Le attività delle aziende italiane sul mercato internazionale

The Italian engineering and design at international level

Svolto nell'ambito di
Expo Ferroviaria 2012

27-29 marzo 2012

Lingotto Fiere, Area Expo,
Sala Rossa
Via Nizza, 294 - Torino

EXPO Ferroviaria 2012

The European rail culture and knowledge export in Extra-European countries

The role and the recent experience of an Italian engineering company

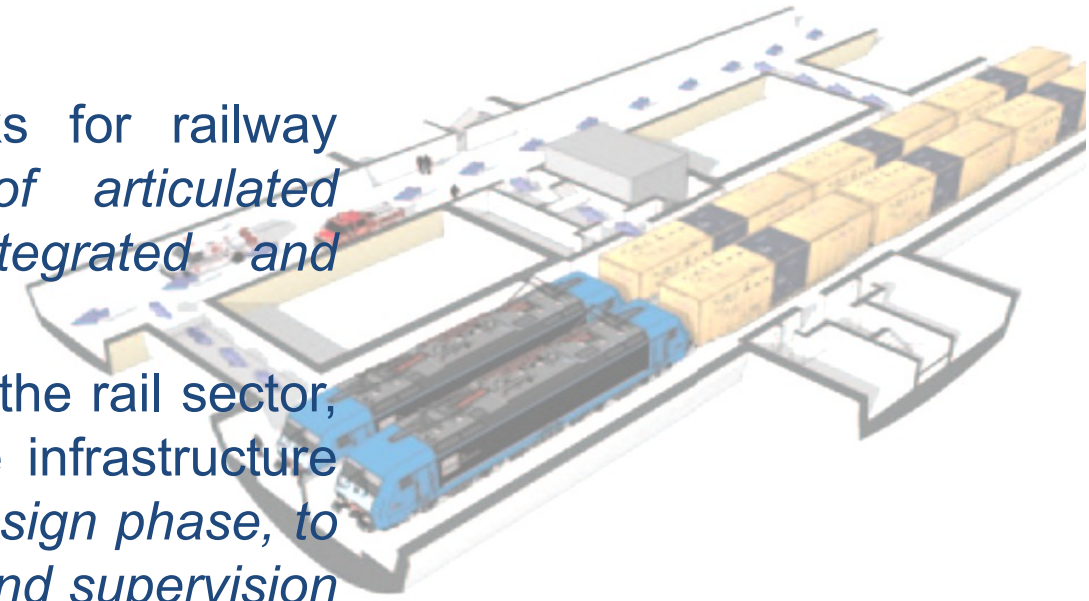
A.Corsi - G.Astore - S.Eandi

GEODATA

1. Who is Geodata
2. What Clients usually ask us
3. The local railway culture and experience
4. Examples

Recent Geodata experience

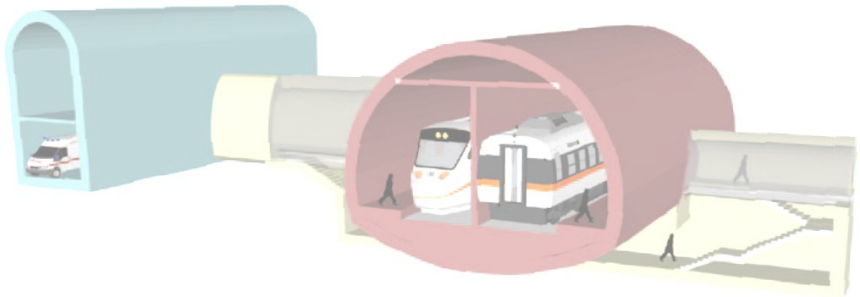
Geodata was founded in 1984, in the last years we have designed and supervised works of more than 1000km of railways, in most cases abroad and out of Europe.



- Essential role in the works for railway infrastructures: *definition of articulated projects that required integrated and complete services*
- Multidisciplinary expertise in the rail sector, in the entire life-cycle of the infrastructure and equipments: *from the design phase, to providing technical support and supervision during construction, from commissioning to maintenance*
- Rooting in the territories, while maintaining an important technical interface with the Italian technological centre

➢ *Permanent cooperation together universities (i.e. Turin Polytechnic and Trieste University)*

Geodata is involved on big railway projects in the following extra-UE countries:



America
- ✓California
- ✓Venezuela
- ✓Brazil
- ✓Chile
- ✓Argentina

Europe – not UE
- ✓Russia
- ✓Georgia

Africa
- ✓Morocco
- ✓Algeria
- ✓Guinea Bissau
- ✓Guinea Conakry

Asia
- ✓China
- ✓India
- ✓Malaysia

The extra-European and developing countries are increasingly demanding in terms of:

- Quality of service
- European technology transfer
- Training during project design and implementation phases
- Managing the entire process, from design to the implementation of railway infrastructures
- Designer in Railways Project Financing

Railway abroad - General difficulties:

- Changing mentality
- Listening to the voice of the Costumer and the Partners
- Being able to mix “old and new”
- Sharing technical information and experience
- Understanding the local culture and be able to communicate
- Understanding the local design and construction approach
- Working in all project steps: from feasibility to construction
- Providing a complete project from infrastructure to rolling stock

CHINA: HIGH GROWTH – HIGH SPEED

China has the largest high speed railway network in the world: over 7.000km
Its network is continuously growing

- ❑ **in 2012 - 13.000 km**
- ❑ **in 2020 - 25.000 km**

Total investment in 2020 will be up to **US$ 300 Billion.**

Geodata is involved on supervising works of three High Speed Railways (HSR) railways

