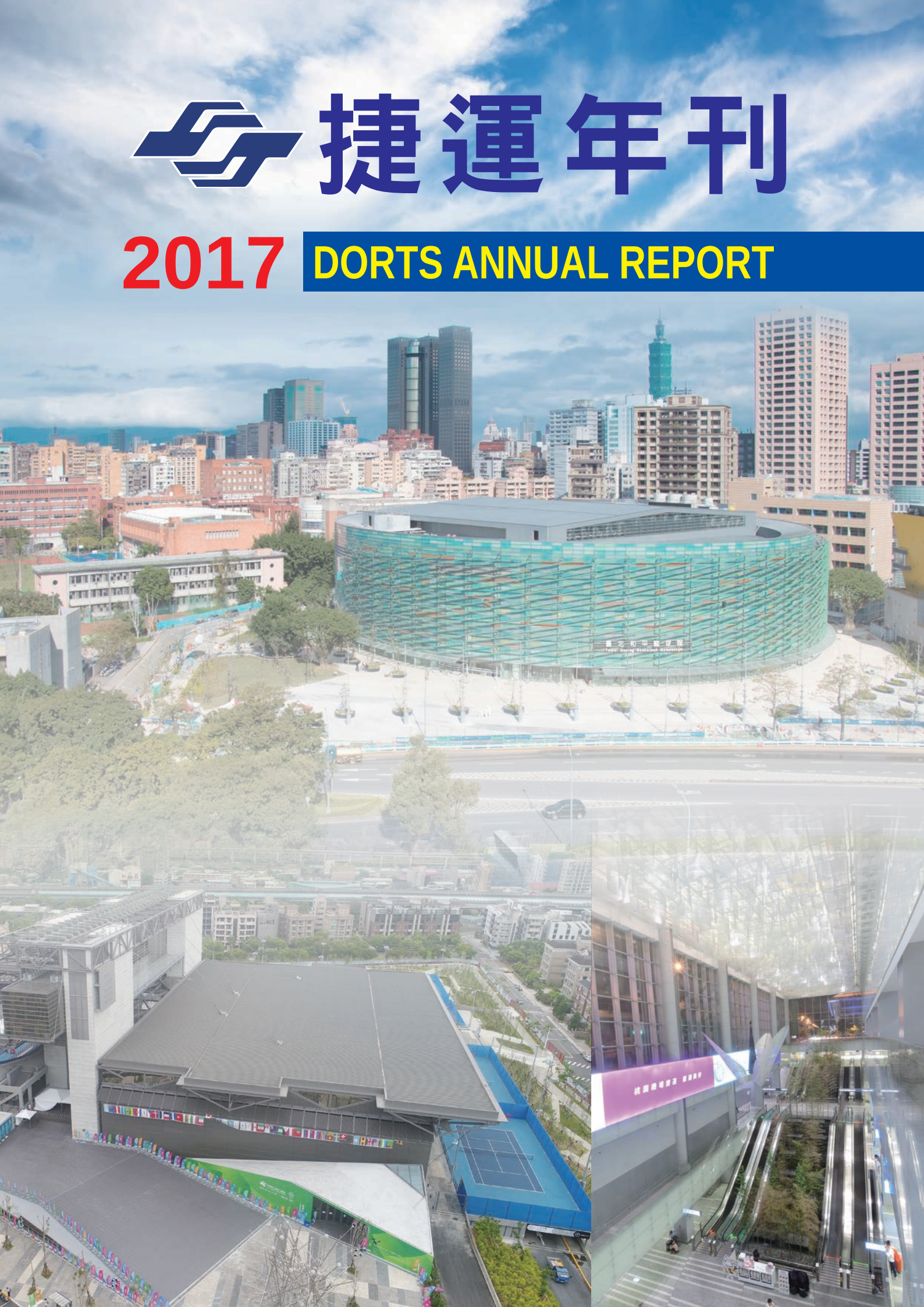
# 捷運年刊

# 2017 DORTS ANNUAL REPORT



# Contents

# A Word from the Commissioner

## Thirty Years of Deep Cultivation of an Intensive Core: MRT's New Customer-Oriented Rebuilding Achievements

For the Department of Rapid Transit Systems (DORTS), 2017 echoed the Confucian saying of being cultured and established at the age of 30. Indeed, thirty years signifies that through the accumulation of past efforts, seedlings have taken root and grown into big trees.

