

**RECORD OF CONSTRUCTION PROJECTS
IMPLEMENTED BY THE
BETON SAZAN MEHR ENGINEERING Co.**



BETON SAZAN MEHR Engineering co.
(Private Joint Stock) Reg. No. : 139207

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RETON SAZAN MEHR

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August - 2011

Introduction

The Beton Sazan Mehr Engineering Co. (Private Joint Stock) was established in 1998 and is graded by the State Management and Planning Organization in the fields of :

- Transportation (Grade 1)*
- Construction (Grade 2)*
- Water (Grade 3)*
- Installations and equipment (Grade 5)*

This company expresses its readiness for cooperation and implementation of projects related to its expertise and experience. A summary of the experience of this Co. regarding construction projects is as follows :

Working-Experience Of The Corporate Employees

The majority of the corporate directors and technical and executive employees of this Company were involved in construction of tunnels for Tehran Metro Lines 1 & 2, from the very beginning of activity of Tehran Urban and Suburban Railway Co. (Metro), and the same individuals, now continue their activities with the Beton Sazan Mehr Engineering ever-since its date of establishment.

Members Of The Board Of Directors

- 1- Mr. Majid ANSARIFARD, Managing Director & Chairman of the Board of Directors.*
- 2- Mr. Sharagim ANSARIFARD, Vice-Chairman of the Board.*
- 3- Mr. Abbas KAZEMI ARANI, Member of the Board of Directors.*
- 4- Mr. Alireza AHMADINEJAD, Member of the Board of Directors.*
- 5- Mr. Fereidoun KOMEILI, Member of the Board of Directors.*
- 6- Mr. Shahrouz ANSARIFARD, Member of the Board of Directors.*
- 7- Mr. Mehdi ANSARIFARD, Member of the Board of Directors.*

Project Introduce

Project Title : Changing the Route of the Connecting-Tunnel of Tehran Metro Lines 1 and 2 & Completion of Construction of the M2-02 Section of the Tunnel Along Line 2

Employer : Tehran Urban and Suburban Railway Co. (Metro).

Consulting Engineer : Farbar Consulting Engineers.

Initial Amount of the Contract : Rls.15,898,136,933.

Contract Period : Twelve Months.

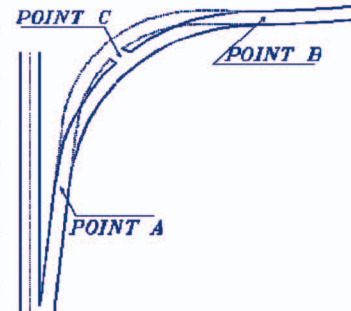
Commencement-Date of the Project : 6 Feb. 1999

Project Status : Final Acceptance Certificate issued.

Final Amount of the Contract : (Including the contract-value, the amount of price-adjustment and difference in price of construction-materials): Rls.23,974,000,000.

Description & Technical Specifications Of The Project

As described in the below diagram, the tunnel connecting Line 1 to Line2, was initially constructed with a 90-degree curve, in between points A and B. Based on technical considerations, the said curve had to be changed to a 120-degree curve. For this purpose, the excavation-operation for the access-tunnel was started at the point C on the already constructed tunnel, towards a point on the would be new tunnel. Then, from such point, the excavation operation was carried-out in two different directions towards points A and B. At the time the construction-operation of the new tunnel was in progress, measures were taken to demolish the full ring of the existing tunnel at the intersection points (i.e., points A and B) which was approximately 84 meters in length, with a view to have an overlap of the two tunnels at the said points. Construction of the M2-02 section of the tunnel, comprised the other part of the project. The tunnel was excavated at two different sections, namely the upper and the lower parts. Then, measures were taken regarding temporary protection, insulation and finally, lining of the tunnel.





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Project Introduce

Project Title : Insulation Works of the Kandavan Tunnel

Employer : Ministry of Road and Transportation.

Consulting Engineer : Sharif Multi-Purpose Cooperative Co.

Initial Amount of the Contract : Rls.2,023,356,000.

Contract Period : Six Months.

