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Some thoughts on network planning and construction of urban rail intersection

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Abstract: A case study of Shanghai Rail intersection network planning , put rail into network era , should innovate in planning design concepts , moderately ahead of plan , Build intensive , Multi-level rail intersection system , and strengthen interaction and land control with urban planning . advocates rail intersection with station Core body , Implement the networked development phase the innovative design of station sustainable development . The summarizes the construction of rail-intersection projects in soft soil area represented by Shanghai technology , construction methods for hub projects and protection techniques and measures for urban environment , Application Prospects for construction of new technologies for rail-intersection engineering .

Keywords: Rail to network; planning; transfer; hub; innovative design; construction technology; space-time effect ;environmental protection

passes Rapid Economic development for many years , domestic Open rail line The city of the road has exceeded the Beijing , Shanghai , Guangzhou and Shenzhen etc big cities basically form networked operating systems ; Tianjin , Wuhan , Nanjing , cities such as Chengdu and Chongqing have also moved from single line construction to networking Times .

from the history of foreign rail intersection , Networked development phase planning , Construction and operations differ from single line , will meet Temporary _ series problems not encountered in single phase . This article has long been involved in the planning and design of the early-stage rail intersection by () , to the Typical problem analysis and interpretation , and rules for future rail intersection to make a few suggestions .

1. Construction of urban rail-intersection network planning

1.1 Close link between urban rail transit planning and Urban master plan , appropriate ahead , time Feedback

because Urban rail intersection is a big investment , Construction Duration Long , Operations Time Long , major workers with significant impact on future urban development , So develop it in a healthy and orderly way , To Achieve the overall effectiveness of the rail intersection control , Careful planning , Advanced Planning is necessary . network age advanced planning and strict control are particularly important . current , Domestic City General The problem with all the times is the poor continuity of the rail intersection plan implementation , have The Network planning for the first round of rail-intersection construction planning in cities Revised or adjusted when compiling the second round of building planning , The period is no more than five or six years or even less.. causes This problem for a variety of reasons , The instability of the above-bit planning itself , planning for lack of project implementation experience by the department , Administrative will on planning control The interference of the system, etc. .

from the relationship between urban rail intersection planning and Urban Master plan , The latter is the Upper plan

for the former , The former is the latter special plan ,is an important part of , must be moderately advanced and in a timely manner to reverse feed . In particular our country is in the midst of a rapid urbanization phase , mostCity size and population expansion faster than planning expected degrees , to make the Rail Vision network implementation cycle more often than the current general rulesDuration . so , at planning time to be based on the master plan , To fully Consider the unpredictability of urban development , leave _ set leeway , to enhance continuity of planning implementation .

According to urban development rules , predicts the development of urbanization in our country to this The middle of the century will gradually enter a smooth development phase , this time and planning for the next round of city master plans (2040 year) General match . so , advising cities to take note of the next round of general rules changes in urbanization features , Special alignment etc Major Foundation Installation planning , Urbanization should be achieved after the smooth development phaseof the, to form a relatively stable scale and reasonable layout structure . Special , recommended when making urban rail network planning, , should leave enough on time , to collect related data , analyze , and create Reasonable evaluation system , Network repair scheme multi-party validation , wide sign Seek and filter acceptance views , to improve the rationality of the final recommendation . 1.2 for City features , Build level clear , mode diverse set approximate rail-Network planning

from the world _ Some famous mega cities (such as New York , London , Paris , Moscow , Tokyo etc) developing rail intersection view all The progressive hierarchy Clear rail network , that is, metro in urban areas , light Rail main , city suburb with country rail or suburban railway mainly , rails Network covers all directions of city . Mega

cities in China development

You should also use this as a reference for rail intersection , But from the current point of view this is done has insufficient .