Looking back to February 23, 1987, when DORTS began operations, a variety of professional talents from all directions were recruited and dedicated themselves to MRT planning, design, construction and operations. Over a number of years, through domestic and foreign consultations and core technology transfers and advancements of DORTS' outstanding engineering teams, from having nothing to having expertise, through numerous difficulties, they have not only established the first domestic MRT construction hall, but also passed on their valuable engineering and technological heritage and assisted in MRT construction in the Kaohsiung, Taichung, Taipei, and Taoyuan metropolitan areas. This has enabled more urban residents to share in a safe, comfortable, and pollution-free mass transportation system while also expanding the scope of their lifestyles, and increasing urban and national international competitiveness.

In 2017, DORTS accelerated the promotion of various projects which are under construction. Among them, after reaching the goal of completing the bulk supply substation of the Circular line EMS construction in June, the delivery of the electric multiple units (EMUs) also reached peak levels, and

extensive field installation work on each item of the core electromechanical projects, including signage, power supply, and communications, has been underway. Power transmission for a portion of the MRT stations and railways has also been successfully completed, which is an important foundation for the operation of the EMUs on the line. In addition, progress is being made on the EMS construction of the Taichung MRT Wuri–Wenxin–Beitun line and trial runs of the EMUs, and at the beginning of August the EMUs began to undergo a series of functional testing and verification on the main line. Furthermore, all of the EMUs arrived early at the Beitun Depot at the end of November.

An explanatory meeting of recruiting investors for C1/D1 Joint Development Project has already been smoothly completed, and all contract signing with the successful bidder for the leasing project of the MeHAS Commercial Market at Xindian Depot on the Xindian line has also completed along with all handover operations. In addition, in order to gain an understanding of city residents' requirements for routes in the Taipei Metropolitan Area, DORTS held a "finding MRT routes" event to serve as a reference for consideration when planning the eastern Taipei north-south MRT system. Meanwhile, DORTS successfully completed the entrusted mission—the construction of Taipei Heping Basketball Gymnasium and Taipei Tennis Center, the major competition venue for the Taipei 2017 Summer Universiade.

Under the quality policy objectives–when establishing a safe, convenient, and high-quality MRT system, DORTS continues to simultaneously pursue excellence and innovation while also upholding professional skills to create outstanding work quality and progress. DORTS also created even better results in 2017 and was honored with major engineering awards as follows:

- JD building (M2) at the Xinzhuang line Daqiaotou Station won a top major gold stone award and a gold stone award at the 25th Annual Chinese Architecture Golden Stone Awards in the Public Construction/Space Activation Category Planning Group.

- Circular line Subcontract CF643A of Section Contract CF640 won a total of three golden awards at the 19th National Construction Golden Quality Award in the Public Construction Civil Engineering Group for track engineering.
- Circular line Section Contract CF650 construction was awarded at 19th Annual National Architecture Golden Award in the Public Works Category Civil Engineering Group for track engineering.
- Circular line Subcontract CF651B of the Section Contract CF650 won the Chinese Society of Structural Engineering 2017 Structural Engineering Technology Award.
- Circular line Contract CF651B was awarded the Chinese Institute of Engineers Award of Excellence for construction.
- Circular line Subcontract CF660B won an award of excellence for public works from Taipei City Government in the first rank of Civil Engineering Category, and a Public Works Quality Award from New Taipei City Government.
- Taichung MRT Wuri–Wenxin–Beitun line section contracts CJ910, CJ920, and CJ930 were awarded construction quality awards in the Public Works Group for the 2017 National Architecture Awards, and four awards in the Planning and Design Category (one first-prize for excellence award, and three awards of excellence.)
- The JD buildings at Songshan line Zhongshan Station (M2) won the 18th Annual National Architecture Golden Awards.
- Songshan line Songshan Station won a Chinese Institute of Civil and Hydraulic Engineering Construction Environment Aesthetics Award in the Landscaping Category.
- New Integrated Construction Projects on the Songshan Precinct, Taipei City Police Department, DORTS Project Office Building, and Songshan line MRT facilities were the recipients of awards in the Ecological and

Environmental Category of the Chinese Institute of Civil and Hydraulic Engineering Construction Environment Aesthetics Awards for landscaping.