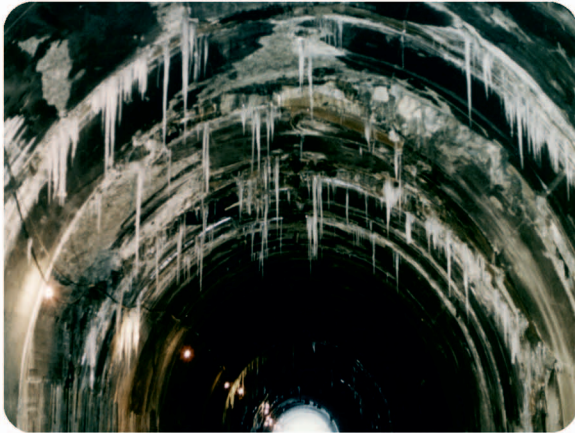
Commencement-Date of the Project : 2010

Project Status : Final Acceptance Certificate issued.

Final Amount of the Contract : Rls.2,400,000,000.

Description & Technical Specifications Of The Project

The drainage-system and Water-tightening of the Kandavan Tunnel project included installation of the drainage-plates to guide the water toward the gutters at the sides of the tunnel; installation of P.V.C. sheets for water-tightening purposes and installation of felt in order to protect the PVC sheets which were installed along a part of the Kandavan Tunnel. In the said Project, the insulation work was performed on a totally uneven surface, inadequate for installation of the sheets. In order to make the surface adequate, it was modified and leveled using a network of galvanized sheets and drainage sheets.



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Project Introduce

Project Title : Reinforcement of the Tunnel for Parking-Lot of the Station II of Tehran Metro Line 1

Employer : Tehran Urban and Suburban Railway Co. (Metro)

Consulting Engineer : Gueno Consulting Engineers.

Initial Amount of the Contract : Rls.2,250,000,000.

Contract Period : Four Months.

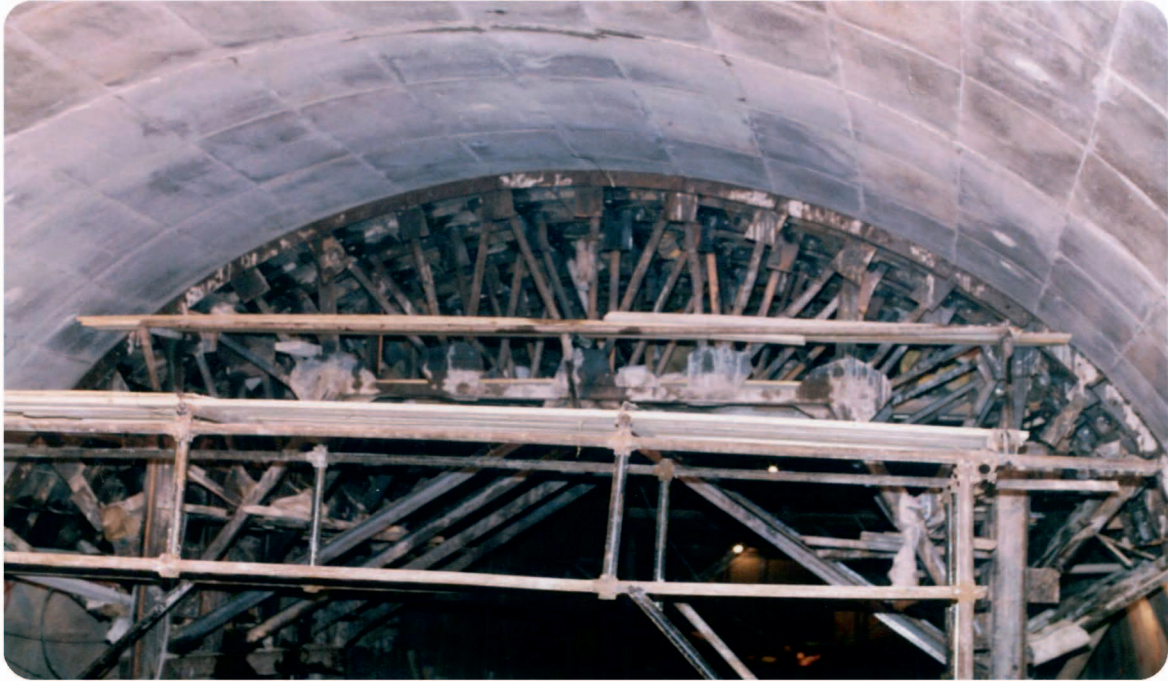
Commencement-Date of the Project : 2001

Project Status : Final Acceptance Certificate issued.

