regional Transport Consortium of Madrid for the MLO Marketing and Communication Team).
- The Award for the Best European Light Rail Operator of the Year (Annual Rail Awards - November 2013).
- The III Tria Railway RD Award for Young Railway Engineers (Spanish Railway Foundation - April 2015).









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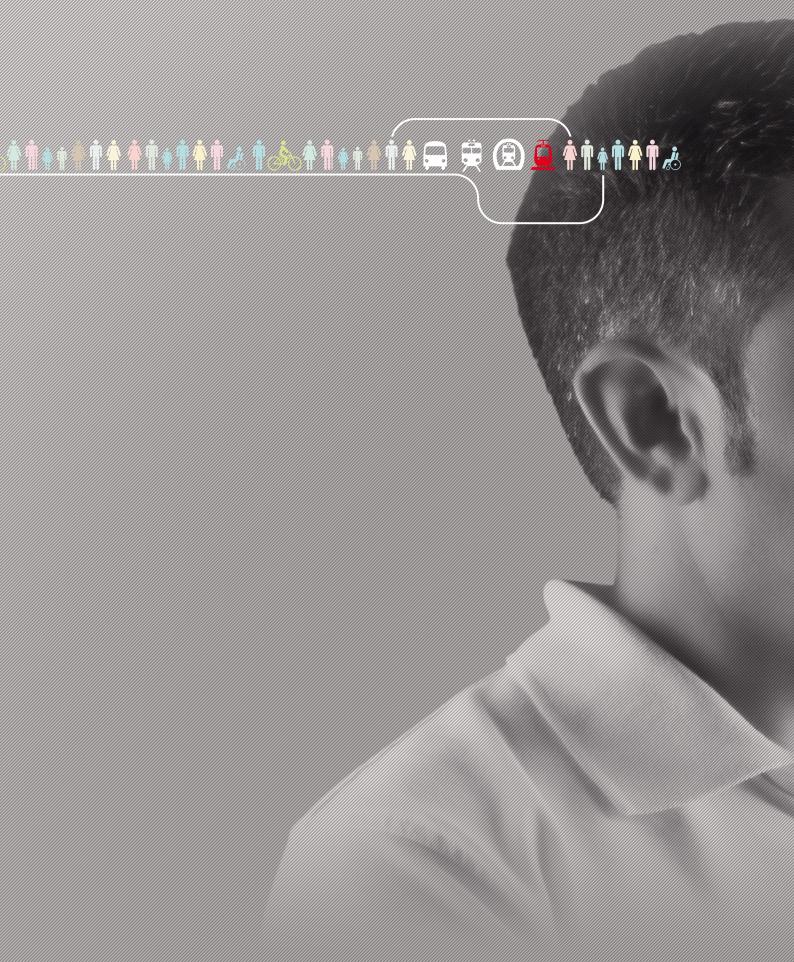
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# metroligero OESTE