- Songshan line Beimen Station won awards for Works of Excellence in Aesthetics and Landscaping from the Chinese Institute of Civil and Hydraulic Engineering Construction.
- Taipei Tennis Center for the 2017 Summer Universiade won one first-prize Taiwan Architecture Award.
- Cantilever construction platform for construction safety and protection -- elevated MRT station exterior scaffolding was awarded one first-prize of Government Creative Proposal Promotion Award.

Intensive planning for organizational reform of DORTS is already fully underway, and operations must be adjusted to keep up with the times. Based on their diligent efforts for the past thirty years and their original intentions, in addition to rapidly working on construction of the Wanda-Zhonghe-Shulin line Phase I, the Circular line Phase I, the Xinyi eastern extension, and Xinzhuang Depot, DORTS also is actively engaged in the planning of routes for the Circular line north section & south section, the eastern Taipei north-south MRT system, Wanda-Zhonghe-Shulin line Phase II, Minsheng-Xizhi line, and the Shezi, Shilin and Beitou light rail transit network. Sustained growth and expansion of more route networks for more mass transit services will bring about more outstanding results for the Taipei MRT.

*Chang Tzer-hsiung*

**Commissioner**

# Organization Chart

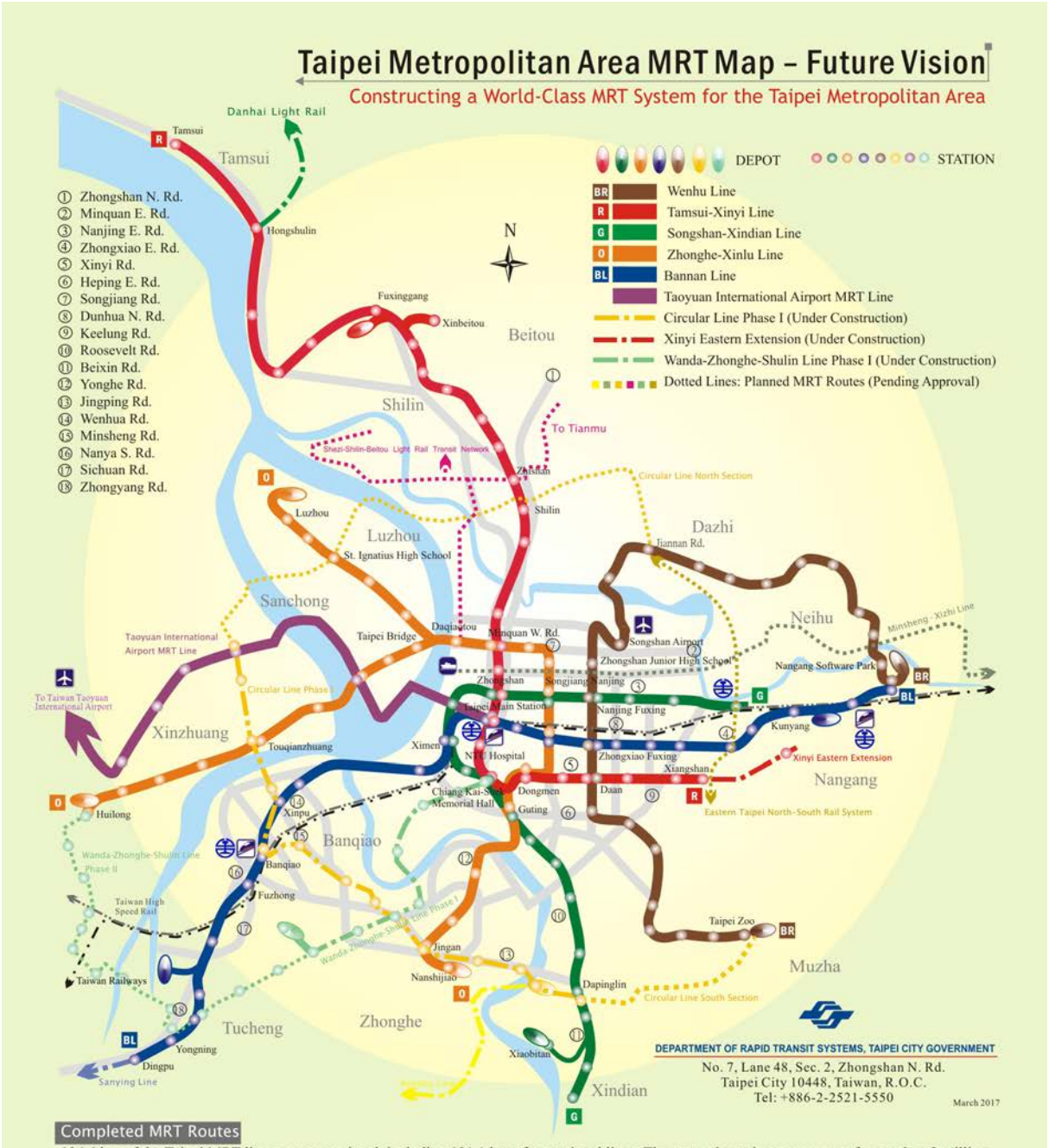
- Commissioner
  - Deputy Commissioners
    - Chief Engineer
      - Comprehensive Planning Division
      - Civil Engineering and Architectural Design Division
      - Electrical and Mechanical Design Division
      - Construction Management Division
      - Joint Development Division
      - Quality Assurance Division
      - Information and Technology Development Division
    - Chief Secretary
      - Financial and Asset Management Office
      - Land Acquisition Office
      - Public Relations Office
      - Administrative Services Office
      - Accounting Office
      - Personnel Office
      - Government Ethics Office
    - East District Project Office
    - North District Project Office
    - South District Project Office
    - Central District Project Office
    - Systemwide E&M Project Office

