

Research on Practice of Excellent Railway Passenger Station Construction and High-quality Development

QIAN Guifeng^{1,2}, Vice director

1. Engineering Management Center, China State Railway Group Co. Ltd.;

2. Office of Leading Group for Construction of Passenger Stations in Beijing-Tianjin-Hebei Region, China State Railway Group Co. Ltd.

Abstract: Taking the construction of excellent passenger stations in Beijing-Tianjin-Hebei region as the research object, the paper discusses the implementation of the new concept of building up “well-connected, fully-integrated, environment-friendly, passenger-oriented, economically-efficient, culturally-rich, intelligent and convenient” railway passenger stations. It then strives to analyze the connotation of an excellent railway passenger station, the construction and management methods, and the innovation of the working mechanism in the new era. It offers thoughts and methods for promoting the high-quality development in the practice of construction for innovative development of excellent passenger stations.

Keywords: railway passenger station; construction practice; new concept; excellent passenger station; high-quality development

(This paper is selected from *China Railway*)

1 Introduction

The Chinese economic development started its great journey from high-speed growth to high-quality development during the “13th Five-year Plan Period” of the national economic and social development. Efforts have been made by China State Railway Group Co. Ltd. to implement the new development concepts of innovation, coordination, green, openness and sharing, adhere to the aim of making the people's railway for the people, and focus on the supply-side structural reform and the high-quality development of the railway sector, for which a series of new measures have been taken^[1]. Great importance has been attached to for the construction of railway passenger stations so as to meet the excellent travel needs of passengers that have been constantly increasing by taking the improvement for their senses of benefit, happiness and security as the goal, making efforts to solve the problems such as lack of close linkages between the railway transportation and other means of transport, the passengers' transfer efficiency being not high enough, and their travel experiences being not good enough, and putting forward the requirements for building up “well-connected, fully-integrated, environment-friendly, passenger-oriented, economically-efficient, culturally-rich, intelligent and convenient” modern railway passenger hub and those for elaborate, fine and exquisite construction of excellent passenger stations^[2-3]. Taking the construction of passenger stations such as the Xiong'an Station, the Fengtai Station, the Beijing Chaoyang Station and the passenger stations along the Beijing-Zhangjiakou HSR and the Beijing-Xiong'an Inter-city Railway as the research objects, elaborations have been made on the innovative practice for deep implementation of the new concepts of building up “well-connected, fully-integrated, environment-friendly, passenger-oriented, economically-efficient, culturally-rich, intelligent and convenient” railway passenger stations and elaborate, fine and exquisite construction of

excellent passenger stations and deep studies and reflections have been carried out on the high-quality development.

2 New Concept Innovation Practice for Railway Passenger Station

The new concepts of railway passenger station cover the interrelations and development levels between transportation and city, nature and humanity, economy and art, technology and efficiency, etc., the commitment to the better services to the passengers, promotion of better convergence for the railway sector and the city with greener, more high-effective and sustainable development so as to create the transportation hub with safety and reliability, convenience, fastness and good accessibility, economy and high-effectiveness, green and low-carbon emission and intelligent networking for which the people will feel satisfied^[4].

2.1 Being well-connected and fully-integrated: innovating the city space with station-city integration, and convergence and interconnection

Being well-connected and fully-integrated are the demands based on the transportation attribute of passenger station and the friendly-grown relations between the passenger station and the city, and handling of the relationship between the passenger station and the city in scientific way is the prerequisite for the planning and design of the railway passenger station. In the stages of selecting railway passenger station location and making planning and design, the relations between the passenger stations and the city are analyzed from the time and space dimensions by adopting the planning and design methods of station-city integration and the design strategy of station-city convergence. It is the effective route to achieve good connection and full integration by carrying out planning and design of passenger station around the goals of good

connection and high effectiveness for passenger flow, vehicle flow, logistics and information flow in the hub and of the convergence and interconnection between the passenger station and the city.

The Xiong'an Station, located in Zangang District of the Xiong'an New Area, started its construction before the construction of the city, may be rated as a model of planning and design with the station-city integration. A leading group composed of members from CHINA RAILWAY and the Hebei Province has been set up to push on the integrated planning and construction for the hub district of the Xiong'an Station. The railway and local authorities have jointly established the working camp to organize the relevant units to carry out systematic studies on the planning of the core areas, the layout of the station hub, the organization of internal and external transportation, the commercial development, the supporting facilities, the city's pipelines and corridors, and the landscape greening. The hub planning takes the improvement of overall operational efficiency as the goal to design for the first time the station buildings of the comprehensive transportation hub type with the integrated overpass and building structure, and the double-floor three-dimensional large space for waiting hall (refer to Fig. 1).