Supervision Works activities for the following lines:

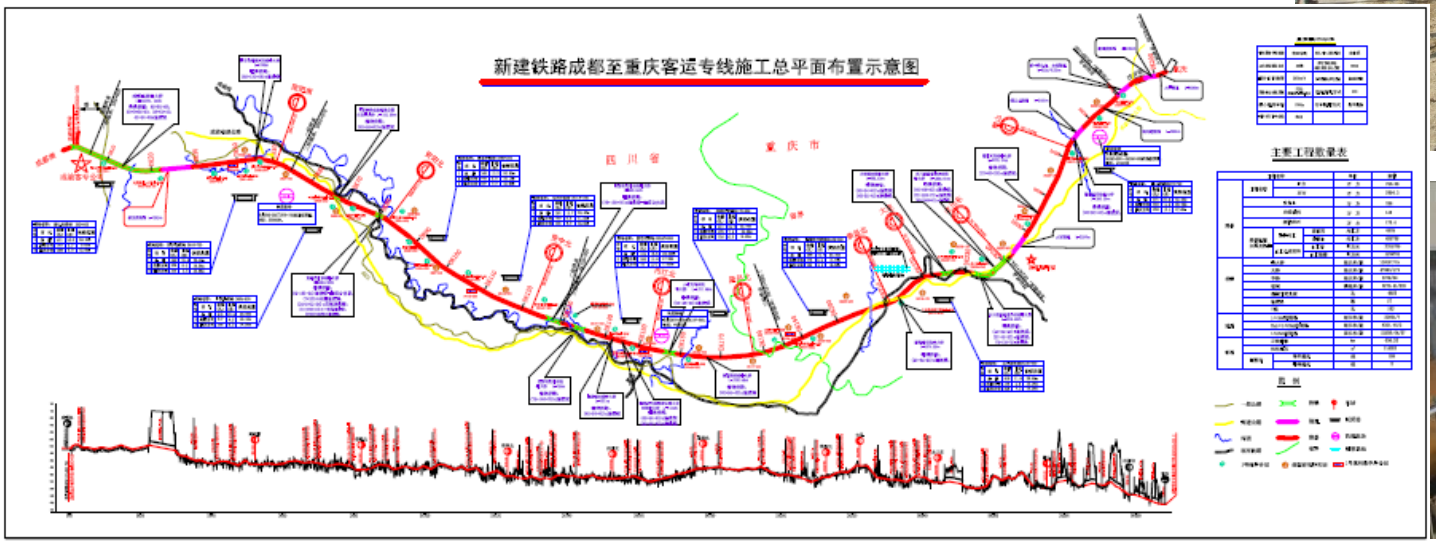
1 Changsha-Kunming (1175 km) - Lot 1, 80 km
Guizhou Province

2 Chengdu-Chonqing (310 km) - Lot 2, 110 km
Sichuan and Chongqing Provinces

3 Shenyang - Dandong (205 km)
Liaoning Province

General characteristics:

- ❑ Passenger dedicated line
- ❑ Design speed: 250-350 km/h
- ❑ Double track
- ❑ Track spacing: 5m
- ❑ Max long slope: 20 ‰
- ❑ Train composition: max 650m
- ❑ Electric traction
- ❑ Safety system: automatic block
- ❑ Train type: EMU Electric Multi Unit
- ❑ Train operation control mode – Traffic control: CTC
- ❑ Platform type: ballast-less, slab typeⅢ Zanan CRTS



Some technical aspects:

- Somewhere predisposition for quadrupling the line
- Long viaducts and with long spans crossing big rivers
- Tunnels in difficult conditions
- High quality required, typical of the high speed railways
- High precision request for civil works in order to set correctly the ballast-less superstructure

Example of differences:

- Chinese regulations: everything is standard and sometimes not optimized
- In many cases, Chinese regulations are quite different from the European or Americans ones
- Different approach to the design
- Different significance for the maintenance concept
- Different use and investments for Equipments & Machinery
- Very big industrial Groups as Contractors
- Different approach to the Management system

But the main differences and difficulties are not technical!

- **Linguistic barrier**: the Chinese is the official language, English usually is not spoken by Chinese people)
- **Cultural habits**: e.g. no straightforward attitude to problem solving; sometimes narrow-mindedness towards innovation
- **Management**: organization, planning, interfaces, relationship between design and construction.

crete was being produced for
idge beam prefabrication was

1) or very unstable protection-
otected electricity cables and
2, 3); Safety Posters – Safety
ent such as fire-extinguishers
le positions for all workers and
nent not protected to prevent
ysical division of work site to
ork takes place. See also
fety gear.

ers (chemical-type). The area

施工情况：

拌合站已经开始投入使用，生产
还处于准备阶段，已开始土石方

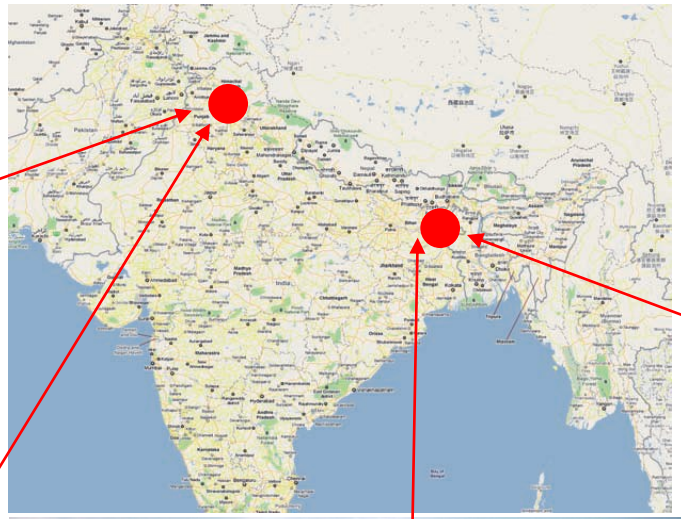
安全状况：

没有防护措施以预防高空坠落
定；存在用电隐患，电缆和电力
片 2，3）；安全标识：安全警示
置在施工现场入口或工人及来访
设有防护，以防工人误碰。施工
域。请见人员安全设施巡检结果

