

İZMİR METRO

**Municipality of Greater City of İzmir
Metro Operations, Transportation,
Construction, Industry and Commerce Inc.**

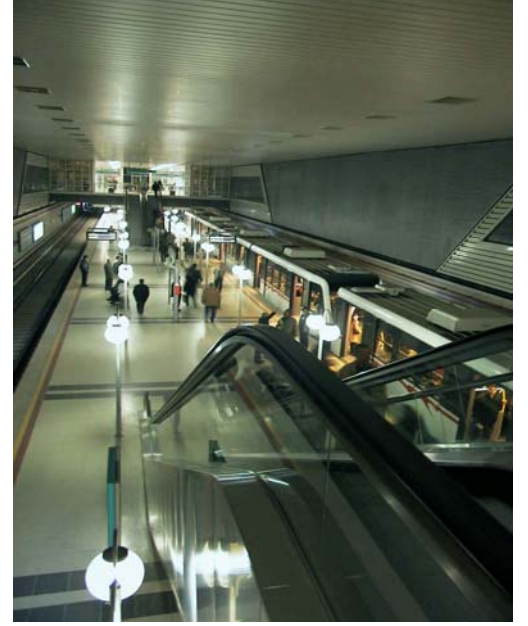


PURPOSE OF İZMİR METRO A.Ş.

İzmir Metro A.Ş. has been established to meet the requirements and expectations of passengers for a fast, reliable, safe and comfortable travel at high efficiency levels, without sacrificing the quality of service.

In order to increase the numbers and satisfaction of passengers on a continuous basis, İzmir Metro A.Ş. adopts the following as its targets:

- timely transit service without delays,
- high service quality,
- high performance level of staff,
- effective, continuous and on-time communication with passengers,
- efficient cost and investment management.



OPERATION CONCEPT OF İZMİR METRO A.Ş.

For İzmir Metro A.Ş., the basic guide of operational activities is the passengers' requirements and expectations related to transportation. İzmir Metro A.Ş. defines the success as "Passenger Satisfaction", and in all phases of operations it specifies working principles and rules according to international standards, and actually applies them.



RECENT SITUATION AND THE PROJECTS FOR FUTURE

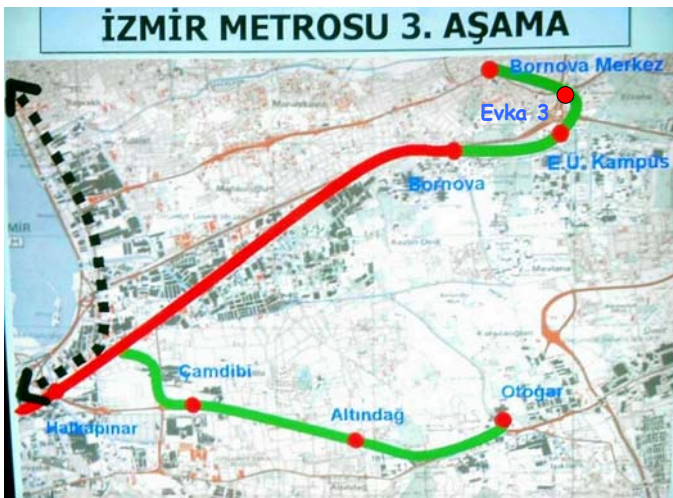
The **first stage**, Üçyol-Bornova route, is 11.6 km long and has 10 stations; The capacity of the route is 45.000 passenger/hour/direction. The **second stage** (Stage 2) is to add the Üçyol - Fahrettin Altay route to the existing Üçyol - Bornova line of İzmir Metro. On this new line having a total length of 5.5 km and constructed wholly underground, there shall be six passenger stations, namely İzmirspor, Hatay, Göztepe, Poligon, Güzelyalı and Fahrettin Altay. When the second stage is completed, daily 160.000 passengers will be carried. The **third stage** is to lengthen the line to Bornova Merkez and Otogar. The route from Bornova to Bornova Merkez is 3.2 km (Üniversite, Evka 3, Bornova Merkez) and the route from Halkapınar to Otogar is 4.5 km (Vakıf, Çamdibi, Altındağ, Otogar). The **fourth stage** is Fahrettin Altay – DEÜ, with 3.75 km underground line and four stations. The **fifth stage** is to be planned Üçyol – Buca – D.E. Üniversitesi line. Besides these, with the addition of "upgrading the suburban lines of TCDD (State Railways) to Metro standards" project (Aliağa – Menderes line), there will be totally of 97 km metro line to serve.



