



**Brescia Subway**

**Ansaldo STS**

A Hitachi Group Company



### Ansaldo STS

Ansaldo STS is a leading technology company operating in railway and underground transportation.

The Company operated with two business units “ Signalling” and Transportation Solutions” with the provision of planning, carrying out and management of signalling and supervision services of railway and underground traffic, also as lead contractor.

Ansaldo STS, a company listed on Milan Stock Exchange, acts as main contractor and system integrator, with turnkey solutions in the framework of important projects throughout the world.



### INTRODUCTION

The origin of the project Metro Brescia comes from a decision of Brescia city council in 1987, when in accordance with the technical and economic examination of the various options available on the market (Tram, trolley bus, ordinary underground, etc.), fully automatic driveless underground has proved to be the long-period winning solution.

Actually, fully automatic driveless underground guarantees all operating advantages, which are usually provided by the usual underground systems (commonly used in big cities), and implements them in a medium-sized city, such as Brescia. The authorisation procedure has been very long and has led to an International call for tender in 2000. In 2003 the contract has been awarded to a group of companies, who formed a Temporary Business Association. They are the agent AnsaldoSTS (responsible for technological plants), Astaldi (responsible for Civil Works, railway equipment and plants not related to system) and AnsaldoBreda (responsible for rolling stock).



The path has been conceived for serving populous areas and linking the main points of interest of the city, including universities, hospital facilities, sport plants, public administration, old city centre, etc. .Furthermore, the path has been planned according to a mobility analysis, which has ensured the identification of the best positions for the stations, as well as the integrations with the remaining part of the city's transportation network.

## PROJECT FEATURES



Below are the main project features:

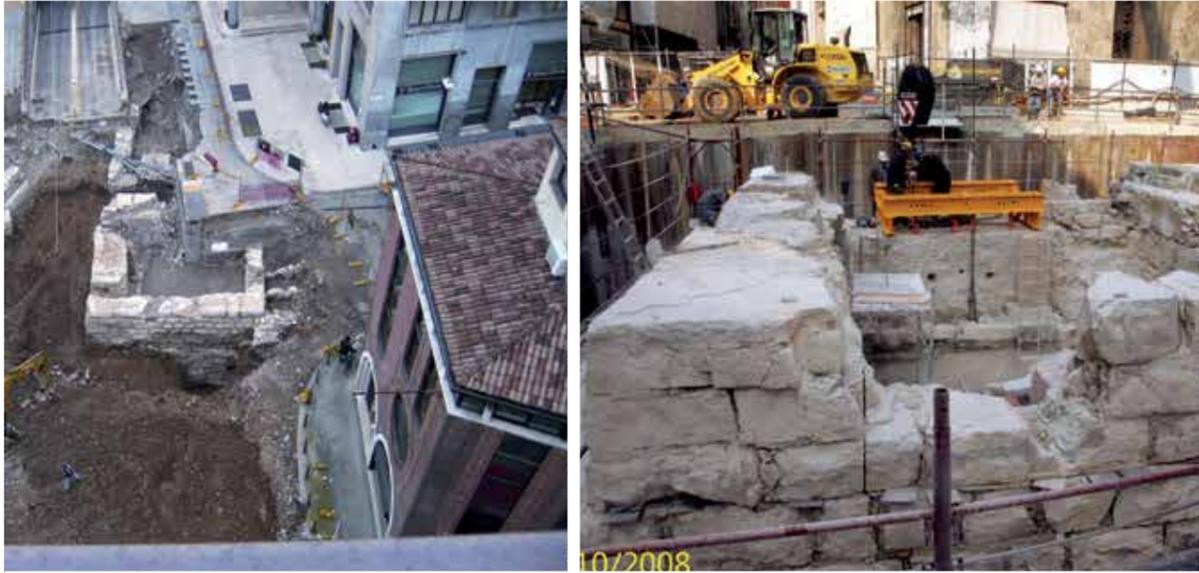
MAIN FEATURES	FIRST FUNCTIONAL SECTION		"TRADE FAIR" EXTENSION		VAL TROMPIA	
		Unit		Unit		Unit
<b>Line</b>						
Total length	13,100	m	3,500	m	14,000	m
In cuts	5,900	m	—	m	1,400	m
In cuts and covers	3,800	m	1,800	m	4,700	m
At grade	1,700	m	—	m	—	m
On bridges	1,700	m	1,700	m	7,900	m
<b>Stations</b>						
Total	17	n	5	n	15	n
In tunnels	8	n	—	n	2	n
In cuts and covers	5	n	2	n	7	n
At grade	2	n	—	n	—	n
On bridges	2	n	3	n	6	n