Passenger stations such as the Fengtai Station, Beijing Chaoyang Station and Qinghe Station are located in the city center and built at the locations of the existing railway stations. The rational layout of station type and strengthening of the organic integration of hub area with urban planning, transportation supporting and industrial development effectively integrate the railway passenger station into the urban organism, interconnect with the city, and realize the smooth integration, which provides reference experiences for the design of station-city integration. The parallel overlapping arrangement of high-speed and ordinary-speed yards is adopted for the first time for the Fengtai Station, which integrates the planning and design of

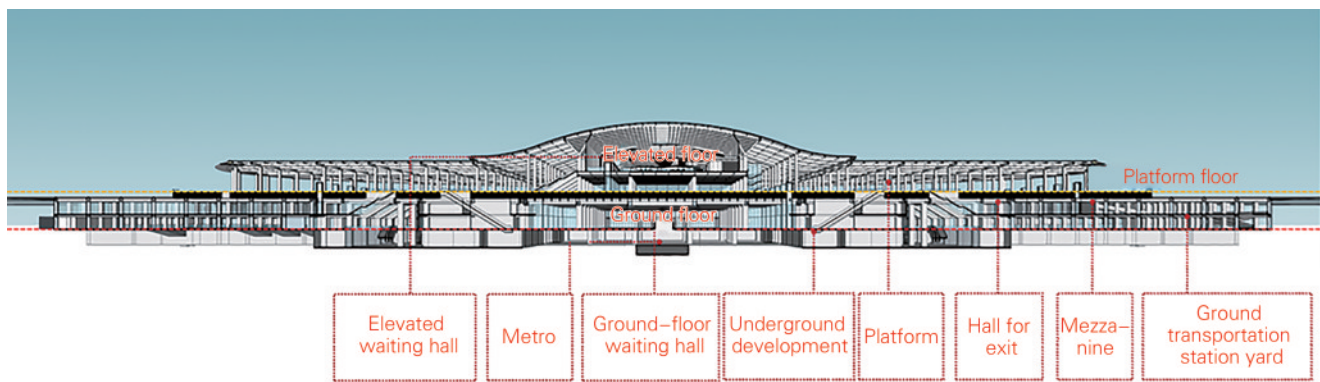


Fig. 1 Sectional view for Xiong'an Railway Station

high-speed railway, ordinary-speed railway, urban public transportation and rail transit. The high-speed yard and station platform floor, the elevated station entrance floor, the ground gathering and distribution floor and the underground fast station entrance floor are set to connect with multiple means of transport, so as to facilitate the rapid transfer of passengers (refer to Fig. 2). The first parking lot with full coverage of canopy on the top in China has been built at the Beijing Chaoyang Railway Station, which greatly improves the space utilization rate. In the meantime, roof greening is rationally set up in the parking lot on top of the canopy, which effectively supplements the urban greening space and improves the urban space environment. The Qinghe Station is close to the city center in the east and the Beijing-Xinjiang Expressway (G7) in the west. The site is narrow. For the station design, attention is paid to establishing the connection between the east and west sides of the city, “mending” the “fragmented” city, and constructing the architectural form adapted to the urban texture. The yards for the national railway and metro line 13 are set up in parallel, and the national railway, metro and ground bus in the hub are smoothly connected (refer to Fig. 3).

Following the principle of good connection and integration, new breakthroughs have also been made for the planning and design of small and medium-sized railway passenger stations. The Badaling Great Wall Railway Station with a depth of 102 m

has been built in the 5A-level scenic spot, which is integrated with the scenic spot and hidden at the foot of the Great Wall (refer to Fig. 4). The Taizicheng Station built in the Winter Olympic Games area can be called “the world's first high-speed railway station leading to the stadium”, which meets the demands of award venues, integrates the cultural and artistic elements of the theme for “combined virtue of heaven with earth, and centennial Beijing and Zhangjiakou”, and enhances the artistic taste and cultural confidence. The organic integration between the station buildings along the Beijing-Zhangjiakou HSR and the Beijing-Xiong'an Intercity Railway, the station area housing design, and the urban planning, the unified layout of production and living facilities, which are intensive and economical, coordinated and beautiful, forming “one

scene for one station”. The intensive planning of the land used for the Xiong'an Station integrates the 12 single buildings for production and living with different functions into a comprehensive building, which is highly coordinated and integrated with urban planning, and has made a pilot test to promote the centralized construction and unified management of production and living facilities.