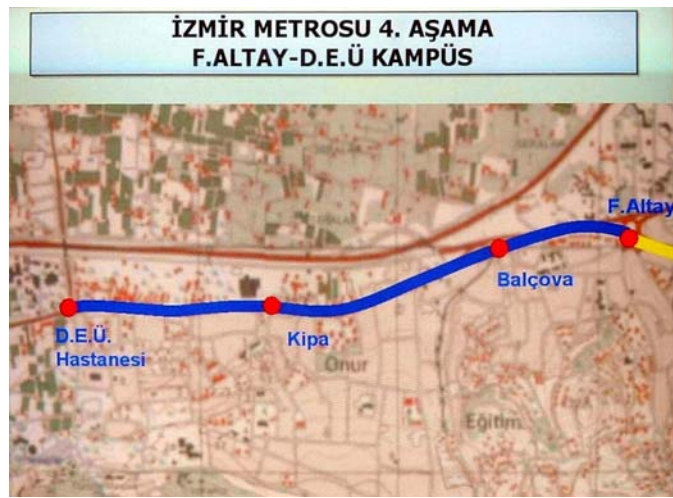
1 ST STAGE



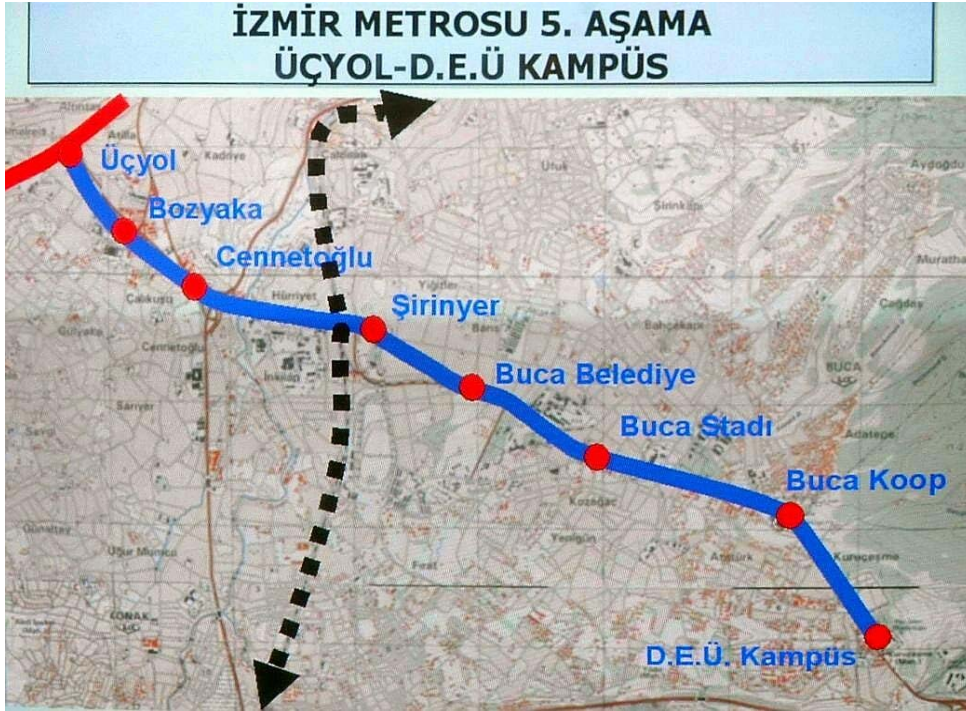
2 ND STAGE



3 RD STAGE



4 TH STAGE



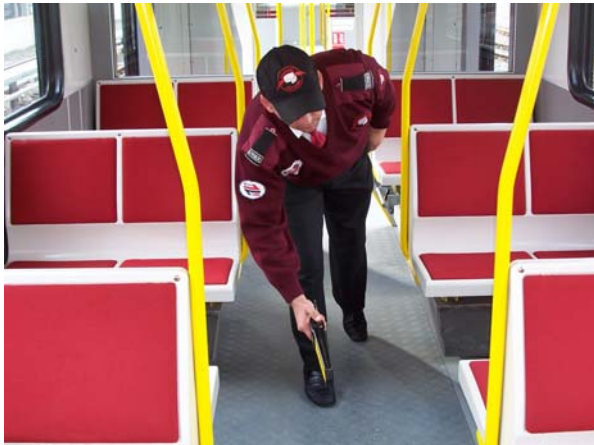
5 TH STAGE



ALL OVER THE İZMİR CITY

İZMİR METRO

- **Fast:** Travel between Üçyol and Bornova takes **17 minutes**. While travel time in the city goes up to approximately 40 minutes in peak hours, speed of cars in same peak hours goes down to 10 km/h. With a speed capacity that can reach 80 km per hour, İzmir Metro is expected to decrease average travel time in the city at the rate of 50 %.
- **Reliable:** Providing a regular service with short headways, İzmir Metro shall create the possibility to get to the home, to work and to appointments without delay. İzmir Metro has been equipped with systems to ensure trains to arrive at stations every **2.5 minute**.