# Newly Completed and Inaugurated Routes

## Completed and Inaugurated Routes (As of December 31, 2017)

| Route | Terminal Stations | Total Length (km) | Notes |
|---|---|---|---|
| Wenshan Neihu Line | Taipei Zoo Station to Zhongshan Junior High School Station | 10.9 | Inaugurated on March 28, 1996 |
| | Zhongshan Junior High School Station to Taipei Nangang Exhibition Center Station | 14.8 | Inaugurated on July 4, 2009 |
| Tamsui Line | Tamsui Station to Chaing Kai-Shek Memorial Hall | 23.8 | Section between Tamsui and Zhongshan stations was inaugurated on March 28, 1997<br>Section between Zhongshan and Taipei Main stations was inaugurated on December 25, 1997<br>Section between Taipei Main Station and Chiang Kai-Shek Memorial Hall Station was inaugurated on December 24, 1998 |
| Zhonghe Line | Guting Station (excluded) to Nanshijiao Station | 5.4 | The entire line was inaugurated on December 24, 1998 |
| Xindian Line | Chiang Kai-Shek Memorial Hall (excluded) to Xindian Station | 11.2 | The entire line was inaugurated on November 11, 1999 (The 1.9-kilometer Xiaobitan branch line was inaugurated on September 29, 2004) |
| Xiaonanmen Line | Ximen Station to Chiang Kai-Shek Memorial Hall Station | 1.6 | Inaugurated on August 31, 2000 |
| Nangang Line | Ximen Station to Kunyang Station | 11.0 | Section between Ximen and Taipei City Hall stations was inaugurated on December 24, 1999. The entire line was inaugurated on December 30, 2000 |
| Banqiao Line | Ximen Station (excluded) to Fuzhong Station | 7.1 | Section between Ximen and Longshan Temple stations was inaugurated on December 24, 1999<br>Section between Longshan Temple and Xinpu stations was inaugurated on August 31, 2000<br>Section between Xinpu and Fuzhong stations was inaugurated on May 31, 2006 |
| Tucheng Line | Fuzhong Station (excluded) to Yongning Station | 5.6 | The entire line was inaugurated on May 31, 2006 |
| Nangang Eastern Extension | Kunyang Station to Taipei Nangang Exhibition Center Station | 2.5 | Section between Kunyang and Nangang stations was inaugurated on December 25, 2008<br>Section between Nangang and Taipei Nangang Exhibition Center stations was inaugurated on February 27, 2011 |
| Luzhou Line | Luzhou Station to Sanchong Elementary School Station | 6.4 | The entire line was inaugurated on November 3, 2010 |