## Performance

Train frequency	<b>3 - 6 min</b>
Number of trains	<b>18</b>
Average working speed	<b>More than 30 km /h</b>
Max. speed	<b>80 km/h</b>
Initial carrying capacity	<b>8,500 passengers/hour per direction</b>
Annual carrying capacity	<b>16 million passengers/Annual carrying capacity per direction</b>





## THE PROGRAMME

The project, started in October 2003, has been developed throughout 9 years, because of significant archaeological findings in the area of Brescia old city centre, as well as changes to the projects of deep stations.

The concerned stations are S.Faustino, where the ruins of Venetian walls have been found, and Vittoria, where the ruins of a tower dating back to the later middle ages have been found. These findings have caused a considerable slowdown of the works and have led to the need of making several changes to the projects in the same stations.





## DESCRIPTION OF THE SYSTEM AND THE SUBSYSTEMS

Below are the main technologies and subsystems supplied by Ansaldo STS for the Brescia subway:

- ATC (Automatic Train Control)
- TELECOMMUNICATIONS (radio, passenger announcements, video surveillance)
- SCADA (Supervision, Control And Data Acquisition)
- AUTOMATIC WALKWAY DOORS
- POWER SUPPLY AND ELECTRIC DISTRIBUTION
- THIRD RAIL
- CONTROL CENTRE
- DEPOT



## ATC

The ATC (Automatic Train Control) is the automation “core”. The underground systems of the driverless type consist of a set of technological systems, all of which are monitored by the operators at the Control Centre located inside the Depot. The ATC is the technological subsystem that guarantees the stop, at the target point, of the trains in the station, as well as the door opening and closing, the exits from the stations, the keeping of the correct speed and the correct safe distance between the trains.

The automation system makes it possible to achieve the following:

- the automatic driving system, characterized by constant data exchange between the control circuits found both on the line and on the vehicle and the Control Centre;
- safe driving, thanks to the constant control and the train speed and the train position along the line;
- check of all of the operating parameters (remote measurement and diagnosis);
- constant check and correction of the difference between the expected running time and the real one;
- high-precision stop at the target point;
- high operating flexibility.



## Telecommunications

This system makes it possible to provide all the passenger information by means of audio/video installations, outside the station, on the walkways and inside the trains.

The telecommunication system consists of all of the connections needed to control the rest of the system, as well as inform the passenger and monitor the passenger’s safety both at the station and on the train.

In particular, this system makes the following items available:

- RADIO connection:
  - between the Control Centre and the service personnel;
  - between the Control Centre and the passengers on board the vehicle;
  - between the Control Centre and the service personnel on board the vehicle;
- telephone equipment;
- passenger information (PID) both on the vehicle and on the walkways;
- sound broadcasting system, with real-time and programmed announcements;
- emergency intercom both on the train and on the walkway, to allow passengers to communicate with the Control Centre;
- video surveillance system (managed by the Control Centre) both on the train and on the walkways;
- audio/video recording.

## SCADA

SCADA is a technology that makes it possible to monitor, while standing at the Control Centre, all the systems at the stations, on the vehicle and along the line. Thanks to a complex system made up of sensors and devices, the Control Centre operator can verify the correct operation of the various installations making up the entire underground system, i.e. the lifts, escalators, ventilation system, cut-outs, etc. and also activate, in an emergency, both the ventilation system and the power supply to the stations/line.