Final Amount of the Contract : Rls.3,283,000.000.

Description & Technical Specifications Of The Project

The implementation of this Project was assigned to this Company when closure of the access to the tunnel made it practically impossible for any mechanical motor-vehicle to be utilized. Therefore, execution of the reinforcement operation of the tunnel was carried-out merely through a well measuring 2.22 meters in diameter.



BETON SAZAN MEHR

Project Introduce

Project Title : Construction of the Core (Central Part) of the N2 Station of Tehran Metro Line 2

Employer : Tehran Urban and Suburban Railway Co. (Metro)

Consulting Engineer : Hegza Consulting Engineers.

Initial Amount of the Contract : Rls.5,201,802,349.

Contract Period : Thirty Months.

Commencement-Date of the Project : 2000

Project Status : Final Acceptance Certificate issued.

Final Amount of the Contract (Contract Amount Plus Price-Adjustment and Difference in Price of Construction Materials) : Rls.5,683,000,000.

Description & Technical Specifications Of The Project

A number of Tehran Metro stations were constructed using cut-and-cover trench method. In this method, first the supporting structure of the station was constructed through excavation of wells, drilled at adequate distance from each other and installation of H-shaped steel-piles inside the wells and performing the concrete-works using lean concrete. Then, by installing plates on top of the steel-piles and installing the transverse steel-beams of station-ceiling along the required length, traffic of motor-vehicles was once again realized. As a result, a bridge, measuring about 17 meters in width and a length of 50 to 140 meters (length of the station) was constructed. Subsequently, the earth-moving operation and then, construction of the final structure were carried-out under the said bridge.



BETON SAZAN MEHR

Project Introduce

Project Title : Construction of Interchange (Two-level junction) at the Taleghani Junction, Karaj City

Employer : Karaj Municipality

Consulting Engineer : Rahab Consulting Engineers

Initial Amount of the Contract : Rls.8,000,000,000.

Contract Period : Twelve Months.

Commencement-Date of the Project : 2001

Project Status : Final Acceptance Certificate issued.

Final Amount of the Contract (Contract Amount Plus Price-Adjustment) : Rls.17,946,000,000.

Description & Technical Specifications Of The Project

Implementation of this project at the most sensitive and crowded junctions of Karaj City, encountered major traffic problems, therefore, the method of execution was so selected that considering the existing traffic limitations, the motor-vehicles traffic-route be not closed. It is noteworthy that a major part of this operation, including excavation for piles, installation of the steel-bar mesh inside the piles and all of the concrete-works including piles, pile-caps and main slab were carried-out at nights.



BETON SAZAN MEHR

Project Introduce

Project Title : Construction of Surface-Water Collection Tunnel at Baharestan Sq.

Employer : Tehran Urban and Suburban Railway Co. (Metro)

Consulting Engineer : Farabar Consulting Engineers

Initial Amount of the Contract : Rls.4,190,000,000.

Contract Period : Twelve Months.

Commencement-Date of the Project : 2001

Project Status : Final Acceptance Certificate issued.

Final Amount of the Contract (Contract Amount Plus Price-Adjustment) : Rls.9,061,000,000.

Description & Technical Specifications Of The Project

Whereas, the surface-water collection tunnel at the Baharestan Sq. (related to Tehran Municipality had intersected with Tehran Metro Line 2, at a point in-between the Baharestan Sq., Station and the Ekbatan Ave. Station, a new tunnel was constructed to change the route of this tunnel so that the already existing tunnel be closed at the intended range.

The construction-operation of this tunnel was carried out using N.A.T.M. method.



BETON SAZAN MEHR

Project Introduce

Project Title : Construction of Tehran Metro Air-Exhaust Shafts In-Between M2 and 02 Stations

Employer : Tehran Urban and Suburban Railway Co. (Metro)

Consulting Engineer : Farabar Consulting Engineer

Initial Amount of the Contract : Rls.2,993,209,883.

Contract Period : Twelve Months.

Commencement-Date of the Project : 2002

Project Status : Final Acceptance Certificate issued.

Final Amount of the Contract (Contract Amount Plus Price-Adjustment) : Rls.6,333,000,000.