| Route | Terminal Stations | Total Length (km) | Notes |
|---|---|---|---|
| Xinzhuang Line | Taipei City Section: Daqiaotou Station to Zhongxiao Xinsheng Station | 6.1 | Inaugurated on November 3, 2010 |
| | Zhongxiao Xinsheng Station to Guting Station | 2.3 | Inaugurated on September 30, 2012 |
| | New Taipei City Section: Daqiaotou Station to Fu Jen University Station | 8.2 | Inaugurated on January 5, 2012 |
| | Fu Jen University Station to Huilong Station | 2.8 | Inaugurated on June 29, 2013 |
| Xinyi Line | Chiang Kai-Shek Memorial Hall Station to Xiangshan Station | 6.4 | Inaugurated on November 24, 2013 |
| Songshan Line | Ximen Station to Songshan Station | 8.5 | Inaugurated on November 15, 2014 |
| Tucheng Extension to Dingpu | Yongning Station (excluded) to Dingpu Station | 2 | Inaugurated on July 6, 2015 |
| total | | 136.6 km | |




## Completed MRT Routes

136.6 km of the Taipei MRT lines were completed, including 131.1 km of operational lines. The network carries an average of more than 2 million passenger trips per day. The Taiwan Taoyuan International Airport MRT line was completed for operation with a total of 51.03 km in length, and the Bureau of High Speed Rail, MOTC is responsible for it.

## Approved MRT Routes Under Design and Construction

Approved MRT routes currently under design and construction by the Taipei City Department of Rapid Transit Systems are the Circular line Phase I, the Xinyi eastern extension, and the Wanda-Zhonghe-Shulin line Phase I, totaling 26.6 km with 24 stations. The New Taipei City Department of Rapid Transit Systems is responsible for the Danhai Light Rail, the Sanying line, and the Ankeng line, totaling 35.8 km with 41 stations. Completion of the above-mentioned lines will extend the Taipei MRT network to 203 km in length.

## Planned MRT Routes

Routes planned for future expansion include the Wanda-Zhonghe-Shulin line Phase II, the Circular line north section & south section, the Minsheng-Xizhi line, and the Shezi, Shilin, and Beitou light rail transit network, and the eastern Taipei north-south rail system, etc. The completion dates of all the routes will be confirmed after route and budget plans have been approved by the central government. When all routes are completed, they will extend the MRT network to a total of 290 km (including the routes built by the New Taipei City Department of Rapid Transit Systems) with average daily passenger trips of over 3.6 million.