## Automatic walkway doors

The automatic walkway door are used at all of the subway stations. This type of technology makes it possible to achieve full separation between the platform and the line; thus, the purpose of the walkway doors is to optimize safety, since they will fully prevent people from accessing the tunnels and the line from the walkways. Moreover, it will enhance the comfort of the passengers at the station, by protecting them against the heavy air flow inside the tunnel.

The automatic walkway doors are controlled by the ATC system and will be opened only concurrently with the opening of the train doors, when the train stops at the station.

## Power supply and electric distribution

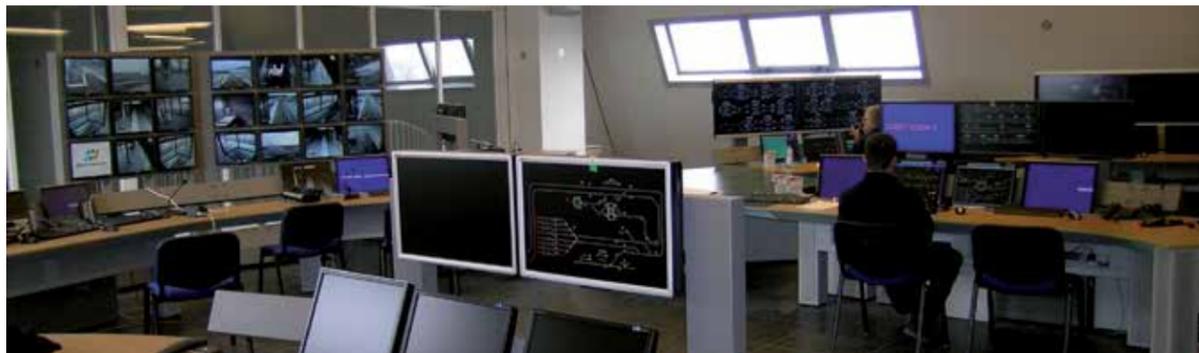
The function of the power supply system is to receive the electric power at 15 kV from the delivering entity through four dedicated ASM delivery points in order to power the third rail (electric traction) at 750 Vdc as well as all of the auxiliary service loads for the various Electric Substations and Station Cabins.

Each station is equipped with two transformers (15/0.4 kV) to supply the electric power to the various subsystems (i.e. ATC, TLC, SCADA etc.).

Some of these subsystems are connected to UPS sets, so as to guarantee the operation of the same even in case of temporary failure of the medium-voltage loop distribution.

## Third rail

The “Third Rail” subsystem consists of a conductive bar (made of aluminium and steel) running parallel with the running tracks, which is used to deliver the electric power needed for the railway vehicle traction. The vehicle picks the power up by means of a number of side shoes creeping on the third rail lower surface.



## Control centre

The control centre represents the system “core”. It shall allow the service personnel to carry out, in as an efficient manner as possible, all of the surveillance, intervention and service actions that will make the system safe for the passengers and the public at large.

Below are the functions available to the control centre personnel:

- line supervision;
- communications with the line personnel;
- passenger control and assistance;
- traffic supervision and control;
- maintenance supervision.

## Depot

The Depot area has a surface area of approximately 7.2 hectares and is located in the S. Eufemia Buffalora area.

This area includes several buildings performing a number of functions, i.e.

- vehicle garaging;
- maintenance area;
- spare part warehouse;
- automatic vehicle washing;
- service vehicle maintenance.



The workshop is fitted with several special equipment used for vehicle maintenance, e.g. a lathe in a pit and the lifting equipment.

Moreover, a building is available for accommodating the offices of the upcoming running and maintenance company (the Control Centre will be installed inside this building, too).

## Stations and architecture

The basic principle on which the architectural work has been based involves originating the station architecture from the space generated by the pre-defined route, and also try to provide external light take-off points and visual connections between the various levels and between the passages, so as to make the route more appealing. The architectural style used in Copenhagen has been taken as a reference, so as to:

- ensure higher capacity and comfort levels;
- make the stations more appealing to the passengers;
- improve the surrounding environment and also provide further opportunities for integration in the urban environment;
- achieve a very high strategic quality level in connection with the image of the city.



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