环境状况：

4. Examples: *Traditional railways in India*

GEODATA is the Consultant of the Indian Railways for the alignment and railway studies of the connection between **Sivok and Rangpo (West Bengala)** and it is the Designer of the railway tunnel T74 in **Dharam-Qazigund section** of the Udhampur-Srinagar-Baramulla line **(Kashmir)**



Indian Raiways main data:

- Development plan 2012-2017: **112 US$ Billion**
- 2012-2017 up to **700km** of new lines
- **30 million** passengers daily
- The world's fourth largest commercial employer, by number of employees: **14.000.000**
- Expected **1,025 Billion** of freight carried in 2012-2013
- Extensive network of **62.725 kilometers**

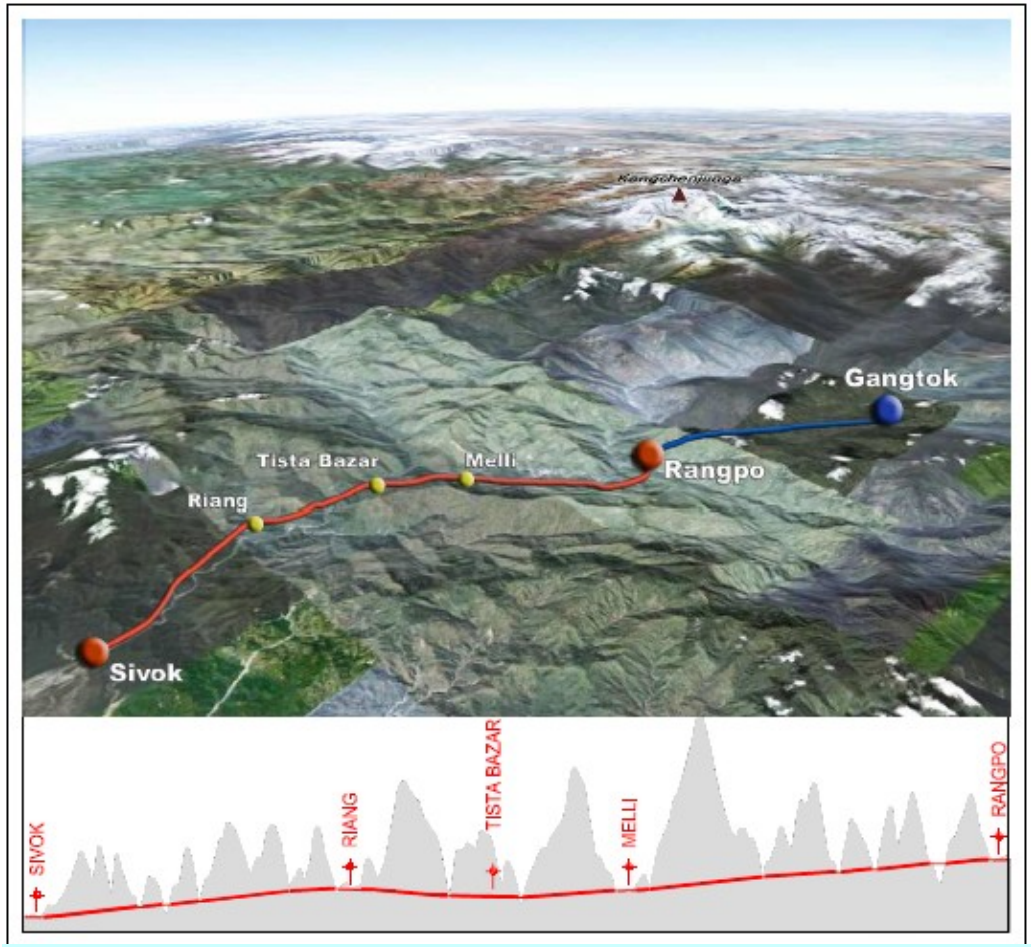
4. Examples: *Sivok-Rangpo railway (West Bengala)*

The main characteristics of the project:

Total length : approx.44+900m;
Stations: 5;

Tunnels: 14 tunnels, for a total length 38.5km with longer tunnel 5Km;

Bridges: 13 major with maximum length 400m above Rangpochu;



General design parameters

- *Gauge:* 1.676 mm
- *N. of tracks*: Single BG track, with clearances for electrified route
- *Axle load:* 25 t loading of 2008 (also for bridges)
- *Design speed:* 65 km/h (freight trains); 100 km/h (passenger trains)

4. Examples: *Sivok-Rangpo railway (West Bengala)*

Several alternatives have been studied with multi-criteria analysis in order to select and choose the final alignment solution

The main factors taken into account in the multi-criteria analysis have been related to:

- ❑ Geological and Environmental impacts
- ❑ Tunnels and bridges constructability
- ❑ Railways operational and safety issues
- ❑ Life cycle costs of the project
- ❑ Location of the of Rangpo Station with future connectivity to Gangtok

Il Sole 24 ORE

I dieci cantieri delle meraviglie

Ferrovie, tlc, ponti, dighe: al via negli emergenti lavori

Micaela Cappellini

Novecento miliardi di dollari. Più o meno la metà di quanto l'Italia produce in un anno.