take Shanghai as an example , The year forms the 425 km Basic Network for 2013, and end of network reach 567 km , connects two international Airport ,3 Rail Passenger Terminal , The Average daily traffic is greater than ? million times , maximum day 900 million times , The total number of bus trips to the city more than . 5, The backbone and role of urban transport The IS fully visible . But on the hierarchy , Shanghai rail network mesh new metro and light rail lines primarily , mode , system format is more for single in particular in the suburban railways and on the use of the national Iron , excluding gold out of mountain railways missing more attempts , The fast line is not really built and the Metropolitan Line network . based on the 2040 Shanghai City overall plan , Shanghai's Future city positioning is the global financial and shipping center , one , Service scope and radiation intensity will be extended to multiple cities around . Its strategic objective is to support the Yangtze River delta led by the Shanghai core City City Cluster Development , drives the development of regional urbanization ; supports urban and rural co-ordination and Regional Orchestration , promoting coordinated development of surrounding large and medium sized cities , implementing Land use intensification and development intensity gradients ; back to Shanghai city "" city "Development and Shanghai metropolitan area "1 hour commuter cycle " construction . This has raised a higher requirement for urban rail intersection . If you still plan on building a new line in the main mode before , not only cast Capital pressure is huge , construction speed is also difficult to meet the needs of urban development . so ,Shanghai in the new _ The focus of urban rail network planning One is a study of fast-line and metropolitan-line networks , especially in the full making use of the state of ,On the basis of summarizing the experience of Jinshan railway, we should continue for useful exploration .

for large cities and medium sized cities , such as Nanchang , Ning wave , provincial capitals and economically developed cities like Changzhou , on the rail network When planning , Note that it is inappropriate to blindly compare , Overly pursue rules mode , Instead, start with the characteristics of the city , Prudent decision network overall size and single line scale , take full advantage of the region or metropolitan area planning intercity rail in , City line planning and existing national Iron Channel , conformitycontrol Row Resources , to achieve intensive planning and

multi-level development of rail intersection .

1.2 establish a good planning decision mechanism , break through administrative divisions and bodies barrier

According to the relevant standard specification , The planning scope for urban rail intersection is the city domain . for mega cities like Shanghai , as described earlier ,rail intersection service scope is more than a city . The will also extend to the surrounding cities or the Metropolitan area . But from inside the city , Planning Administration for the city area by Administrative Division , Municipal and county General Administration ,, The Economic and technological development zone in the urban area also has _Set planning rights benefits , If the scope of the metropolitan area is also taken into account , Administrative Restrictions - – 2:- The system factor may be larger . but from the characteristics of urban rail intersection , line The construction and operation of is bound to be continuous , from the integrity of the network Block considerations ,should not be biased to the benefit of a sector .

Shanghai Rail intersection One the line extends to Kunshan Huaqiao is useful to try , _. this _ Success Tips US , in a city-intersection or city Circle-intersection plan , should consolidate all stakeholders , establish good rules row decision mechanism , to break through administrative and institutional barriers , For example, build Long -term co-ordination Administration , Regular meeting Discussions etc . solution OK these external issues , can better promote planning rationality and continuity .

in the planning implementation phase , Given that the principal of the investment is different , recommendation from the unified _ Management Organization Guide Construction planning , Determine full line technology standard , Coordinating districts (City) interface between lines , Supervision and guidance every district (City)Related build work .

1.3 Planning Design introduces the concept of networked co-ordination , To improve the planning section Learning , Extensibility and network benefits

After entering the networked development phase , and single line building , shutdown The focus of the note is very different. , as associated lines technical standards ,,,system compatibility between lines and operating lines , node implementation vs . reserved Principles ,_ , ticket transfer and fare assignment , interface with related traffic vs. reconcile (rail intersection , Ground bus , Railways, etc.), network functionality and Admin Schema , Network operations Management _ Coordination and contingency handling , Network Complex maintenance-managed protection , network resource consolidation share , Network Mutual interworking , Network standardization Construction , Network integration Development , Network Section to environmental protection , Network Operations management efficiency etc . These are single level section cannot be covered by , must start at the network planning stage consider , and make reservations and controls .