2.2 Being environment-friendly and passenger-oriented: building green passenger station with green ecology and humanistic care

Green and warmth are the concrete practice of implementing the concept of green development. The outlook on sustainable development, the development of ecological architecture theory, and the development of advanced scientific and technological



Fig. 2 Sectional view for Fengtai Railway Station

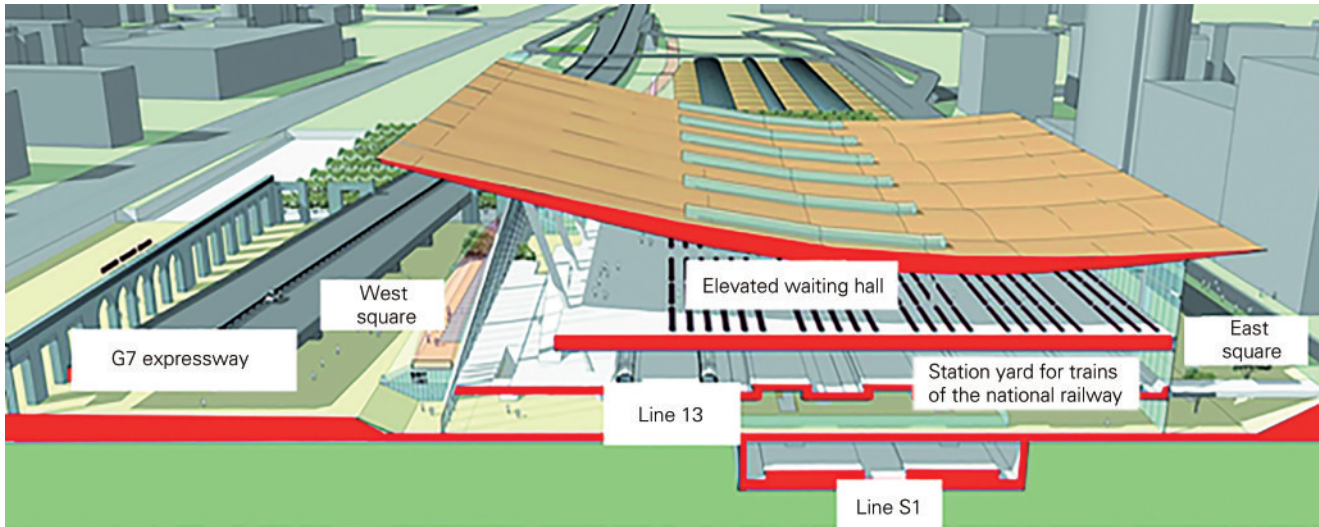


Fig. 3 Layout of Qinghe Railway Station and yards



Fig. 4 Badaling Great Wall Railway Station

means and construction technology make it possible to build the green passenger station with warmth.

The design method of ecological architecture is innovated and practiced for the passenger station design, which combines and respects the nature, and pays attention to the regeneration of the environment rather than the simple waste disposal after consumption. For the Xiong'an Station and Fengtai Station, the positions of the parking lots are spaced out to set up the light corridor so as to introduce more natural light into the room.

Light pipes are installed at Beijing Chaoyang Station, Qinghe Station and Badaling Great Wall Station to guide the natural light to the platform floor or the underground floor (refer to Fig. 5). The station building and canopy are designed with fair-faced concrete and steel structure, which are safe and beautiful, so as to decrease the task of furnishing and reduce the costs of operation and maintenance. Innovations of technology applications for saving land, energy, material and electricity are carried out in engineering design and construction to im-

plement the three-star green building evaluation standards^[6], and strictly put into effect the evaluation indicators such as for safety and durability, convenient service, health and comfort, livable environment, resource conservation, management and innovation. Energy conservation and emission reduction, and innovation in the application of new energy technologies are enhanced. The lighting design is optimized systematically by adopting intelligent shunt control. The roof of the Xiong'an Station is equipped with 42 000 m² photovoltaic power generation panels, and the photovoltaic power generation capacity is 5.80 million kW·h, which is equivalent to 12 hm² of afforestation. The lighting systems of the combination of floor high-pole lamp, ceiling lamp and wall lamp are adopted for the Beijing Chaoyang Railway Station to improve the power consumption efficiency and the comfort of passengers. The integrated arrangement of the high-pole lamp and monitoring with the broadcasting system facilitates the maintenance. The station building design adopts the assembly-type machine room and assembly-type platform, and the assembly-type technology and intensive management are popularized for construction management houses, temporary road, slope support, etc.