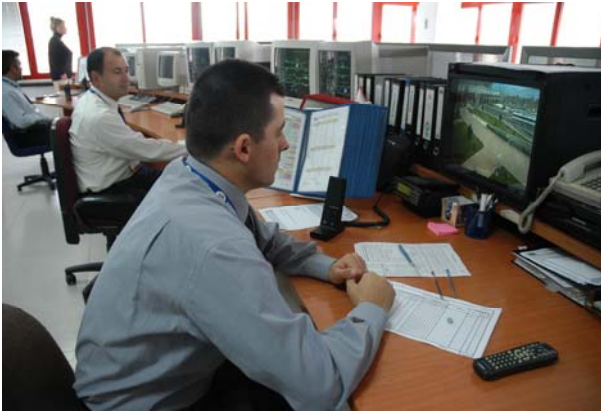


- **Comfortable:** A travel without joggling, vibration or noise, on rails laid using the latest technology. Comfortable cars with a large seating capacity, escalators extending to platforms, elevators for disabled passengers, spacious and large platforms, underground stations that turn into shopping and living centers.
- **Safe and Secure:** Risk of accidents is much too small compared to other transport vehicles such as airplane, car and bus. İzmir Metro's Signalling and **Automatic Train Protection (ATP)** systems equipped with very advanced functions ensures a high level of safety for travels. If the driver skips a measure required by the rules during running, Automatic Train Protection System remind this to the driver. In case the system notices that the driver fails to perform necessary actions, the Automatic Braking System cuts in like an automatic pilot and reduces the speed to the desired level, and stops the train through emergency braking if necessary. Through the radio system, the Traffic Control Center maintains communication with drivers on a continuous basis. And special security officers of İzmir Metro provide service in order that the passengers can travel safely in all hours of the day.

- **High Capacity and Efficiency:** İzmir Metro is capable of providing daily a rapid and safe transportation service to 800 thousand passengers with a headway of 2.5 minutes and three-car trains and to 1.7 million passengers with a headway of 2 minutes and five-car trains. The number of passengers to be carried by each car in İzmir Metro trains exceeds the total number of passengers which can be carried by 200 cars.



- **Passenger Information:** Such information as departure times, arrival time of the next train as well as up to date information and changes relating to transportation services are transmitted to the passengers without delay from the digital panels located in platforms. The passenger is thus able to foresee and evaluate the transit time in the most efficient way.



- **High Technology:** Thanks to the modern signalling system, entire operations of Metro trains are supervised in Traffic Control Center by means of computers. The vehicles of İzmir Metro specially designed using modern technologies according to transport requirements of İzmir create a comfortable medium of travel.

- **Environment Friendly:** İzmir Metro is an option for transit that does not pollute the atmosphere, provides saving in energy utilization, gives relief to intercity traffic density, and is noiseless. And taking the transportation in the centrum (Üçyol - Konak - Çankaya - Basmane) totally underground, it has been made possible more land to be allocated to green areas, and the silhouette of

the city was not changed.

- **Economical:** İzmir Metro was designed to give maximum energy saving. When going downhill or performing regenerative braking, the cars feed energy back to the system by means of their generators and thus ensure utilization of energy in most efficient way.



İZMİR METRO VEHICLES



The cars of İzmir Metro designed as light rail vehicles are in the form of articulated units with six axles and three bogies. Each car is driven with a total of four traction motors, each bogie at car ends having two motors. The middle bogie is not driven. There are **30** cars with driver cabin (**MD**) and **15** cars without driver cabin (**M**), i.e. total 45 cars.

It is foreseen that İzmir Metro would provide service in two different car combinations using three-car (**MD-M-MD**) or five-car (**MD-M-M-M-MD**) sets. The station platforms are designed to serve trains with maximum five cars (125 m).

Each car has 44 seats, and can carry maximum 300 passengers in the average.