when Shanghai repairs A new urban rail network, , first to the previous round network planning , building , Operational Experience Comprehensive evaluation , toNetwork orchestration (vehicle segment / Farm , main substation , Control Center , Hub Station network resource layouts technology , Underground station (Combine large transfer pivot New) and development design , Construction , electromechanical , Operations Management Integration Technology , construction Technology of rail intersection underground engineering in soft soil area and network Operations Management , Maintenance Management , disaster mitigation , , Risk control system Key technologies and successful experiences are summarized . co-ordination in planning phase consider the Key technologies above , can greatly improve the nature of planning, to implement Sex and network benefits .

The ultimate goal of networking is to use the network's operating mode , Tube mode and System Professional resource sharing focus , with network Operational features requirements Core , Building network synthesis . pass set Up network Operations Coordination Center , Emergency center , ticketing and customs clearance Center , Create efficient network operations Management system ; by building a pass

lose , Exchange , Wireless network support systems , Build Network operations base Base platform ; through

coordination mode , Unified Standard , Planning the channel ,Max degree of network interoperability ; through network orchestration , system integer close , high sharing and intensification of resource utilization . fully issued Swing Network system overall performance , Ensure network system security , reliable , efficient operation , Implementing networked planning One design one construction FirstOperations one The virtuous circle of urban development .

2. station building design in networked construction

' distance is not distance , time is the distance . the image of the word "" is a metaphor for fast public transport systems operating in urban rail Transit , the objectdistance becomes precise time distance , brings fast Convenient travel , Breaking the city's traditional geography , block concept , and The measures distance from the concept of social travel time in a broad sense . such as today , Rapid public transport system accelerates the expansion and development of suburbanization and Rational adjustment of urban structure , to form a central city as the main body of the ' more Axis , multiple , Multi-core Reasonable layout of the urban space structure of ,implements large The overall planning objective of the city is . China's major cities have entered the Rail intersection networking construction phase , One of the most important features of station architecture is the line intersection form _ set number of transfer stations , and in () Integration of Old City reconstruction with urban rail intersection development mode , city suburb TOD Development Mode , Transfer Station resource sharing , Existing building changes built for stations , The appearance of design innovations such as atrium stations .

2.1 Network-built transfer station design diversity , complicates trend

The biggest feature of the networked development phase , is line and line intersect to form a transfer station so that the line is anchored to the network , Implementing Rails Network effects . where lines intersect and transfer most of them with two-line primary , But there is also a three-wire in a particular area of a large city Change , even four-line transfer station , Its transfer is often through the existing The station or the large-scale transformation of an existing building to implement .

2.1.1 Mega public transport hub -- Shanghai Hongqiao Comprehensive Exchange through hub

Hongqiao Integrated transport hub is located in the west of Shanghai's Central District , original Rainbow Bridge Airport West , Total building area over million m 2 ,includes Hongqiao machines field 2 terminal , Maglev Hongqiao station , Railway Hongqiao station , 4 City Rail intersection and East , West Traffic Plaza , is on the ground ,Large combined underground Three-dimensional integrated transport hub , to meet daily average $ throughput (with National Aviation , high-speed rail , Maglev , Highway Traveler . will generate 20 pivot area Multiple passengers / Day on-orbit exchange on Demand seek , Qingpu line , Rail intersection 2 line and Ten line , plan Line Internaltransfer passenger flow up to million people / Day , Other that may pass through the hub

Local traffic transfer needs are 5 ~15 million times / Day .

Hongqiao Hub takes the World Expo as an opportunity , drives Hongqiao National Convention and Exhibition Center and Regional Development of modern service industry , to long triangle economic complexity Honor and urban agglomeration structural optimization provide strong support , reaching the long triangle ' Regional traffic integration , promoting regional economic integration "" purposes .