The development of behavioral architecture provides a theoretical ba-



Fig. 5 “Light corridor” setting at Xiong'an Railway Station

sis for embodying humanistic care, creating a warm passenger station and offering diversified and personalized services^[5]. The design of station building comprehensively improves the good experience of passengers' boarding and alighting through special research and continuous optimization of space layout, passenger flow line, indication signs, sound, light and electricity, temperature and humidity, vibration and noise, decoration and furnishing, and intelligent passenger station. More attention is paid to researches on color planning, material selection for furnishing, and space identification for decoration and furnishing, which change the color tones of black, white and gray and the stylized single layout of the station building in the past, so as to better meet the needs of passengers in their use and create the passenger stations with warmth. By setting up the waiting area for children's play, waiting area for parent's care, the general waiting area, military waiting area, etc. and the room for baby care, thoughtful services are offered to passengers with different demands of consumption. Comprehensive service center and central

service island are set up to cater for the need of open service mode. The unisex toilet and barrier-free facilities are provided and design details of toilet and tea room are improved to make them more convenient for passengers to use.

2.3 Being economically-efficient and culturally-rich: creating an intensive, efficient and artistic cultural passenger station

The study of modern architectural aesthetics theory believes that industry and applied science provide the conditions for the creation of new art, and the result is to improve improve the technical benefits^[5]. Economic art not only ensures the economy of investment and the reliability of technology, but also build the passenger stations into the permanent and solidified works of art, which have certain artistic appeal and expressive force, and become the symbol of inheriting railway culture and displaying the railway image^[3], pursuing the organic combination of function, technology, art and economy, and improving the comprehensive function and value.

A high-degree integration of art, technology and details with beautiful fair-faced concrete flowering beams and columns, solid granite column feet, artistic perforated GRG plate ceiling, soft spotlights, changing ground pavement and coordinated seat accessories is achieved for the Xiong'an Station, presenting the solemn, elegant and shocking waiting hall spaces. The steel structure of the platform canopy is built as a whole for the architecture and structure, which fully demonstrates the structural beauty, industrial sense and modern sense. The elevated waiting hall of the Beijing Chaoyang Railway Station integrates the beauty of space, structure, details and warmth by taking “open seam and exposed beam” with the gradually changing slat ceiling, V-shaped column of steel structure, frame-less and rib-less folded plate glass curtain wall, and combining with the lighting high-pole lamp of the integrated arranged broadcasting and monitoring equipment and the champagne-color embellished arrival unit (see Fig.6). “Economic Window” is provided in the Zhangjiakou Station to meet the needs of different functions of local economic specialty dis-

play and Winter Olympics publicity.

Railway passenger station, as the transportation hub and landmark building of a city, is of great significance for bearing its culture. In order to highlight the cultural connotation of Beijing and Zhangjiakou for the past 100 years, a systematic study on “cultural and artistic expressions” has been carried out for the first time in the construction of the project, and the cultural theme of “combined virtue of heaven with earth, and centennial Beijing and Zhangjiakou” has been established. Through the optimized design for the station building furnishing and the introduction of public art, cultural display, details decoration and other means of expression, “one scene for one station” is created to transmit traditional culture, railway culture and the spirit of the times, and reflect the beauty of the railway and the beauty of China. The waiting area of the Qinghe Station in combination with the equipment units systematically displays the development of high-speed railway, enhances the artistic appeal and expresses the spirit of “self-improvement with unremitting efforts”. The Badaling Great Wall Station displays the new and old Beijing-Zhangjiakou theme culture along the passenger flow line through sandstone relief, expresses the dialogues between ancient and mod-

ern, new and old Beijing-Zhangjiakou, and implies the “eternal monumental work”. Through the presentation of “Olympic Eye” lighting skylight and indoor Winter Olympics elements, landscape seal carving on the concrete column surface and wall mosaic relief and other diversified techniques, the Taizicheng Station expresses the cultural themes of “geography being unbounded for HSR, landscape being unbounded for human mind, and Olympics being unbounded for human beings”, and conveys the connections between man and nature, and between space and nature, which are the supreme pursuit of Chinese traditional culture of “Harmony between Heaven and Human Being” and “Combined Virtue of Heaven with Earth”. The themes of “ancient lake with innovation and clear blue with condense drop” for the Xiong'an Station, “capital of vitality and road of vigor” for the Beijing Chaoyang Station, and “abundance to all around, and brilliance with jubilation” for the Fengtai Station are integrated into architectural design through different expressions such as architectural shape, decoration and furnishing, and artistic installations, which enhance the aesthetic charm and cultural taste of the station building. Exploration and practices are carried out for the transmission of

humanistic value and bearing of cultural attributes in railway passenger stations.