Description & Technical Specifications Of The Project

Excavation of access-shaft was performed at the location of tunnel air-exhaust shaft, with required diameter and depth as those of the main tunnels (the access-shafts of Tehran Metro Tunnels measure approximately 15 m. in diameter and 20 m. in depth), in such a manner that after each 1 to 2 meters excavation (depending upon the soil composition), steel-meshes together with pre-fabricated temporary protective-frames were installed at the side of the shaft, followed by shot-crete works. When the shaft reached the required depth, the construction operation of the access-tunnel (connecting to the main tunnel) and construction of the relevant Y-shaped (three-way) tunnel was carried-out until it was practically possible to perform the main-tunnel excavation works, in two different wings.



BETON SAZAN MEHR

Project Introduce

Project Title : Construction of O2-P2 Air-Exhaust Shaft Along the Tehran Metro Line 2

Employer : Tehran Urban and Suburban Railway Co. (Metro)

Consulting Engineer : Tarh-e-Bamdad Consulting Engineers

Initial Amount of the Contract : Rls.3,431,039,355.

Contract Period : Five Months.

Commencement-Date of the Project : 2003

Project Status : Final Acceptance Certificate issued.

Final Amount of the Contract (Contract Amount Plus Price-Adjustment) : Rls.4,593,000,000.

Description & Technical Specifications Of The Project

This air-exhaust shaft included two vertical shafts and a horizontal section, connecting the said two shafts, equipment-installation premise and an access-gallery connecting to the main tunnel.

At the connection-point of the access-gallery to the tunnel, segments supporting-structure was constructed, Segments-support operation included a combination of supporting and segment-cutting and embedding of metal elements, including beams and columns in substitution of the cut-segments.

This operation is one of the most significant and sensitive parts of air-exhaust shaft construction.



BETON SAZAN MEHR

Project Introduce

Project Title : Construction of 24-m. of Double-Track Tunnel for Tehran Metro Line 2

Employer : Tehran Urban and Suburban Railway Co. (Metro)

Consulting Engineer : Farabar Consulting Engineers

Initial Amount of the Contract : Rls.2,490,000,000.

Contract Period : Three and Half Months.

Commencement-Date of the Project : 2003

Project Status : Final Acceptance Certificate issued.

Final Amount of the Contract (Contract Amount Plus Price-Adjustment) : Rls.1,927,000,000.

Description & Technical Specifications Of The Project

Construction of the main tunnel was conducted in two distinct sections, namely upper and lower sections. Initially, the upper-section of the tunnel was excavated and temporary protection was made after completion of construction of the upper-section, construction of the lower-section was commenced in the very same manner. After completion of the cross-section, insulation work, reinforcement-bar placement, formwork using tunnel sliding-mold and then concrete-work were performed.

The cross-sectional area of the tunnel measures about 70 Sq. meters. Considering the length of the tunnel, volume of the earth-moving operation was 1680 Cubic meters. The volume of the concrete-work for the tunnel construction was about 384 cubic meters, with 44 tons of reinforcement-bar placement.



BETON SAZAN MEHR

Project Introduce

Project Title : Construction of Four Air-Exhaust Shafts at the Eastern Half of Tehran Metro Line 2

Employer : Tehran Urban and Suburban Railway Co. (Metro)

Consulting Engineer : Tarhe-Bamdad Consulting Engineers

Initial Amount of the Contract : Rls.14,500,000,000.

Contract Period : Six Months.

Commencement-Date of the Project : 2004

Project Status : Final Acceptance Certificate issued.

Final Amount of the Contract (Contract Amount Plus Price-Adjustment) : Rls.22,918,000,000.

Description & Technical Specifications Of The Project

As it was mentioned before, the air-exhaust shafts include a vertical shaft, a horizontal gallery and the segment supporting-structure.

Dimensions of these air-exhaust shafts are about 10 m X 10 m with an approximate depth of 30 meters and an earth-moving operation of about 10000 cubic meters. The volume of concrete-work of the Project was approximately 5700 cubic meters, with 800 tons of reinforcement-bar.



BETON SAZAN MEHR

Project Introduce

Project Title : Construction of the Fifth Section of the Tunnel for North Extension of Tehran Metro Line 1

Employer : Tehran Urban and Suburban Railway Co. (Metro)

Consulting Engineer : Darya Khak Pey Consulting Engineers

Initial Amount of the Contract : Rls.127,000,000,000.

Contract Period : Thirty Six Months.

Commencement-Date of the Project : 3 May 2005

Project Status : Under Construction

Contract Amount By 20 March 2010 (Contract Amount Plus Price-Adjustment) : Rls.221,700,000,000.