Is based on the controls local traffic transfers , to build the Hongqiao hub into the main socket the major hub of external traffic positioning , rail intersection system through road network layout adjustment , forming a better rail interchange system outside the hub , reduce this pivot New York traffic pressure . where , rail intersection 2Line and ten line at airport and All stations under the high Speed railway station (Underground Two-storey parallel transfer station) , other , Rail intersection Qingpu line two floors underground station and Line with platform transfer , plan " Line perpendicular to 2 line and ten Line , Qingpu line , in high speed rail Station floor three-tier station implementation rail interchange by . things two stops , Three-dimensional switch Multiply layout , not only meet the convenient transfer requirements of all kinds of rail-transit passenger flow , and The avoids the impact of the city's traffic flow on the major hubs .

2.1.2 Existing station retrofit implementation 4 Line Transfer -- Shanghai Rail intersection Century Avenue station

Rail intersection century Avenue in Shanghai Pudong New Area Zhangyang core Public Circle , Publicity Road , Orient Road , Weifang Road , Fuk Shan Road wai Hop century large down to . 2, 4, 6, 9 Line rail network requirements this intersection , Shape To National page _ 4 Central Transfer hub station for line transfers (See figure 1) . Hub Total construction area exceeded 4. million m 2 , Total passenger distribution amount to million people / Day . 4 Line station in pivot form " 30 " glyphs transfer " ,Efficient and easy . with 6 line (Hall-level underground level side station with the two level of the underground 2, 4, 9, lines 3 line sharing station section vertical tangent , by making a massive transformation of the lines that are already operational after setting the station . This renovation works in the domestic Rail transit field is the first one , its work The process difficulty and risk is self-evident . The project's disaster prevention research in the internationally Advanced Level .

2.1.3 reconstruction of existing buildings 3 Line Transfer -- Shanghai Rail To Xujiahui station

Xujiahui Station in Shanghai, the first city to form the deputy middle of the heart one xujiahui , Huashan Road , caoxi , Zhao Ka Bang Rd , for Hongqiao Road intersection. The five fork junctions are the most important in the Southwest of Shanghai. Node , traffic is very busy . According to rail network planning ,1, 9, one line to form a city-area rail intersection 3 a large hub for line transfers , Yue passenger flow up to. 2 million times . built on track 1 line (three floors underground station (no) along Hengshan Roada Cao Xi North Road is located at Xujiahui Central Square , Its underground one floor for Hengshan Road interchange . original 1 Line in construction, District Traffic and economic development for several years , If further road excavation is implemented workers , Their traffic impact and economic losses are incalculable . After years of research the, design units innovate to launch the renovation of Hang Lung Harbour Plaza basement The ring sinks 3 Line transfer Scheme , The upcoming Hong Kong Trade Plaza and Hong Kong exchange one floor between apartments converted to 9 Line Station Hall level . underground two , three-storey garage conversion to 9 line platform layer , and to the in the pending commercial plots on the north side of the Gongcheng Road one line station with "L" form phase underground of commercial squares _, Two-level local transformation to with 1 Transfer channel for the line (See figure 2). This scenario is design concept and real Apply technology breakthrough , Its large-scale transformation of existing buildings as a rail intersection The station is the first in the world to be a .

2.2 Innovative design for sustainable development of station building in networked construction

2.2.1 Transfer Station space and equipment resource sharing

The biggest feature of networked construction is the formation of numerous transfer stations . due to mechanical and electrical system of the station involving power supply , ventilation ,FAS,AFC , Pass Letter Multiple Professions , device type , takes up more space , is for the second line Maximum line Transfer Station If you still follow the single station method Count , not only cause device system , Equipment and management room weight one 4 A complex , A waste of equipment and space resources , Bad operations management and cost savings . so , must be integrated with Transfer station electromechanical system Resource consolidation , Implementing system sharing ,space Sharing , device sharing , Tube to share , Achieve reasonable utilization of related resources , Comprehensive configuration , Efficient Use and sustainable development purpose . one Some cities to transfer station Type summary , proposed management room and electromechanical system resource set shared principles and requirements ,to implement operations management , electromechanical system Integration to standardization , Modular , Human-oriented development , Save Work Process Investment and operating costs , improving efficiency and level of operations management . where , Shanghai Shen Tong Subway Group through the various types of transfer station resources shared Focus Research , , forms a new round of building resource sharing Design guidance file , the ensures that one single station independently transports the work can , base to meet basic system design requirements and construction requirements ,, Implementing Transfer Station resource sharing , and reach station section , , section , , Cost-saving sustainable development Goals .