2.4 Being intelligent and convenient: building a passenger station of the era for improving people's well-being

Information technology and intelligent technology are fully used to bring more convenience and efficiency for serving passengers and operation and maintenance^[3,7]. A framework system of intelligent passenger stations covering the systems of intelligent ticketing, intelligent passenger station management and control platform, and intelligent operation and maintenance has been established by China State Railway Group Co. Ltd. through the application of innovative information technology and intelligent technology in railway passenger stations, for which top-level design of technical schemes is carried out for building the intelligent passenger stations in the new era. Systems for station electronic passenger ticket, navigation in the station, integrated display, voice broadcasting, help inquiry, integrated transfer, and platform safety door protection provide intelligent and convenient services for passengers to travel and pass safely. The intelligent systems for intelligent brain, structural health monitoring, mechanical and electrical equipment and energy management are used to achieve intelligent station management, energy-saving and electricity-saving management and control for mechanical and electrical equipment of buildings, and comprehensive prediction of station structure service status.

3 Presenting New-era Excellent Passenger Station with Exquisite Quality

The new concept enriches the connotation of excellent passenger stations in the new era. While innovating and practicing the new concepts in the construction of top-quality passenger stations in Beijing-Tianjin-Hebei region, the working requirements for



Fig. 6 Indoor space in the Beijing Chaoyang Railway Station

elaborate, fine and exquisite construction of excellent passenger stations are earnestly fulfilled to present the high-quality passenger stations in the new era with exquisite quality.

3.1 Connotation of excellent passenger station

First of all, the excellent passenger stations in the new era are built in accordance with the laws, rules and regulations, for which they are fully up to the standards in the aspects of safety, quality, progress, investment and environmental protection, and can withstand the tests of history and operation. In the meantime, it is also a high-quality project to practice the new concept of railway passenger station and meet the requirements of green, intelligent and humanistic goals.

The in-depth implementation of the new concepts for the construction of top-quality passenger stations in Beijing-Tianjin-Hebei region is permeated with the requirements of elaborate design, organization and construction, fine management, exquisite techniques and excellent quality in the whole process of the engineering construction to create top-quality projects. The green design, green construction and green buildings are popularized with positive efforts to implement the requirements of saving land, energy, material and electricity as well as environmental protection, and widely adopt the new technologies such as vibration and noise reduction, photovoltaic power generation, information technology and intelligence so as to create the green projects. Deep integration of Internet, Internet of Things, big data, artificial intelligence with the HSR passenger station construction, operation and maintenance is promoted to realize intelligent construction, intelligent building and intelligent service, and strive to create the intelligent passenger stations. People-oriented practice is persisted in to strengthen humanized design, enhance the cultural connotation and artistic quality of the passenger station, so as to meet the needs of the broad masses of people for a better travel in all aspects,

and strive to create the humanistic project.

3.2 Construction and management methods for excellent passenger station

Railway passenger station construction is a complex systems engineering, with comprehensive disciplines, complex technology, strong systematic nature, specialty intersection and numerous interfaces. According to modern management science, scientific management can be divided into three levels: standardization, refinement and individualization. The refinement of social division of labor and service quality requires the refine management^[8]. The working requirements of elaborate, fine and exquisite construction of excellent passenger stations are permeated with the thoughts of modern management science.

For the construction of top-quality passenger stations in Beijing-Tianjin-Hebei region, fine management is strengthened to focus on making the objectives and tasks be concrete, and the management responsibilities be concrete and clear, implementing responsibilities of all parties, and permeating the working requirements into the elaborate, fine and exquisite construction of excellent passenger stations.

First, we should carefully make the top-level planning for excellence and clarify the task objectives. By analyzing the characteristics of the project, the specific objectives of excellent, green, intelligent and humanistic projects are established, the objectives and tasks are quantified, the overall planning for creating excellence is worked out, and the main-object responsibilities of the development organization for creating excellent management, the design unit for excellent design and the construction unit for careful construction are clarified.

Second, according to the top-level planning of creating excellence, the units involved in the construction work out the implementation scheme for creating excellent planning from the aspects of organization structure, division of responsibilities, technical scheme,

working mechanism and system guarantee, further refine the indicators and work programs for innovating and creating excellence, and compact the post responsibilities.