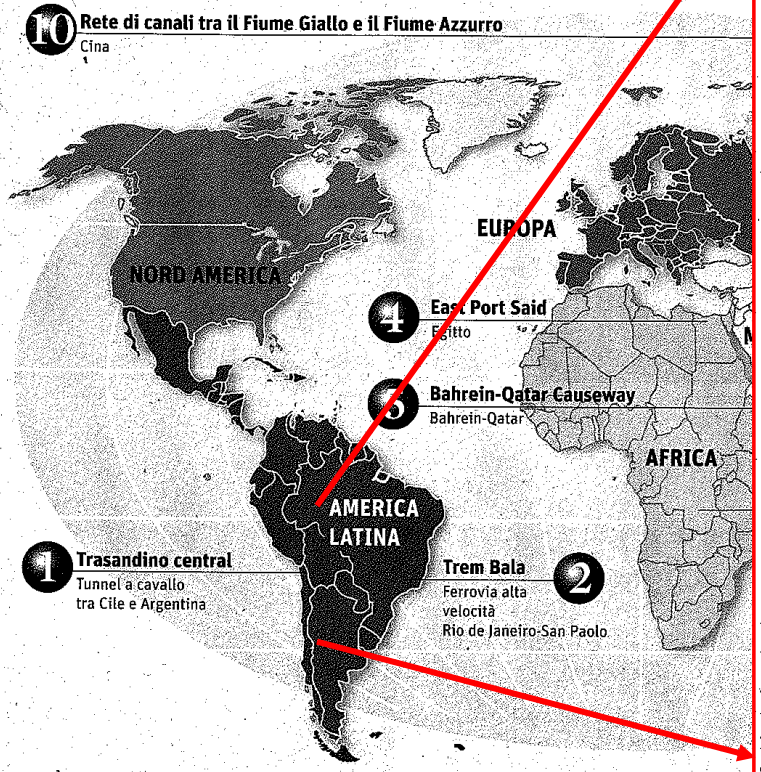
È certamente una cifra imprecisa, ricostruita a tavolino impastando tra loro le stime delle società di consulenza, le dichiarazioni d'intenti dei governi e i desiderata delle istituzioni internazionali. Ma si avvicina a quanto spenderanno quest'anno i paesi emergenti nella costruzione di nuove infrastrutture. Dove per infrastrutture si intende qualsiasi "via" che li porti verso lo sviluppo: da quelle, più tradizionali, d'asfalto, agli acquedotti per l'approvvigionamento idrico; dai terminal aeroportuari delle rotte d'aria fino alle autostrade informatiche; dalle tubature del gas ai binari dell'alta velocità.

L'Asia, manco a dirlo, farà la parte della tigre. L'Unescap, la Commissione economica e sociale per l'Asia e il Pacifico delle Nazioni Unite, stima il fabbisogno di infrastrutture per quest'anno di tutto il continente in 600 miliardi di

ASIA ÜBER ALLES

Secondo stime Onu, è di 600 miliardi di dollari il fabbisogno di quest'anno per l'intero continente
Ma si muove anche l'Africa

La mappa dei lavori in quattro continenti



Il maxitunnel delle Ande che unirà due oceani

Trasandino Central (Argentina-Cile)

5 miliardi $

Un collegamento ferroviario, diretto e veloce, tra due oceani, quello Atlantico e quello Pacifico. E tra due nazioni, l'Argentina e il Cile. Requisito necessario per realizzarlo: trapassare, letteralmente, le Ande. Nasce così il Trasandino Central, il maxitunnel (52 chilometri la sua lunghezza) che costituirà il tassello fondamentale del Corridoio bioceanico. Il progetto del tunnel, che verrà realizzato a un'altezza compresa fra i 2mila e i 2.500 metri, è dell'argentina Corporación America (Casa); del consorzio che lo realizzerà - l'operatività è prevista per il 2020 - fanno parte anche Mitsubishi, San José, Empresas Navieras, Odebrecht e Queiroz Galvão.

4. Examples: *Corredor Bioceanico Aconcagua*

Railway transport system of 205km along an ancient railway built in 1910 between two countries: Chile (Los Andes) and Argentina (Mendoza). The line will be able to transport up to 80 Mton/year, but also able to work as passengers line.

Unique case of Private Financing where the Dealer:

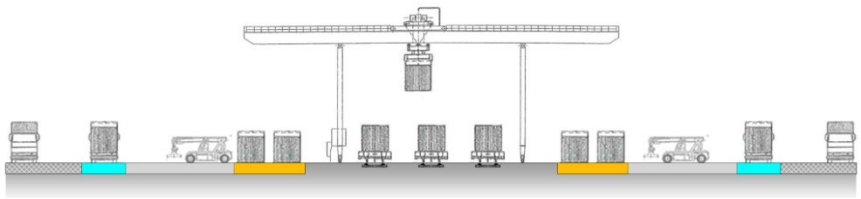
- ❑ **Develops** the design
- ❑ **Builds** works
- ❑ **Operates** the railway

Geodata is not only general designer, but a Partner in the proposing Consortium

The challenges:

