Questions to be responded to by the firm submitting the application

Why do you think this project should receive an award? How does it demonstrate:

- innovation, quality, and professional excellence
- transparency and integrity in the management and project implementation
- sustainability and respect for the environment

Shanghai Rail Transit Line 10 (M1) Phase I project is 36.2km in length with 31 underground stations. The line, together with other 14 Rail Transit lines, forms 15 interchange hubs (nodes). Engineering consultation for the project started in 2003, and its construction started in 2005. It has been put into operation since 2010.

FIDIC's advanced concept of "contract management, risk management, sustainable development" was introduced throughout design consultation. FIDIC's "honesty, excellent, teamwork, commitment" spirit was followed. By learning from domestic and foreign experience in rail transit design, construction and operation, design scheme was optimized. This project becomes a pioneer in the three aspects including driverless operation; tunneling through an airport runway in service and property development above stabling yard, which plays a leading role in design and construction technology in China's rail transit field.

I. The project reflects innovation, high quality and excellent professional level.

1 Fully automatic driverless operation system

Shanghai Rail Transit Line 10 (M1) Phase I project adopts fully automatic driverless system, which is the first in China's rail transit field. The technology relies on automatic and integrated control system (CBTX, ISCS, wireless control, TMS, etc.), and central operators, by virtue of integrated communications, conduct comprehensive monitoring for trains, signal and equipment and so on. Use of the technology brings a revolutionary breakthrough to traditional rail transit construction, management and operation fields in China.

It breaks the limitation of labor division by specialties and types of work in the traditional mode and accelerates the process of systematization, standardization and modularization in rail transit construction.

Fully automatic driverless system replaces the work of drivers with efficient, integrated and intelligent train control system, and improves technological advancement and safety by combining with the mechanism of manual monitoring and intervention. Through accurately positioning and real-time tracking for trains, it shortens running interval and enhances the operation speed. Transport capacity is improved by small marshalling and high-density trains, the scale of stations is downsized and investments are saved. The system improves the operation management level and quality and reduces operating costs, which represents outstanding economic and social benefits. It has an important significance to urban mass transit based on the new "people-oriented" concept.

Since the operation of the project, operation of systems has been sound, all on-line trains have be equipped with the function of fully automatic driverless operation, and operation management has been perfected gradually, with all operation indicators obviously higher than those of the other lines in the network. The on-schedule rate was 99.97% in 2014, 0.5% higher than other lines in the network averagely, and was well received by operation units.

2 Successfully solving the problems in running tunnel construction

1) The running tunnel passing through the airport runway was first studied systematically: There are few tunnels shield driving beneath airport runway in soft soil areas in foreign countries, and there is no such example in China. To make the project safe, good-quality and high-efficiency, study is specifically made to solve the problems. Through control of tunnel buried depth, limit volume loss rate, secondary grouting solidification, optimizing water proofing of segment joint and construction site monitoring, the running tunnel was successfully constructed under the airport runway. The success has great demonstration meaning to the domestic rail transit construction and saves an engineering investment about 0.3 billion Yuan.

2) The problems in DOT shield machine driving through underpass were solved: At the interval between Tongji University Station and Siping Road Station, a 213m long section had to be constructed by DOT shield machine driving beneath an underpass. Study was firstly made on construction of DOT running tunnel beneath an underpass structure in China, giving the solutions to the difficulties such as the construction sequence of these two projects, control standard of tunnel structure, operation and maintenance requirement. Its successful construction provides a good reference for the similar projects.

3) Configuration optimization and construction control technology for shield cutting tools: In accordance with the features of earth pressure balance shield machine, a targeted research has been carried out and resulted in the following achievements, such as the configuration optimization for cutting tools for the shield; the shield machine self-carried grouting technology, which is to reinforce the front soil in poor geological area; and the cutting diaphragm wall technology by shield machine (plus concrete cutting and solution agent technology); construction control technology of shield cutting different barriers (pile foundation, underground diaphragm wall) in soft soil. By use of these developed technology, the pile foundation of bridge under the arterial traffic was successively cleared, avoiding the traffic detour and relocation of municipal pipeline and obtaining great social and economic benefits, saving an investment about 0.08 billion Yuan.

3 It is the first project in China that implements property development above stabling yard to enhance land comprehensive utilization efficiency

Property development project is constructed above the superstructure of stabling yard at Wuzhong Road, which is the first attempt in rail transit construction in China. The project covers an area of 23.34 hectares with total development area of 516 thousand square meters (excluding stabling yard buildings), and develops a comprehensive urban space integrating commerce, municipal administration and public benefit and so forth. The ground floor is the rail transit stabling yard, where parking, cleaning and train inspection are undertaken for trains of this project, and a large platform made of reinforced concrete with an area of 76 thousand square meters is constructed around 8.3m above the ground, available for following development; underground commercial space is constructed under some storerooms, which is connected to the nearby station of Ziteng Road of Line 10. The platform, underground construction and stabling yard construction are deemed as a whole for unified planning, simultaneous design and simultaneous construction, which realizes the overall harmony and comprehensive utilization of urban space, playing a demonstration role in domestic rail transit construction.