Third, information technology and meticulous management are organically integrated to develop the passenger station information management platform system, promote the standardized management with information technology as an important means, and improve the digitization and meticulous management of progress, quality, safety, materials and investment in the process of passenger station construction.

Fourth, careful construction is implemented to present the high-quality products. Model first and first-piece evaluation are implemented. Careful studies on the techniques and working method are conducted to carry forward the spirit of “craftsmen”. Application of BIM technology is popularized to achieve precise construction of complex projects such as comprehensive pipeline arrangement, machine room equipment, special-shaped structure and complex furnishing surface. Careful and meticulous construction is carried out to present the high-quality products.

Fifth, grid management is adopted to improve the efficiency. As the construction period of furnishing for the Xiong'an Station building is extremely tight, the grid management method is used to suit the local conditions. Based on the principles of “each performing its own duties, complementary advantages, management according to law, standardized operation and rapid response”^[9], the furnishing project is divided into small areas to form grid units according to the objectives of construction period nodes. Rapid response is made according to the construction situation to make daily dynamic allocation of production resources and in the meantime an assessment mechanism is established with assigned personnel, posts and responsibilities to strengthen management and control and ensure the construction period nodes, quality, safety and

environmental protection.

3.3 Innovation of the working mechanism for the construction of excellent passenger station

The innovation of working mechanism is based on concentrating technical resources, gathering experts' wisdom, fully mobilizing the initiative, dynamic role and enthusiasm, and forming a joint force for building high-quality products.

First, technical resources are concentrated. A leading group and general office are set up by China State Railway Group Co. Ltd. To take the charge of making system optimization scheme, carrying out overall coordination of key technology research and promoting engineering construction. The systematic major research topic "Research on Key Technologies of Major Passenger Stations in Beijing-Tianjin-Hebei Region" is established to provide reliable technical support for green construction, intelligent passenger stations, vibration and noise reduction, convenient transfer and humanistic engineering.

Second, the wisdom of experts is widely gathered. An expert team composed of experts from Tsinghua University, Tongji University, Southeast University, China Railway SIYUAN Survey and Design Group Co. Ltd., China Railway Engineering Design and Consulting Group Co. Ltd., and China Railway Shanghai Group Co. Ltd. has been established to jointly study the technical schemes, guide the optimization of design and solve field problems, and carry out normal addressing by experts.

Third, researches are strengthened for the technical schemes of the source. A systematic method for continuous optimization design is established to motivate the designers to do a good job for excellent design schemes. Centralized evaluation for furnishing sample and the first-piece project are carried out to ensure the reliability for technical schemes of construction.

Fourth, innovation is implemented for incentive and restraint mechanisms. A mechanism for inspection

and evaluation of high-quality passenger stations is established by China State Railway Group Co. Ltd., focusing on excellence, intelligence, green, humanities, safety, integrity and other indicators to carry out inspection and evaluation. The evaluation results are linked to credit evaluation through monthly inspection and quarterly assessment.

Fifth, the *Provisional Technical Regulations for Fair-faced Concrete* is compiled, and the *Key Points for Management and Control of Red Line for Quality and Safety of Station Building Projects* and the *Internal Control Standards for Acceptance of Excellent Projects such as Roofing, Steel Structure, decoration and Furnishing, Mechanical and Electrical Installation* are implemented on trial basis to effectively control the construction safety and the solid quality.

4 Thoughts of High-quality Development for the Construction of Railway Passenger Station

It is pointed out in the *Outline of Railway Development Program for Building China into a Strong Country in Transportation in the New Era* that the national railway mileage in operation will reach 200 000 km by 2035, including 70 000 km of high-speed railway. A more developed and improved modern railway network will be completed by 2050^[10]. As an important part of the railway network, the construction scale of railway passenger station will be constantly at a high level, so it is necessary to firmly establish a new development concept to provide powerful infrastructure guarantee for the high-quality development of railway.

4.1 Deepening the implementation of new concepts for railway passenger station and promoting the construction of excellent passenger station

The new concept of railway passenger station is based on the compre-

hensive studies conducted by China State Railway Group Co. Ltd. by summing up the experiences of large-scale railway construction and development and railway passenger station construction, grasping the trend of high-quality development of the railway industry, and combining the goal orientation with the problem orientation. Good connection and integration reflect the traffic attributes and healthy development of railway passenger stations. Green and warmth are the modern measures to implement green development and build harmonious co-existence between man and nature. Economic art contains the truth of improving the quality and efficiency of development and pushing forward the overall progress of people and society. Intelligence and convenience embody the idea of seizing the historical opportunity of a new-round scientific and technological revolution and industrial transformation to make the scientific and technological innovation achievements better benefit the people. The new concept of railway passenger station is closely related to the requirements of the new era and the purpose of the people's railway for the people, and the core meaning is to meet the higher needs of the people's better life with better development results and services.