To develop this project was necessary to put aside years of European (and Italian in particular) railway culture:

- ❑ Facing a situation in which there is not a railway culture
- ❑ Design a mainly freight line
- ❑ Choose between a closed rail system (from terminal to terminal) or open
- ❑ Defining the type of transport (containers, loose cargo, rolling highway...)
- ❑ Choosing the rail gauge (1000mm, 1435mm, 1676mm)
- ❑ Defining the design speed and all key parameters of the track
- ❑ Analysis about possibility to recover energy
- ❑ Defining reference clearance gauge
- ❑ Choosing the type of traction
- ❑ Choosing the rolling stock
- ❑ Evaluating the composition of the trains
- ❑ Analyzing many operational schemes



Main data:

- Total length: 205km
- Gauge =1676mm
- Traction: A.C. 25kV 50hz
- Train composition: 750m with double or triple traction in blocked composition
- Type of transport: Accompanied and Not Accompanied
- Maximum number of trains par day: n. 200
- N. 3 construction and operational phases: single line, double line, opening to Chilean and Argentinean railway system
- Max longitudinal slope: 20‰
- Multimodal terminals: n.2 - total area of 200Ha
- Base tunnel length: 52,5km
- Bridges and viaducts: 13km
- Short tunnels: 20,6km

4. Examples: *Corredor Bioceanico Aconcagua*

It is worth to underline:

Base Tunnel: Choosing a functional solution that would ensure adequate margins with a single tunnel

High Safety attention

Technical solutions to reduce accident risk: multi-scanner portals for the Base Tunnel, anti-derailment systems, innovative rolling stock

Simple signaling with integration on trains (ATP to support driver)

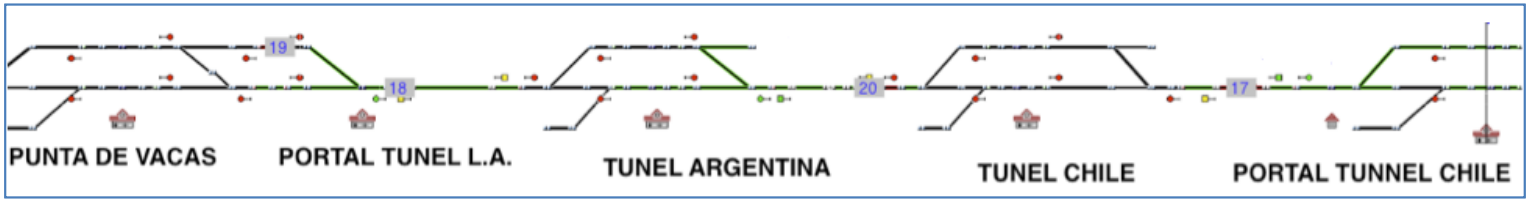
Risk analysis along all the alignment according to the climate and geo-morphological conditions

Railway simulation

Using internationally recognized software to simulate the train operation simulation

Need to test the limits of the system at various stages

Complex model that simulated all 205 km of the network including terminals for each stage



4. Examples: *Sarmiento Railway Junction*

The project includes the renewal of rolling stock, the upgrade of infrastructures, improvement of architecture and upgrade of technological installations to ensure better safety and reliability

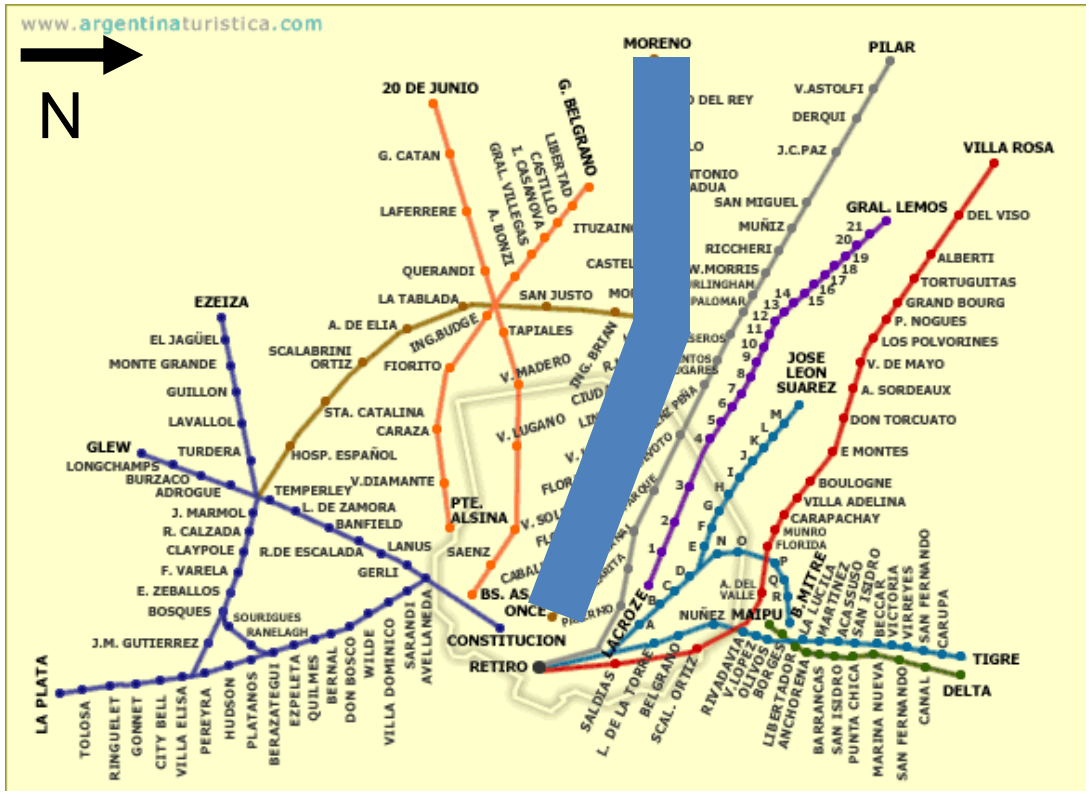
GEODATA is the DESIGNER all the works, including Civil, E&M works and Rail System, including tracks, operational, signalisation, telecomunication, electrical and catenary design