4 Application of RAMS technology

Design principle of "people-oriented, safety first" of RAMS is firstly introduced in domestic rail transit projects and is abided by during the whole project. For the purpose of establishing a rail transit system featured with "safety and convenience, environmental coordination, advanced technology, reasonable cost", system safety assurance and risk management was carried out in the overall design for the project, and the system safety assurance and risk management program was submitted to relevant competent authorities for review as per the principle of RAMS in the preliminary design phase, and review report was issued.

The established RAMS work system was extended to the construction stage and the contractor, and system assurance engineers were introduced, and sub-contractors' system assurance work was specially organized and reviewed, to ensure the contractor performing all obligations of system security, reliability, availability and maintainability specified in the contract.

5 Station decoration

1) The decoration of whole line is around the theme of "Metropolis Melody" to reveal the metropolis cultural characteristics. The decoration concept is combined with cultural background around station site. The project pays more attention to historical inheritance and harmonious relationship between the construction of ecological city of Shanghai and modern style. For example, frescos in Yuyuan Garden Station represent local culture by combining classical and modern features; frescos at East Nanjing Road Station represent combination between ancient and modern features and between domestic and foreign features, fashion and passion of the "the most famous street in China"; frescos at Shanghai Zoo Station depict harmony between man and animal with animal-shaped artistic silhouettes; Tongji University Station is decorated with paddles to embody the "pull together in times of trouble" spirit and culture; and station name walls of the whole line show handwritings of many famous calligraphers from the Wei-Jin Dynasty to modern times to let you feel extensiveness and profoundness of China's treasury - calligraphy.

2) The simple decoration adopting comprehensive cable stray and "black and grey space" concept is new breakthrough in station decoration. Eight standard stations are designed by innovatively applying the integrated cable tray in the public areas and adopting the decoration style of no ceiling. By arranging pipelines with integrated cable tray, demonstrating with 3D design simulation and applying the black and grey space concept, a simple spatial hierarchy is formed to combine aesthetics with integrated functions. It becomes a pioneer of simple decoration for domestic subway construction and has been an up-to-date decoration style for the station in China. With lower construction costs, convenient operation and maintenance, and less maintenance expenses, it is welcomed by operators.

6. This project firstly developed and adopted the prefabricated spring floating slab and successfully used symmetric three-way turnout technology.

1) Prefabricated floating slab track bed: The traditional design and construction process for floating slab are complicated and need longer construction time, which cannot meet the requirements for the scale and progress of city rail transit construction at present. This project firstly developed and adopted the prefabricated spring floating slab, solving the steel spring floating slab construction progress problem effectively.

The prefabricated spring floating slab adopts the track-laying base for pre-assembly of steel reinforcement cage of floating slab, realizing parallel flow process for three major procedures of floating slab steel reinforcement cage and track panel assembly, floating slab base construction (backfilling of inverted arch of tunnel), track slab concrete pouring, The technology speeds up the construction progress for floating slab track and realizes the "standardization, modularization, factorization, mechanization" for track engineering design and construction in urban rail transit project, improving the construction quality and saving the cost.

2) Three-throw turnout

To reduce the investment scale of city rail transit construction and improve the line' function as far as possible, the Line 10 firstly applied the 60 kg/m steel rail symmetric three-way turnout technology in Shanghai Rail Transit, and paved three groups of three-way turnouts in the Songyuan Road Station, Xintaindi Station, North Sichuan Road Station storage track along the whole line.

This turnout is connected with three ways (in the front of the turnout, on the right and left sides of the turnout) at the same time, and the function of which amounts to 2 groups of 60 kg/m steel track No. 9 single-way turnout. Compared with single-way turnout, each symmetric three-way turnout can shorten the line of 34.56m and save the engineering investment for about 17,280,000 Yuan each group (not including the indirect cost like that for building demolition and relocation of pipeline).

7. Achievements:

This project has obtained 14 patents, achieved more than ten items of achievements in scientific research, and published one monograph (820,000 words). The scientific achievement of "Key Technologies and Application in Shanghai Rail Transit Line 10" has obtained the Second Prize for Shanghai Scientific and Technological Advancement Award. The project was awarded the "First Prize for Municipal Public Works of National Excellent Engineering Exploration and Design Industry Award" issued by China Reconnaissance and Design Association in 2011, and the "First Price of Shanghai Excellent Engineering Design" issued by Shanghai Reconnaissance and Design Association in 2011.

II. The principle of transparency and honesty was implemented during the whole construction.

1. The engineering construction scheme was informed to the public and fully communication was made among the related parties. Their opinions and suggestions were carefully listened to and considered. Parts of the opinions have been adopted and implemented, and for those opinions not adopted, the communication and explanation work has also been made for the understanding and support of the public.

2. Engineering technical consultation companies, such as France "SYSTRA" and Singapore "MSI", were introduced to participate in engineering construction management and operation commissioning as the owner's consultants and evaluate and demonstrate the technical solutions of the project, which makes the technology transparent and open, and provides powerful guarantee for the success of the fully automatic driverless operation.