Each car is equipped with an audio-visual passenger information system indicating the direction being travelled, the next station and the station arrived at. In addition to digital panels with single line, the driver can communicate with the passengers any moment using the public announce system.

The ventilation system has the capacity to maintain the temperature inside the car at +22°C when it is -3°C outside. The 6 heaters installed under passenger seats distribute the heat evenly. There is also a heating-cooling unit installed in driver's cabin to ensure safe driving under most severe conditions. All cars are fully air conditioned.



PASSENGER STATIONS OF İZMİR METRO AND SAFE TRAVEL



There are 10 passenger stations in Stage 1 of İzmir Metro. The stations are located as follows: four (**Üçyol, Konak, Çankaya, Basmane**) in underground, two (**Hilal, Stadyum**) on viaduct, three (**Halkapınar, Sanayi, Bölge**) at ground level, and one (**Bornova**) in open top cleft tunnel. The distances between stations varies among 0.8 km (Basmane) and 1.6 km (Üçyol - Konak). Stations at Üçyol, Hilal and Stadyum have "side" type and other stations have "center" type platforms.

In order to provide easier entrance to stations and platforms, a total of 30 escalators and 32 special elevators for disabled passengers were installed in all stations.

Total 17 shops at Üçyol (6), Konak (10) and Çankaya (1) to respond to the needs of passengers shall be put to commercial service through bidding method.

All station platforms have a length of 125 m and are suitable to accommodate operation of 5-car trains. There are two ticket offices each in Üçyol, Konak, Çankaya, Basmane, Halkapınar, Stadyum and Bornova stations, and one each in all other stations. A total of 103 turnstiles have been installed, 55 being for entry and 48 for exit. In order to ensure integration in intercity transit, the ticketing system of İzmir Metro is presently being made compatible to **Kentkart** (City Card).

In every station of İzmir Metro, a minimum of one **Station Chief**, one **Station Operator**, **Technical Service Responsibles** and **Security Officers** shall be available on duty from the first to the last train service in order to ensure safe and secure travel of the passengers. The fact that each metro station has a direct communication channel with **fire brigade, police** and **health** agencies through **Traffic Control Center** ensures the possibility to intervene all kinds of risky situations in time.



SAFETY POLICY OF İZMİR METRO INC.

The safety policy of İzmir Metro Inc. aims to create a safe, secure, healthy and comfortable environment both for its staff and all passengers travelling in İzmir Metro; also being in touch with known worldwide companies on this topic to create a management fact. The safety policy contains **“to specify and eliminate issues that would create risks, to prevent accidents, to protect the transportation system and increase its efficiency”**.



The target is to remove the accidents and possible risks with good management, safe and secure technology, experienced and trained staff.

To achieve this goal;

- superiority in passenger-company relationship,
- working with higher level trained and experienced staff,
- auditing the whole system,
- obeying the existing rules and regulations,
- training the staff on railway subjects,
- encouraging the staff on creativity and participation,
- knowing that the security is for everyone's responsibility,
- protecting and increasing the efficiency of the system are main components of safety and

health policy.

İzmir Metro train management system is working with “environmental protection” understanding. To be more useful for İzmir people;

- wasting is done according to legal instructions,
- saving on energy and natural sources,
- enlarging the environmental activities are main components of our environment policy.



HUMAN RESOURCES MANAGEMENT IN İZMİR METRO INC.

The **Human Resources Policy** of İzmir Metro Inc. aims to increase to efficiency and motivation of the staff, to ensure all personnel to adopt the company culture, to establish an effective medium of communication within the company, and to have solidarity, cooperation and multi-faceted communication among units and persons.

The company culture of İzmir Metro Inc. that consists such qualities as **supporting the team spirit, solidarity, sincerity, basing on clear and multi-faceted communication, open to changes and new ideas, and perfectionism** constitute the basis of Human Resources Policy.

The Human Resources Policy is formed around the following principles:

- Devotion, job security, openness and satisfaction from job,
- Continuous development of communication within the company,
- Exchange of information and views without regard to hierarchy, Besides promoting team work, to award the personal success,
- Research, development and training.



BACKGROUND OF METRO PROJECT



The initial work for İzmir Metro was started in 1989. **Heusch und Bosefeldt** of Germany made traffic measurements for two years on the main arteries of the city and prepared the **Transportation Master Plan**.