The main works:

- 32 km underground line
- 15 stations
- 33 ventilation shafts

III Step | IIStep | I Step

The Sarmiento Railway Junctions in Buenos Aires: the main current urban railway project in Argentina **(3.0 Billion $)**



The Sarmiento railway with more than 300 daily trips, transporting 110 millions people each year, lies entirely on surface and it provides the main transport system for people moving between the western suburbs and the city centre of Buenos Aires

Metropolitano - Línea Roca
TBA - Línea Sarmiento
Metropolitano - Línea Belgrano
Metropolitano - Línea San Martín
Ferrovías - Línea Belgrano
Tren de la Costa

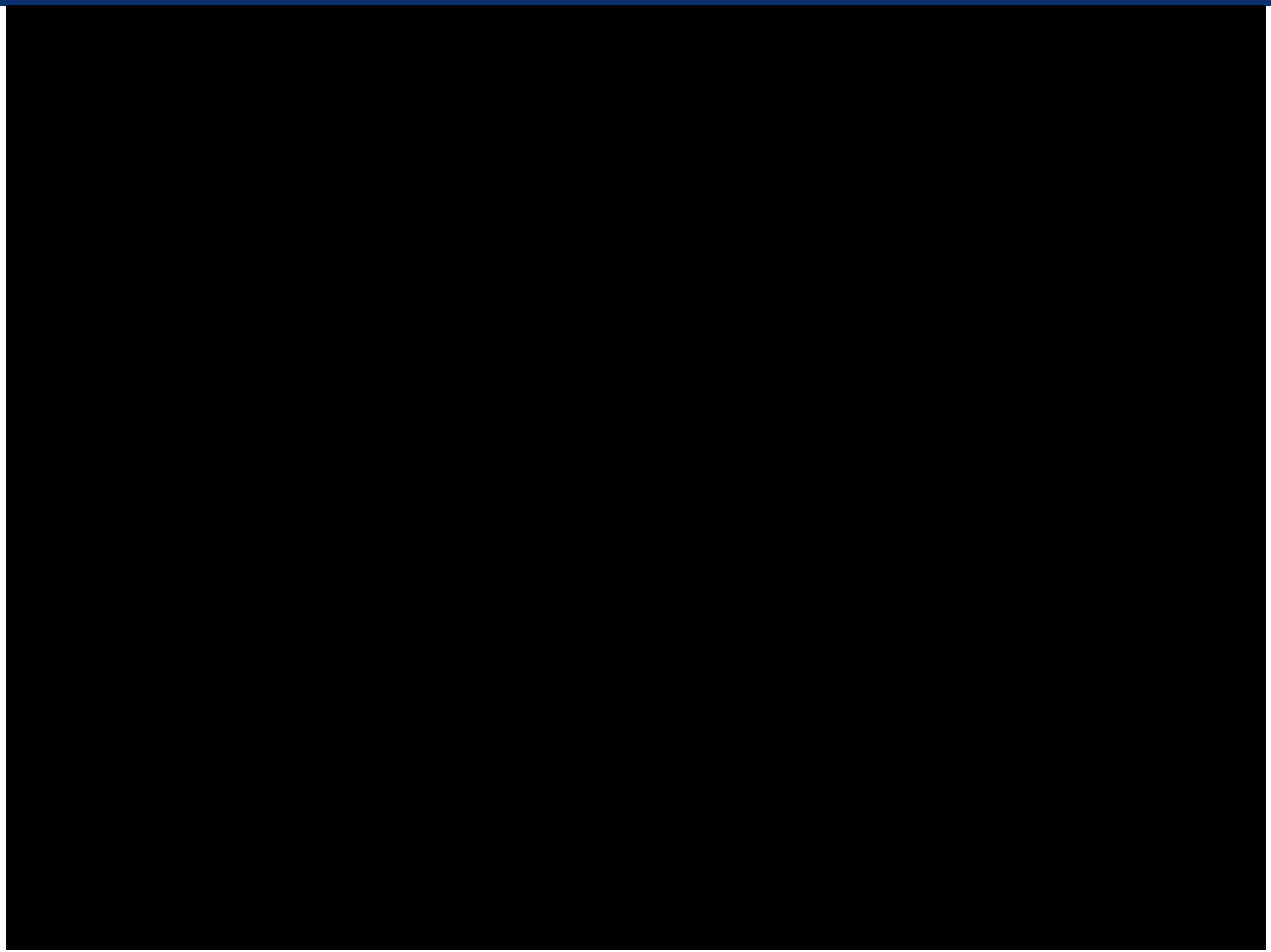
Metrovías - Línea Urquiza

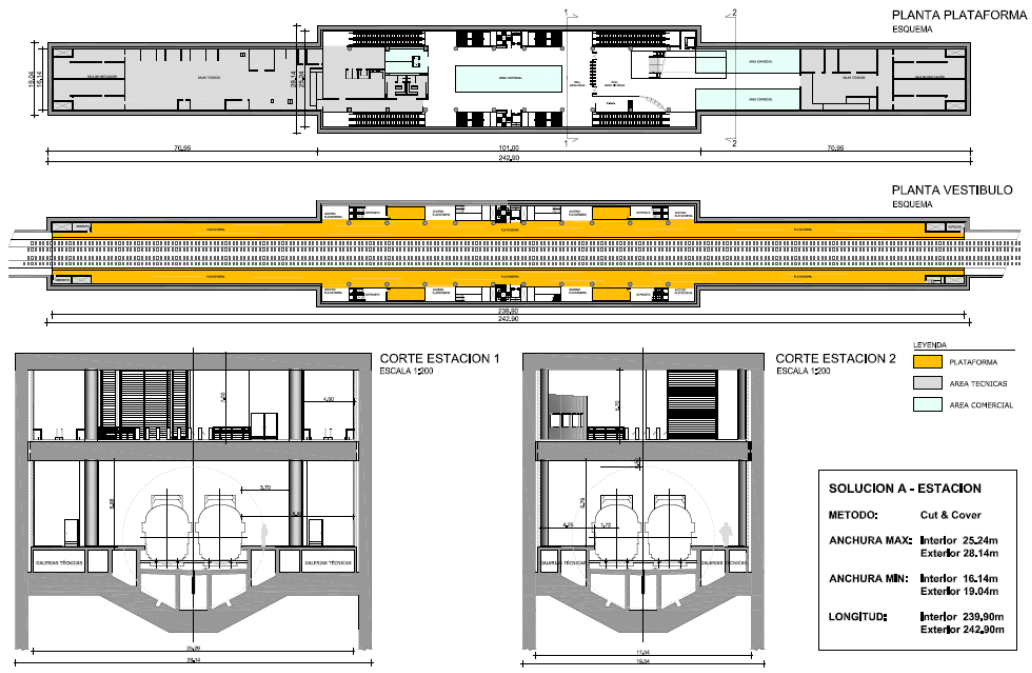
1: Artigas
2: Arata
3: F. Beiró
4: El Libertador
5: Devoto
6: V. Linch
7: Moreno
8: Lourdes