The construction of high-quality intelligent, green and humanistic passenger station with excellent quality as the core is a measure to implement the new development concept, which is in line with the theoretical logic of high-quality development and the need to realize the transformation of railway construction from scale-speed type to quality-benefit type. It reflects the improvement of total-factor productivity in the whole process, the transformation from the old unsustainable momentum relying on the expansion of factor input to the new sustainable momentum relying mainly on total-factor productivity, reflecting the balance, adequacy and fairness of the enhanced development^[11-12]. To deepen the implementation of the new concept and build the excellent passenger

stations, it is necessary to have a deep understanding of the rich connotation and specific practical requirements of the new concept.

4.2 Promoting high-quality development in the course of innovating development for the construction of excellent passenger station

With the development of modern science and technology, digitized, intelligent and ecological building has become the development orientation of the construction industry, which provides a broad space for the development of excellent, intelligent, green and humanistic engineering technology. Therefore, it is necessary to base ourselves on a new starting point and promote high-quality development in the practice of innovative development of excellent passenger station construction.

It is the foundation of high-quality development to create the culture of new-era excellent passenger station project. The construction culture bears the values of builders, and common values have strong cohesion, guidance and binding force^[13-14]. The real power of culture lies not in slogans and posters, but in the practice what one advocates and the combination of knowledge and practice behind the words. The combination of knowledge and action means the high unity of values and methodology. The main leaders of the units involved in the construction play a key role in the formation and guidance of the corporate culture. To create the culture of new-era excellent passenger station project, each project manager shoulders the responsibility of cultural guidance, and needs to have in-depth study of new concepts, implements the new concepts in a complete, dynamic and open way, fully grasps the connotation and practical requirements of building a new-era excellent passenger station, and leads all builders to improve the consciousness and capability of action.

It is the key to the high-quality development to grasp the scientific management method of excellent passenger station construction. Manage-

ment theory and engineering practice experience show that innovation leading, science and technology support, and fine management are the key routes of the high-quality passenger station construction. It is necessary to do a good job of top-level planning for excellence and consolidate the responsibilities of all parties involved in construction. Management of survey and design should be enhanced to guarantee the excellent products from the design source. The integration of standardized construction^[13] with fine management and digital intelligent technology should be explored to realize the effective integration of information technology with industrialization, mechanization and specialization, and develop towards the orientation of industrialization, digitization and intelligence. The assessment management of quality construction should be strengthened to establish incentive and restraint mechanism, and implement the main-object responsibilities. It is necessary to adhere to the problem orientation and focus on solving the prominent problems such as non-detailed objectives and tasks of high-quality products, imperfect quality assurance system, unclear post management responsibilities, non-strict inspection and test of raw materials entering the site, inadequate control of construction process and techniques, and unclear acceptance control criteria.

4.3 Solving difficulties of restrictions to the high-quality development of railway passenger station

At present, there are some difficult problems that restrict the high-quality development of railway passenger stations and need to be solved.

(1) Problems of planning and design institutions and mechanisms. Collaboration of planning, combination of multi-planning and integration of multi-planning are the foundations for achieving smooth integration of railway passenger station hub. Hub planning should start from the construction of integrated transportation network of urban agglomeration by respecting the law of urban develop-

ment, promoting the integrity, systematic nature and growth of the city and making overall arrangements for urban functions, transportation functions and land use layout. At present, there are some problems closely related to the management of institutional mechanisms, such as unsystematic planning, non-synchronized timing and non-shared interests. To achieve smooth integration and healthy development, it needs to break down the barriers of institutional mechanisms. The vitality of multiple subjects is stimulated through deepening the reform of institutions and mechanisms and promoting the relationship between stations and cities to synergistic symbiosis and multilateral win-win situation on the basis of consultation and co-construction.