2.2.2 Change Traffic Hub is City Node , building with stations for Core rail intersection complex

Search for sustainable transportation and urban development throughout the world ,, development model for integration of urban traffic and land development has been broadly Pan-promoted , Complex features contribute to the diversity of rail resources utilization . when site area feature is combined, Rail intersection for people in this area out of the line will have a significant effect . the Rail intersection will transform from simple traffic to A part of people's living facilities , covers traffic , Business , Office ,A composite of features such as residential , dramatically shortens the citizen Social activities distance , lowering traffic cost . This is also the rail construction Sustainable Development Goals .

in _ Some of the city's track-and-turn construction process , The Planning Department is based on the TOD [] planning adjustments under Innovation , make Land intensive composite The use is implemented with . Shanghai Rail intersection 7 line back Beach station , Shipyard Road station and 9 The Dapuqiao station on the line is located on the commercial complex block , through the ground , development of feature composite , reflect land intensity Advantage ; at the same time , Scale of urban underground space via Rail intersection , Networking Development , intersection and commercial real estate development "organic coexistence " , not only Saving Station-building land costs , , Avoid construction period to road Traffic impact , combined with commercial plaza open space for stations brings comfortable external space and outdoor environment , The greatly improves the Rail intersection station image .

2.2.3 Innovative design for non-decorated stations

Rail Transit stations are subject to engineering conditions and investment restrictions , structural forms are more single , decorate solutions are often structure Outsource decoration material to implement . rail intersection in Seal city development trajectory at the same time , also carries the mission of disseminating urban culture . This requires me to

in a specific areas of the city , must be culturally functional to the station to locate , and creative design based on cultural theme , breaks the original station building expression single _ .

Shanghai Rail intersection 8 Line elevated station indoor and outdoor use of water mixed The no-decoration design of the form of coagulation , public area ceiling neat devices pipeline Exposed layout , plus interval prefabrication U The beam itself is the _ a good visual expression , in Shanghai's modern New town a PU Jiang Zhen forms a _Road Beautiful scenery line . Station in communication new urban construction setting culture at the same time , Its simplicity , low-carbon Innovative design also responds to Rails to make sustainable development requirements .

2.3 culture-implanted rail intersection , Open the road to innovation in station building

Rail intersection promoting cultural development originally understood only as passenger service the contents of The _, and the rail intersection is an important section of the urban public space Point , same load affects Volkswagen , Public mission to affect the general . under China leapt into the World's second largest economy , for Universal ' ' Chinese Dream today , Shaping the characteristics of the era that reflects the construction of rail intersection , on Build Cultivation , Promote the government's culture platform has become a new _ Another for wheel-rail construction _ Important goal . combined with track culture building Set requirements , We must change the existing design concept , Place the station's Public culture space shaping into design plan , pass to road network and each line , all stations ' cultural space requirements , " audience Group Analysis , " State Station cultural positioning , Ensure that the goal of cultural platform construction is implemented in the procedure . other , through cultural implants Innovation Station Architectural design , Building culture platform at the same time guest The shipping service level will also be elevated .

3. Development of construction technology for rail-intersection engineering and application of new technologies

3.1 Construction Technology of rail-intersection engineering in soft soil area

Construction of rail-intersection projects in urban building , in heavy traffic and city The downtown area of the city

is mostly underground. , Its construction technologyThe is the key element that determines the success or failure of the project _. on track underground works construction , , The stratigraphic characteristics of our cities can be divided into 4 Large class :

1) Soft soil represented by Shanghai .