9: Tropezón
10: G.M. Bosch
11: M. Coronado
12: P. Podestá
13: J. Newbery
14: R. Darío
15: E. de los Andes
16: De La Calle
17: Barrufaldi
18: Cap. Lozano
19: Tte. Agneta
20: C. de Mayo
21: Sgto. Cabral

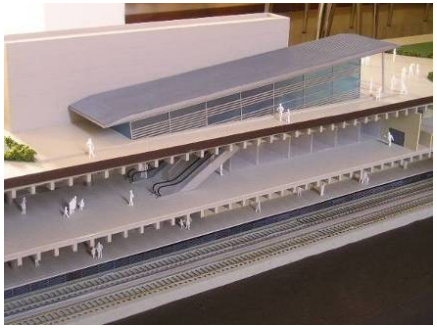
TBA - Línea Mitre

Ramal J.L. Suarez
A: 3 de Febrero
B: Carranza
C: Colegiales
D: Belgrano R
E: L.M. Drago
F: Gral. Urquiza
G: Pueyrredón
H: Miguelete
I: San Martín
J: San Andrés
K: Malaver
L: Ballester
M: Chilavert

Ramal Mitre
N: Coghlan
O: Saavedra
P: J. B. Justo
Q: Florida
R: Cetrángolo





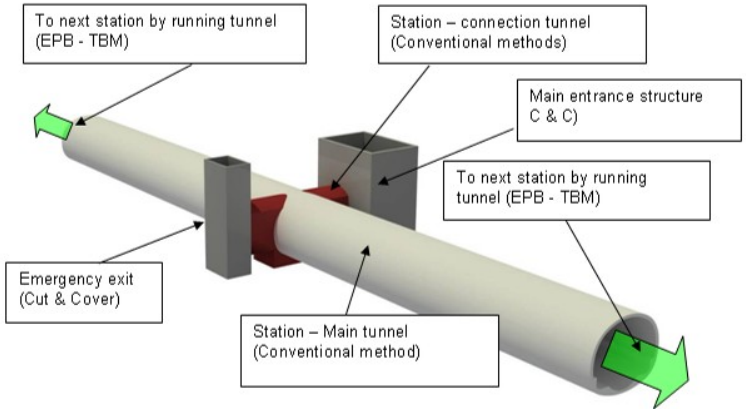


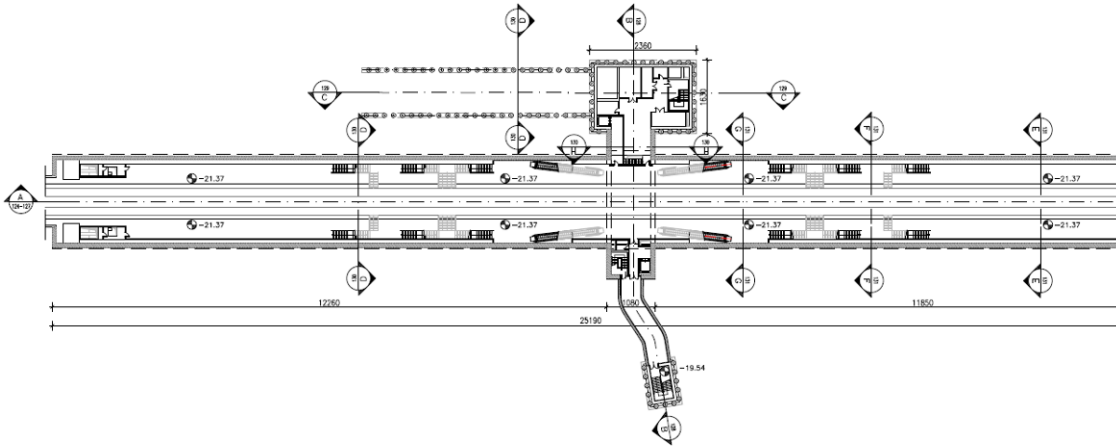
The original tender solution proposed the construction of all stations by means of Cut and Cover Method. Stations had to be completely built in advance with respect to the passage of the EPB-TBM excavating the running tunnel