(2) Problems of study on the economy of railway passenger station. Economy mainly focuses on the level and degree of cost saving in the process of resource input and use, and the rationality of resource use. The economy of railway passenger station refers to the cost and consumed expenses of the project from planning, survey, design, construction to the whole service life cycle, specifically the rationality of the sum design cost, construction cost and use cost compared with the generated earnings. At present, there is still a lack of systematic research on the suitable scale, development volume, market gains and social benefits of hub economy of the railway passenger stations, and there is a lack of theoretical basis to guide the development of railway passenger stations in accordance with the economic principles at a certain level. In engineering practice, the determination of the final scale of station building construction and the rights distribution of development and operation are usually based on the game results between railway departments and local governments. On the one hand, the results of the game between the two sides are difficult to fully conform to the economy. On the other hand, the game process often delays the construction of passenger stations

and hub planning and design progress, which directly affects the rational construction period and high-quality construction of the project.

(3) Problems of construction industry workforce building. Man is one of the most critical factors in engineering construction. Viewing from the current situation of the construction industry, the high mobility of construction workers, the cultural quality and skill level do not meet the requirements of refinement, the empty shell of labor service companies and the non-standard employment have become the obstacles to the transformation, upgrading and sustainable and healthy development of China's construction industry. In order to realize the high-quality construction and development of railway passenger sta-

tions, we must solve the above-mentioned problems and speed up the construction of a long-term mechanism conducive to the building of workforce in the construction industry.

5 Conclusion

Railway passenger stations are the important component part of railway network and the important infrastructure to serve the broad masses of people, for which the railway passenger stations in a new era have entered a new stage of high-quality construction development. It is the core purpose of high-quality development for railway passenger stations to build up "well-connected, fully-integrated, environment-friendly, passenger-oriented, economical-efficient, culturally-rich,

intelligent and convenient" railway passenger stations, meet the higher needs of people's better life with excellent development achievements and service, and improve the well-being of the people. Deepening the implementation of new concepts and building high-quality passenger stations in the new era are the basic ways for high-quality development of railway passenger stations. It is necessary to vigorously create the culture of building high-quality passenger stations in the new era, grasp the construction methods of excellent passenger stations, solve the problems in the development of high-quality construction, and realize the high-quality development of excellent passenger station construction in innovative practice.

(Translated by ZHENG Mingda)

References

- [1] LU Dongfu. Working Conference of China State Railway Group Co. Ltd. was hold in Beijing [J]. *Railway Quality Control*, 2021(1): 1-4.
- [2] LU Dongfu. Shoulder the historic responsibility of playing the leading role of railway in building China into a strong country in transport and work hard to make progress in China's railway reform and development in the new era: report on Working Conference of China State Railway Group Co. Ltd. (key points) [J]. *Chinese Railways*, 2019(1): 1-8.
- [3] LU Dongfu. Best wishes for new year to all the railway builders [N]. *People's Railway Daily*, 2021-02-09 (1).
- [4] ZHENG Jian, WEI Wei, QI Guangping. *Design Concept Innovation and Practice of Railway Passenger Stations in New Era* [M]. Shanghai: Shanghai Scientific and Technological Literature Press, 2020.
- [5] LIU Xianjue. *Theories of Modern Architecture* [M]. Beijing: China Architecture Pressing & Media Co., Ltd., 2008.
- [6] Ministry of Housing and Urban-Rural Development of the People's Republic of China. *Assessment Standard for Green Building: GB/T 50378—2019* [S]. Beijing: China Architecture Pressing & Media Co., Ltd., 2019.
- [7] WANG Tongjun. Study on the development strategy of China intelligent high speed railway [J]. *China Railway*, 2019 (1): 9-14.
- [8] TAYLOR F. *The Principles of Scientific Management* [M]. MA Fengcai, translated. Beijing: China Machine Press, 2007.
- [9] WANG Feng. *Construction and Management of Railway Passenger Stations* [M]. Beijing: China Science Publishing & Media Ltd., 2018.
- [10] China State Railway Group Co. Ltd. Railway Development Program for Building China into a Strong Country in Transportation in the New Era [A]. Beijing, 2020.
- [11] CHENG Shi, QIAN Zhijun. What's the core of high-quality development? [J]. *Textile Science Research*, 2018 (4): 16-17.
- [12] HE Xiaoyu, SHEN Kunrong. Modernized economic system, total factor productivity and high quality development [J]. *Shanghai Economic Review*, 2018(6): 25-34.
- [13] LU Chunfang. *Standard Management of Railway Construction Project* [M]. Beijing: China Railway Publishing House, 2013.
- [14] QIAN Guifeng, CAI Shenfu, ZHANG Jun, et al. *Approaching China High Speed Railway* [M]. Shanghai: Shanghai Scientific and Technological Literature Press, 2019.