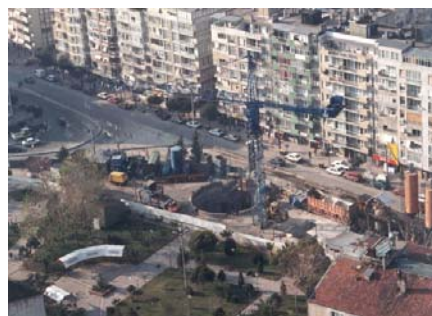
The **Transportation Master Plan of İzmir** proposes, for the year 2010, a 50 km metro system leading to four farthest points of the city (**Bornova, Buca, Narlıdere, Çiğli**), in the shape of two back-to-back crescents. Priority was given to the part of the system where traffic is the heaviest, and in June 1992 the tender for the most urgent portion was announced. Siemens, Breda (Italy) and ABB - Yapı

Merkezi Consortium submitted bids. The contract was signed on January 15, 1993 between **ABB - Yapı Merkezi** Consortium and the Municipality of Greater City of İzmir.

As a "design and built" consortium, **ABB-Yapı Merkezi** was also carrying the responsibility to provide project financing from abroad.

Reassessment of the route became an agenda item in 1994, and the section extending to **Fahrettin Altay** was cancelled in the new project. **Basmane - Bornova** line was taken over from **TCDD** for a period of 50 years, and the contract regarding the current configuration of İzmir Metro was signed on March 1995, with a delay of 1.5 years.

The system was handed over in April, 2000



CONSTRUCTIONAL FEATURES OF İZMİR METRO TUNNELS

"Ümmühan Ana" twin tunnels located between Konak, Çankaya and Basmane stations of İzmir Metro were drilled at a depth of 18 m below ground level using a giant machine specially developed to drill tunnels in soft ground. Ümmühan Ana Tunnel consists of two 1400 m long tunnels parallel to each other, and constituted the section of the route of İzmir Metro that was the most difficult to build. In order not to impair the historical texture of İzmir, a machine was designed having the same features as the technology used to cross the English Channel under the sea bed, and it was used in İzmir to open tunnels in a strata that can almost be called "marshy". Having a length of 80 m and a diameter of 6.45 m, this giant equipment was specially manufactured in Germany for İzmir Metro with contributions of Turkish Engineers of **Yapı Merkezi**. An advantage of this tunneling method called **EPBM - Earth Pressure Balance Method** is that it provides capability of flexing during an earthquake, because İzmir is located in a first degree earthquake zone. Thickness of ground layer over this tunnel (also called "shallow tunnel") varies between 6 m and 13 m. The reason to name the tunnels Ümmühan Ana (Mother Ümmühan) originates from the tradition of giving the names of women with historical importance to tunnels difficult to construct. Believing that this would bring luck and facilitate the construction, Yapı Merkezi calls this tunnel with the name of the mother of Süleyman Demirel, President of Turkey.



The 1.7 km Nene Hatun Tunnel between Konak and Üçyol was constructed using the **New Austrian Method (NATM)**. In the section of the line between Üçyol and Konak the work had to be performed with much more care and attention due to existence of fault (breaks) rather than the hardness of rock formation. Connection of station units in Konak, Çankaya and Basmane were performed using the cut-cover method. The double track section is 30 - 60 m below the ground surface, and the width of the main tunnel there is 10 m. At locations where stations are built, tunnel width increases to 17 meters. The tunnel proceeds with a downhill slope of 4 %, and average depth reaches 25 m. And Üçyol deep tunnel station was built 32 meters below the ground level.



STAGE 1 CONSTRUCTION

Date of Contract Award Decision	: June 1992
Date of Signing of Contract	: January 1993
Completion of Credit Negotiations	: March 1994
Cornerstone Laying	: December 1994
Payment of Advance and Commencement of Job	: June 1994
Date of Route Change Agreement and Actual Start of Work	: October 1995
Date the Consultant Commenced Work	: June 1995
Delivery of First LRV	: August 1996
Job Completion	: April 2000
Final Acceptance	: April 2001
Contract Price of Job	: US\$ 422.789.766
<u>Final Estimated Price</u>	: <u>US\$ 584.929.682</u>
Percentage of Estimate Increase	: 38,35 %
Contract Price of Consultancy Services	: US\$ 4.990.000
<u>Final Estimated Price of Consultancy Services</u>	: <u>US\$ 7.469.855</u>



