

Ms. Gao Hong

Ms. Gao Hong now serves as the deputy chief engineering of the construction institute under TSDI (The Third Survey and Design Institute of China Railway). She is also a senior engineer in construction, who owns Class-I PRC Registered Architect qualification.

She, as the deputy chief engineer responsible for design, has been in charge of the design of many large-scale construction projects, such as the upgrading of Tianjin Railway Station, Shenyang North Railway Station, the extension of Beijing-Tianjin Intercity Railway Line, Harbin-Dalian Passenger Dedicated Line. She is good at providing solutions to design issues in national railway projects and urban rail projects.

Innovation of Comprehensive Transport Hub Passenger Station Design of China Railway in Low-carbon Era

From Copenhagen to Davos, from political game to global competition of economic interests the low-carbon economy and green development has become the focus around the world.

- General**
- System integration techniques**
- Energy saving techniques for enclosure structures of building**
- Techniques to improve acoustic environment**
- Techniques to reduce vibration and noise**
- BIPV (building integrated photovoltaics) technique**
- Low carbon energy saving technique for heating and ventilation**

General

In the 1970s when the global energy crisis and environmental issue became significant, railway transportation had obtained its development opportunity with such advantages as large transport volume, low energy consumption, environment friendliness, and all-weather operation in safety.

- The status quo and development of modern comprehensive transport hubs has shown that the basic figures of a comprehensive traffic hub: functional diversification, spatial intensification. As the integration of multiple traffic modes, a comprehensive transport hub integrates railway, bus, subway, light rail transit, taxi and private cars, into a system that interlinks closely and functions efficiently. The construction of comprehensive traffic hubs with seamless or short-distance transfer indicates that the low-carbon era has come on China Railway.**

(Tianjin Station, Guangzhou South Station): **System integration Technique**

The construction of major comprehensive transport hubs began after 2003 on China Railway. The systematic study and integrated utilization of new ideas and novel techniques in large-scale railway hub passenger stations has led to a dramatic change in the form of passenger stations as compared with that previously, which is quite refreshing.

- Passenger stations should blend in with the overall planning of cities, and meet the requirements of the functional layout, railway network and landscape of cities.**

(Shanghai Hongqiao Station) **System integration Technique**

- An integrated solution is proposed, based on the city's overall planning, railway network, road network, railway yard arrangement and traffic flow inside the station.**

Considerations are given to the integration of the interfaces within and among the subsystems of the station, i.e. the station square, station buildings, station yards and passenger facilities.

Shanghai Hongqiao comprehensive transport hub, as a modern passenger transport center, integrates into one the three means of traffic of railway, highway and air transport, highlighting the two outward traffic functions of railway passenger station and airport.

(Beijing South Station): **System integration Technique**

For the realization of an integrated & special architectural space of passenger stations, a series of advanced techniques and means have been applied to the comprehensive transport hub design of China Railway, such as Technologies and measures utilized to realize intensification of the architecture space of large-scale comprehensive transport hub; planning techniques ;passenger flow organizing techniques ;integrated building-bridge structure ;Design techniques for extra-large structures; design techniques for

performance-based fire protection, etc.

(Beijing South Station) Design Techniques of Indoor and Outdoor Space

Plenty of sunshine, air and afforestation is introduced inside the comprehensive transport hub station to improve the comfort of public space, sufficient sunlight, fresh air and plants are introduced inside the station. The design of canopies and elevated waiting hall in Beijing South Railway Station brings natural sunlight into the interior of station, the platform and the underground space.

(Beijing South Station) Energy saving techniques for enclosure structures of building

- Curtain wall: Low-e hollow glass curtain wall, sun shading louver.**
- Roofing system: Beijing South Railway Station, 70,000 m² and roofing of standing seam system. Glass fiber of 150 thick is applied to the heat insulation layer, with profile steel sheet underlaying. Slabs of the aluminium-magnesium-manganese alloy roofing lock each other securely with no screws exposed on the roof.**

(Beijing South Station) Techniques to improve acoustic environment

The research on acoustic design of Beijing South Railway Station mainly includes:

sound insulation of exterior wall and curtain wall;

sound insulation performance of the roof and skylight;

reverberation time control in the elevated waiting hall floor and the platform floor;

noise propagation at the platform floor;

noise and vibration control of electrical and mechanical devices;

separation of noise propagation at the station platform level and elevated waiting hall daylighting glass;

isolation of noise in the machine room and the sound insulation performance of the walls of machine room.

(Hongqiao Station) Techniques to reduce vibration and noise

- The structural technique of "integrated building-bridge structure" has solved the puzzle of track level structure design of large-scale traffic hubs. Offering technical support for creating comprehensive traffic space, it has brought about the train vibration problem to the buildings at the same time. For example: Shanghai Hongqiao Railway Passenger Station is separated from the top downward into elevated commercial development level, elevated station hall level, platform level, underground station hall level and subway level with trains operating on the platform level. Corresponding vibration and noise reduction measures should be applied to the track level.**

(Beijing South Station, Hongqiao Station) BIPV (building integrated photovoltaics) techniques

- As the energy crisis intensifies, new energy is facing a great opportunity of major development. In the long run, solar power generation with its renewability will reduce the environmental protection cost, thus the solar electric technology has a broad application prospect. Two different photovoltaic systems have been applied to Shanghai Hongqiao Railway Station and Beijingnan Railway Station based on different installation locations.**

Low carbon energy saving techniques for heating and ventilation

- Ground Source Heat Pump (GSHP) Technology : GSHP is a renewable energy utilization technology which makes use of the deep soil as the air conditioning cold and heat source. Compared to traditional AC, the operational efficiency is 40% higher while the cost is 30%~40% lower; what's more, the pollutant emission is about 70% less than when the air source heat pump is used.**
- Combined Cooling Heating and Power Technology (CCHP) : CCHP is a poly-generation system that provides heat energy, cold energy and electric energy at the same time.**
- Air-conditioning System with Independent Control of Temperature & Humidity**

Epilogue

Looking into the future of China Railway, since a great number of modern railway passenger stations have been completed and put into operation, passenger stations of China Railway will provide the passengers with more convenient entry and exit services, more comfortable waiting circumstances, more humanized service facilities and more harmonious relations with the city. It will surely play a more important role in improving the urban comprehensive communication, and even the economic and social development. Therefore, construction of the low-carbon and environment friendly buildings is a major issue concerning developing low-carbon economy, saving energy, protecting environment and closely related to all the people and the whole of the society. A great event propelling the advances of the entire society, it is an inevitable choice to boost the sustainable development of economy and society.