2) strata and soft formations represented by Guangzhou and Nanjing, in the form of changed strata .

3) Strata based in Qingdao and Chongqing .

4) Sand Pebbles for Chengdu and Beijing layer .

due to different geological conditions , construction methods used in different cities There are significant differences between and . Shanghai-represented soft area rail intersection Construction works are mainly made by Ming-digging method (Foundation Pit Law) and shield tunneling .

Construction of Shanghai Rail intersection project from century Experiment Research start . Experiment Study , Survey Design and construction technology active explorations in , creating a deep foundation pit design for soft soil Space-time effect theory , The forms a soft soil shield tunnel design , Construction Complete technology ,Developing construction remote monitoring System , OK in Shanghai Construction of urban rail intersection network in saturated soft soil strata _ Series Technology andManagement Actions , and successfully applied the in the project . Shanghai rail network , the Metro zone above is built with shield method , Single , Double Circle ShieldConstruction Environmental protection technology has reached the world Shield tunnel construction of the Advanced Level ; Excavation of a deep foundation pit with diaphragm wall support , open pit dig depth up to M , The deepest wall reaches m; uses the ' separate , Drop , fill "" comprehensive treatment of ultra-deep pressurized water and settlement control measures ,, through pumping " back-irrigation integrated isolation of deep foundation pit drop bearing pressure water back The impact of the strata in the protected area ; with lid-digging , half cover digging technology in cities City Core Construction metro station ; using rectangular pipe jacking method to build under main Road or important underground pipeline exit channel ; To conquer the silt , Flow Sand , Poor geological conditions such as pressurized water and shield tunneling Camp tunnel , Construction of transfer station by freezing mining method under Operation station , The river damaged tunnel in situ repair Project a series of problems , very well controls the impact on the surrounding environment and traffic during construction .

3.2 The construction method of the rail intersection integrated hub

a large transfer hub with a three-wire transfer is a rail network construction key node . The construction of the hub station can be divided into general planning , oneSecondary design construction completed or phased construction , pre reservation node new type , such as Hongqiao Hub integrated transport hub ; No test in the plan to interchange with existing operating stations " extension " , as Shanghai rail turn to 1, 2, 8 The People's square hub on the line transfer , 2, 4, 6, 9 Line transfer Century Avenue junction ,1, 9, one line to transfer to Xujiahui new , etc.

in the extension of the interchange hub at the four-line century Avenue , New build 4 Line stations and operations 2 Line station parallel transfer , two Station distance only 0~ 5.4 m ,4 Line station more 2 Line station bury depth approximately 6. 9 m . in order to minimize the build stations and intervals tunnel impact , A piecemeal approach to Foundation pit design , Full Play spatio-temporal effect , take steel pipe and reinforced concrete combination support technology actions and targeted reinforcement , Use automated monitoring for information construction ; 2 the maximum settlement of the line station is only 4. , mm, Road Bed Water flat tilt to maximum 0. mm , is in the operating allowable warp range within ; 6 Line station rail area crossing 2 Line Station Hall layer , by setting the Set single-line slot girder structure , Resolve structure withstand through section of station Hall 6 train load Problem 2 When the line station is rebuilt , take small fan Round-chisel except , with chisel with build , Structural reinforcement Hardening , anti-pull pile pressure beam system Anti-floating measures , ensure the safety of station structure in construction ; The takes a new Waterproof material , seam plugging patch strong , Drainage and construction from Waterproof measures , reduce joint and structural differential settlement of new and old concrete cause

leakage , The effect of remodeling on the durability of the built structure is reduced to lowest .