Description & Technical Specifications Of The Project

This project is considered as one of the most difficult and complicated projects ever implemented in Iran with the deepest urban tunnel of the Country. The major difficulty was excavation operation at a depth of 64 m. in the rocky and wet ground of northern Tehran. This project includes about 800 meters of main tunnel of metro line with an excavation cross-sectional area of 70 Sq. meters, in addition to an access-shaft and tunnel to the main tunnel. In order to reach to a depth appropriate for performing the excavation operations, an access-shaft measuring 16 m in diameter was excavated at the depth of 64 m. In the course of the shaft-construction, the side-walls are insulated with a view to remove the problem of wet-soil, to certain extent.

After reaching to a shaft-depth of about 50 m, construction of the shaft-outlet begins in order to have an access to the tunnel. Upon construction of the said outlet, excavation operation is directed toward the access-tunnel and from there toward the main tunnel. The volume of the earth-moving operation, considering the length of the tunnel is 56000 cubic meters. The volume of project concrete-work, at the tunnel-section, is about 13000 cubic-meters, with a reinforcement-bar placement of 2200 tons.



BETON SAZAN MEHR

Project Introduce

Project Title : Construction of Inter-Tunnel Air-Exhaust Shafts Along the North Extension Line of Tehran Metro Line 1 & Construction of 260 m of Tunnel from T2U2 Air-Exhaust Shaft to the Site of U1 Station

Employer : Tehran Urban and Suburban Railway Co. (Metro)

Consulting Engineer : Tarhe-Bamdad Consulting Engineers

Initial Amount of the Contract : Rls.32,320,000,000.

Contract Period : Eight Months.

Commencement-Date of the Project : 12 August 2007

Project Status : Under Construction.

Contract Amount By 20 March 2010 (Contract Amount Plus Price-Adjustment) : Rls.33,325,000,000.

Description & Technical Specifications Of The Project

The air-exhaust shaft, subject-matter of this project is similar to the air-exhaust shafts of Tehran Metro Line 2, which are vertical. The dimensions of the shaft of each air-exhaust shaft is about 14X13 m, with an approximate depth of 20 m. The length of the (horizontal) gallery, considering the situation of the tunnel and the shaft is different. In this project, the gallery is to be constructed with various cross-sections. A part will be similar to the tunnel, with an arch-ceiling, another part in the form of a box, together with a transition cross-section which connects the two aforesaid cross-sections.

The volume of earth-moving work for each air-exhaust shaft is about 3500 cubic meters, the extent of reinforcement-bar placement, taking into account the gallery, is 200 tons and volume of the concrete-work is about 1500 cubic-meters.

Construction of the main-tunnel is performed in several wings and at two upper and lower sections. Y (Three-way)-shaped structure is used in order to inter-connect the gallery to the main tunnel. The Y-shaped structure is provided with temporary supporting-structure and a special main structure. The cross-sectional area of this tunnel measures about 70 Sq. m. and the volume of the earth-moving operation, considering length of the tunnel is 18200 cubic meters. The volume of concrete-work of the project, at the tunnel section, is about 4160 cubic meters and the extent of its reinforcement-bar placement is 515 tons.



BETON SAZAN MEHR

Project Introduce

Project Title : Construction of the Surface-Water Collection Tunnel at the Narmak Village

Employer : Khakriz Ab Co.

Consulting Engineer : Caspian Tarh-o-Sazeh Consulting Engineers

Initial Amount of the Contract : Rls.56,874,000,000.

Contract Period : Eighteen Months.

Commencement-Date of the Project : 6 March 2008

Project Status : under Construction

Contract Amount By 20 March 2010 (Contract Amount Plus Price-Adjustment) : Rls.19,160,000,000.

Description & Technical Specifications Of The Project

This project includes 1860 m. of ready-made reinforced concrete tunnel with semi-oval shaped cross-section, measuring 3 X 3.30 m. in internal dimensions, together with construction of drops inside and also all along the tunnel, in addition to construction of such ancillary structures as manholes, manhole-intake (pond), stilling basin, etc.

The tunnel-excavation cross-sectional area is about 15 Sq. m, with an earth-moving volume of 27900 cubic meters. The volume of the tunnel concrete-work is about 8000 cubic-meters with a reinforcement-bar placement of 800 tons.