İZMİR METRO

Total Length	11,60 km
	4,50 km underground
	2,80 km viaduct
	3.6 km ground level
	0.7 km cleaving
Capacity in Peak Hours	45.000 Passenger/hour/direction
Maximum Capacity	1.700.000 Passenger/day
Feasibility Capacity	400.000 Passenger/day
Average Travel	6 km/passenger
Travel Time	16 min 23 sec
Headway	2,5 minutes (minimum)
No. of Cars Per Train	3-4-5
Total No. of Cars	45
Depot Stabling Capacity	140 car
Power Supply	750 V DC
Feeding Type	3rd Rail
Maximum Speed	80,00 km/h
Commercial Speed	40,00 km/h
Maximum Acceleration	1,00 m/sec ²
Maximum Deceleration	1,10 m/sec ²
Track Standard	80,00 km
Rail Weight	49,00 kg/m
Rail Gauge	1.435,00 mm
Min. Horizontal Curve	250,00 m
Min. Vertical Curve	3.000,00 m
Rail Joints	Welded
No. of Passenger Stations	10
Station Platform Height	88 cm
Length of Platform	125 m
Platform Surface Area	500 m ²
Distance Between Stations	0.6 - 1.6 km
Total No. of Ticket Offices	17
Total No. of Turnstiles	103
Total No. of Escalators	53
Total No. of Elevators	32

İZMİR METRO VEHICLES

Width of Carbody	2650 mm
Length Between Couplers	23500 mm
Height of Car (above rail top)	3760 mm
Opening of Passenger Door	1400 mm, (4 doors on each side)
Number of Seated Passengers	44
Number of Standing Passengers	280 (M), 264 (MD)
Maximum Capacity	300 passengers/car
No. of Traction Motors	4
Traction Power	300 kW
Acceleration	1.0 m/sn ²
Tare Weight	32000 kg. (MD type car)
Door Operating System	Electrical/Pneumatic
Carbody Exterior Material	Steel
Primary Suspension	Air Spring
Brake Systems	Regenerative dynamic brake
	Pneumatic disk brakes with inverted spring
	Electro-magnetic rail brake



POWER SUPPLY SYSTEM

- For trains to run 34.5 kV network connection at three points
- 34.5 kV internal connection between substations
- For stations to work 10.5 kV network connection at four points
- 10.5 kV internal connection between stations

To supply energy for trains;

- 750 V DC on third rail
- Third Rail;
Aluminum + Stainless Steel Composite Section
Feed From Below
Protected by Sheath

İzmir Metro was designed to give maximum energy saving. When going downhill or performing regenerative braking, the cars feed energy back to the system by means of their generators and thus ensure utilization of energy in most efficient way.



TRAVEL TIME IN İZMİR METRO

PASSENGER STATION	TRAVEL TIME (Seconds)	TIME OF STAY AT PASSENGER STATIONS (Seconds)
ÜÇYOL		
	116	
KONAK		40
	76	
ÇANKAYA		30
	64	
BASMANE		30
	84	
HİLAL		20
	97	
HALKAPINAR		20
	96	
STADYUM		20
	81	
SANAYİ		20
	81	
BÖLGE		20
	79	
BORNOVA		
TOTAL	774	200

Üçyol-Bornova: 16 minutes 23 seconds



OVERVIEW OF PASSENGER STATIONS

NAME OF P/S	CONSTRUCTION TYPE	DISTANCE BETWEEN P/S	NO. OF TRACKS	ESCALATORS	ELEVATORS	PLATFORMS	TICKET OFFICES	TURNSTILES	ENTRY/EXIT DOORS
Üçyol	Deep Tunnel	1.547	2	23	4	2 (side)	2	11 ent / 6 exit	5
Konak	Cut-Cover	1.048	2	7	5	1 (center)	2	9 ent / 8 exit	5
Çankaya	Cut-Cover	774	2	8	6	1 (center)	2	6 ent / 6 exit	4
Basmane	Cut-Cover	1.038	2	4	2	1 (center)	2	4 ent / 4 exit	1
Hilal	Viaduct	1.475	2	2	2	2 (side)	1	3 ent / 2 exit	1
Halkapınar	Ground Level	1.363	3	3	3	2 (center)	2	5 ent / 6 exit	2
Stadyum	Viaduct	1.176	2	2	2	2 (side)	2	3 ent / 4 exit	1
Sanayi	Ground Level	1.105	2	1	3	1 (center)	1	3 ent / 2 exit	2
Bölge	Ground Level	1.053	2	1	3	1 (center)	1	3 ent / 2 exit	2
Bornova	Cut-Cover		2	2	2	1 (center)	2	8 ent / 8 exit	2
TOTAL				53	32		17	55 ent / 48 exit	25

Height of platform : 88 cm.
 Length of platform : 125 m.