3.3 Protection technologies and measures for urban environments

Rail-intersection engineering often works in the urban core area , around building secret set , Underground pipeline vertical , with multiple urban rail intersection gradually into the network operating phase , Protection from existing operating lines becomes more environmental protection The most important . in previous construction, due to resident house occurrence settlement cracking A lot of social contradictions and cases . due to construction improper cause municipal pipeline fracture , is often caused by environmental issues promoted to City safe run issue . to protect a built (construct) , Normal use and safe operation of construction and underground pipelines ,Rail intersection project The surrounding strata displacement caused by construction must be limited to _ The Variant value within .

Shanghai Rail Deep excavation environmental protection grade is _ level , Enclosure structure allows horizontal displacement to 0 . 14% for Deep Foundation excavationdegree : Shield Tunneling Engineering environmental safety Grade super time allow change form 5 to , the formation loss rate is 0.5%6~1%6. in the case of the soft ground conditions in Shanghai such as , the Usual design is hard to reach to above environmental protection requirements of . In recent years , with design concept cross -Development, the theory of space-time effect in deep excavation works should be with , new technology , new Device , New processes continue to emerge , Rail intersection project Design and construction innovations , There are several environmental New technology and new measures , For example, the new technology of super deep underground wall construction , Super deep Foundation Hardening Process , Micro-perturbation hardening technology , Automated monitoring technology , "" piano on major pipelines or operating tunnels construction workers Law , Steel Support Axial Force automatic compensation support system , Shield New slurry, etc. Application of new technology , A good solution to urban-intensive rail intersection engineering surrounding environmental protection issues facing the construction , Promote the construction of rail intersection The high-speed development of the operation .

3.4 application prospect of new technology for urban rail intersection

is currently , Urban Rail-intersection construction technology develops rapidly , Various methods and Technical innovations and breakthroughs . from the actual situation in our country , build Rail intersection construction technology should be in the following aspects of national industrial governance The policy's support and attention :

1) speeding up profiled section Shield tunneling machine , Hybrid Shield tunneling forward to and TBM Development of new construction equipment such as tunneling machine and apply . through development , make it better suited to complex geological conditions , make Roadheader go to machine , electrical , Hydraulic and automatic control _ Body , Smart Device direction development . via the large Shield tunneling implementation vehicle Station, Deep Research on special section shield with rectangular shield , resolving city The confusion of the construction of the subway station by the center area .

2) Widening the construction of underground structure artifacts , Factory research scope , and as an important symbol of the development of new construction technology

Improve the engineering quality of rail intersection and speed up the construction progress of the project .

3) developing multimedia monitoring and simulation system , three-dimensional emulator Computer Management system , Achieving management informatization and intelligence .

4) In-depth research and full utilization of information technology , healthy and complete Good rail intersection construction risk management mechanism . make full use of advanced monitoring technology Procedures and methods , especially 3S Technology etc , set up for surface and underground production Raw deformation , The database of the displacements , and develop the Automated evaluation Analysis Department Unified ; Simulate simulation of surface load and underground space development test , to explore natural and artificially exploited complex factors , "" Project Construction a Geology a interaction mechanism and coupling of ecological environment Combination effect , provide basis for safety assessment of underground works .

5) in view of the high risk of urban rail intersection construction construction , Must realize the construction management informationization of the site, to effectively reduce the construction Risk .

6) speeding up new waterproofing materials and construction technology investigate , to ensure that the rail intersection works as expected to implement the knot in the life cycle construct Durability .

7) further supplement and improve the urban rail-intersection engineering regulations draw , Reconnaissance , Design , Technical and economic regulations such as construction , label , and so on .

8) firmly set and persist ' technical feasible , safe and secure, via Reasonable , Environment-friendly Concepts and principles of , Consolidated , to flexibly with various possible technical means , adapt to urban rail network construction type , deep down trends such as , integration , Complex etc . hard work new technology for urban underground construction (new material , New Machine , new worker Artists) and Planning surveying techniques , Design Calculation technology , Environmental Protection, support for disaster prevention and management technologies, etc. , serialized , specification and internationalization .