3. Transparent, high-efficiency, competitive bidding was adopted for the engineering consultation service. STEDI provided the owner with professional, objective and fair service and suggestions on the basis of good quality.

4. In tendering of each construction and purchase contract, the professional ethics system of registered consulting engineers and the "technology first" principle were followed to provide the owner with reasonable suggestions and maintain the owner's interests.

5. Investment supervisor was participated during the whole construction process and strictly implemented the acceptance and settlement system for the project. The project passed engineering audit in 2012, and its engineering funds were used reasonably.

III. The project is sustainable and environment-friendly.

1. The main line of the project was smoothly opened prior to the Shanghai World Expo. It has made great contribution to relieve the ground traffic pressure, undertaking ridership of 50 million during 2010 Shanghai World Expo. By December 2014, the ridership statistics of Phase I project of Line 10 showed that average daily ridership was increased to 692,300 from 99,900, making great contribution to the megalopolis with a population of 23,000,000.

2. During construction of the project, about 50,000 jobs (direct and indirect) were provided. After construction, the operator provides 1850 direct jobs.

3. As the project is an underground line, its noise is far below that of public transport vehicle on the ground and its impact on the city's acoustical environment is very small. Although it may produce some vibration, environmental impact assessment and research were conducted in the earlier stage of the project, and proper measures for vibration reduction were taken to meet the environmental protection standard.

4. In this project, the clean energy – electricity is used as power. By the end of 2014, compared with other transport means, it has accumulatively reduced standard coal consumption by about 143,000t and reduced CO2 emission by about 30.6t.

5. This project is laid under the ground with less land occupation, which is better than ground road transportation. Wuzhong Road Stabling Yard is the only one item on the ground. Property development with approx. 516000m^2 total development area (excluding stabling yard buildings) is constructed above its superstructure, which saves a great number of land resources and facilitates improvement of the city's general environment.

6. The decoration concept payed more attention to historical inheritance and harmonious relationship between the construction of ecological city of Shanghai and modern style. The cultural atmosphere of Shanghai is represented by combining fresco art and cultural background around stations. Station name walls of the whole line show handwritings of many famous calligraphers from the Wei-Jin Dynasty to modern times to pass on and carry forward China's treasury.

7. For construction of the sections nearby Soong Ching-ling Memorial Residence, Shanghai Conservatory of Music and Shanghai Jiaotong University and the stations along historical district conservations at Fuxing Road, protective construction technology was used to meet the requirements of the conservations against vibration and ground settlement.

8. The project connects Shanghai Hongqiao Railway Station and Hongqiao Airport to form a large-scale

integrated transportation hub, enhancing connection to the city's outward transportation and promoting development of urban agglomerations and economic circles at the Yangtze River Delta.

9. As this project is totally an underground line, the running tunnel and underground stations are designed according to level 1 of engineering structure safety and Level 7 of seismic fortification. And the project has a 100-year design life according to durability design of concrete structure.

What services did the member firm provide to the project? Please describe briefly.

Shanghai Tunnel Engineering & Rail Transit Design and Research Institute (hereinafter referred to as STEDI), founded in 1958, is one of the pioneers in overall design and whole-process consultation of urban mass transit in Mainland, China. Over more than 50 years, STEDI has been devoted to whole-process consultation service for soft soil tunnel, underground works and specialized fields of urban mass transit. It has been an engineering consultation enterprise with excellent professional ability in core business and also an important power leading the industrial development in Mainland, China and has considerable international competitive power and great renown.

The Shanghai Rail Transit Line 10 (M1) Phase I project is an important east-west backbone in Shanghai urban mass transit network and also a multi-disciplinary integrated project featured with great investment, strong specialty and wide coverage. As an overall designer of the project, STEDI was fully responsible for engineering design and relevant overall management in each stage of the Rail Transit Line 10 (M1) Phase I project. STEDI finished preparation of the Pre-feasibility Research Report of the project, the Feasibility Research Report of the project and the preliminary design documents successively, and all of them have passed evaluation. STEDI was responsible for the detailed design of 13 stations out of total 31 stations and nearly two-thirds of the running tunnel, and specialized design of nearly ten subdivisions, including alignment, power supply system, HVAC system, communicating signal system and monitoring system.

STEDI prepared the general technical management documents for design of the project in accordance with the scale and characteristics of the project; actively carried out FIDIC's advanced concept of contract management, risk management and sustainable development for the purpose of improving the operation service level of the urban public transportation system; prepared each design principle, design standards and uniform technical requirements of the project by means of technical innovation and scheme optimization. In the process of practice, FIDIC's project management method is adopted, and management is mainly based on "performance excellence management, quality management, environmental management, occupational health management, honesty management and social responsibility management" to ensure that engineering design of the project is general, systematic and complete, as well as adapting to general planning of urban construction and promoting the city's economic development and ecological balance.

Please use additional pages as needed.