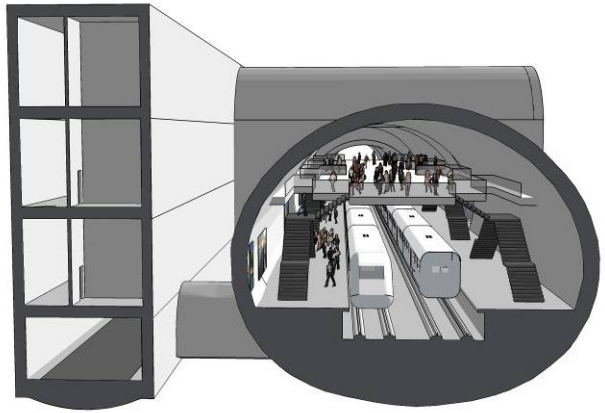
Considering the strong superficial bonds, like the railway systems and the railway deviations (all works, included in each stage, are to be performed allowing the current superficial line in operation), it was necessary to define a new solution for all the stations avoiding any disturbance to existing railway facilities

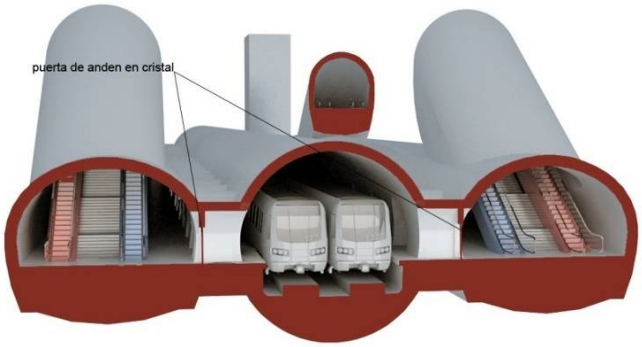
In the revised solution, the underground structures of the stations will be excavated by means of conventional method.

The most challenging feature in construction of stations is attributed to its large cross section area of 300m2 in difficult geotechnical and very shallow conditions.





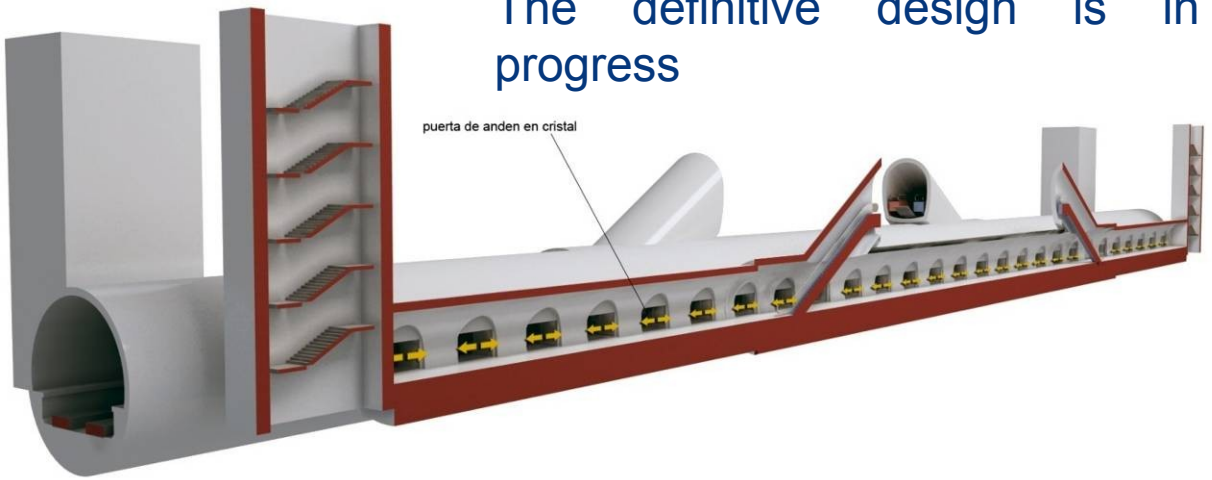




In order to respect the new schedule dead-line, it will be necessary to strictly separate the TBM works from the platforms and station work

A new functional and structural solution is defined for the stations, with the implementation in the railway system of the **sliding doors** and of the **ATO**.

The definitive design is in progress



4. Examples*: Sarmiento Railway Junction*

Le attività delle aziende italiane sul mercato internazionale

The Italian engineering and design at international level

Svolto nell'ambito di
Expo Ferroviaria 2012

27-29 marzo 2012

Lingotto Fiere, Area Expo,
Sala Rossa
Via Nizza, 294 - Torino

THANK YOU

EXPO Ferroviaria 2012

GEODATA