Taipei Metropolitan Area MRT Map

# Data Construction Model and Database Application Project for Long-term Deformation of the Taipei MRT Shield Tunnel

## Project Origin

Various lines in the Taipei Rapid Transit System (Taipei MRT), including Luzhou line, Xinzhuang line, Tamsui line, Xindian line, Zhonghe line, Bannan line, Xinyi line and Songshan line, have been successively completed and begun operation. The entire network exceeds 100 kilometers, with main sections having been constructed through underground excavation and tunneling. Once completed construction in accordance with the technical specifications, the contractor should conduct the first measurement of the current status of the shield tunnel to maintain the long-term safety of its ring structure. With every five meters representing one measuring section, the internal displacement of six points has been measured, and these measurement results were delivered to the Department of Rapid Transit Systems (DORTS) and the Taipei Rapid Transit Corporation (TRTC). In order to maintain the safety of the MRT facilities and operation, TRTC commissioned professional manufacturers to conduct maintenance and inspection of the entire tunnel in 2002, 2008, and 2015. In 2002, measuring sections of the shield tunnel were measured using traditional theodolite/leveling instruments. In 2008 and 2015, with the MRT system operating all year long and the extremely short time available for testing due to more than 18 hours of daily operation, full-section tunnel structural image scanning technology was introduced to examine the degree of cracks in the lining ring and the roundness of the ring piece in the shield tunnel using Light Detection and Ranging (LiDAR).

Quantitative data have also been provided by the roundness test performed on every 50 meters of the entire line using the image scanning system. However, with the accumulation of more data, together with different storage formats and data presentation and processing methods, comparing results before and after testing has been difficult. How to effectively use LiDAR's original point cloud data and improve data processing efficiency, thus establishing the precision required to detect the allowable values of deformation of MRT facilities that comply with the Regulations of Building Permit Bans and Restrictions alongside MRT Facilities using optimum point cloud intensity has become a major issue.

To obtain a more accurate history and the trends of long-term shield tunnel deformation, a systematic storage method must be established for the format and precision of tunnel lining scanning data at different stages, and new and old data must be integrated and shared to be stored in the database in order to facilitate the future development of query,

analysis, statistics, and early warning functions of the tunnel maintenance management database. For subsequent large-scale deep excavation construction projects near the MRT shield tunnel, the impact of such excavation construction projects on the safety of the MRT tunnel can be assessed using the deformation values of the shield tunnel provided by the database in advance. Furthermore, the deformation values of the shield tunnel obtained using monitoring instruments during construction can be automatically linked with the database, and information can be updated upon completion of the project. Doing so would be of great value for subsequent safety control of the tunnel. Therefore, we hope to establish relevant rules for providing, storing, and compiling information on long-term deformation of the shield tunnel using the basic prototype of a good and well-structured database, thus facilitating the circulation of the original data of various types of databases in the future. Ideally, this database can also be used as the foundation for the future development of 3D mesh models and Google Maps visualization based on the concept of full life cycle sustainable management.

## Scope of Work

The subject of this commissioned technical service is the lining ring of the Taipei MRT shield tunnel (Figure 1. Shield tunnel lining). The scope of work includes the following main items (as shown in Figure 2):

1. Establishing a full-section image scanning data storage mode for the surface of the tunnel lining ring
2. Establishing the basic structure of the database system
3. Presenting information and results of tunnel lining surface image scanning (approximately 1.5 km) for the demonstration section during operation
4. Reviewing and comparing the allowable deformation values of similar tunnel ring structures between those in foreign countries and Taipei MRT
5. Developing a clear draft of technical specifications for the original data

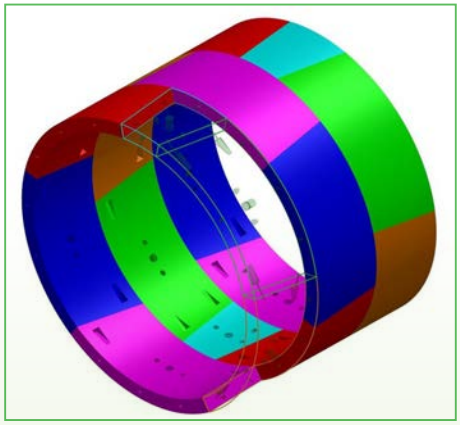


Figure 1. Shield tunnel lining


Figure 2. Main items in the scope of work for the Contract RX149

## Implementation Schedule

This project was awarded to the Taiwan Construction Research Institute (TCRI) via open tender. This project commenced on January 10, 2017 and was examined and accepted on November 27, 2017. For details on the progress of each segment, refer to Figure 3. Gantt Chart for Performance Schedule.

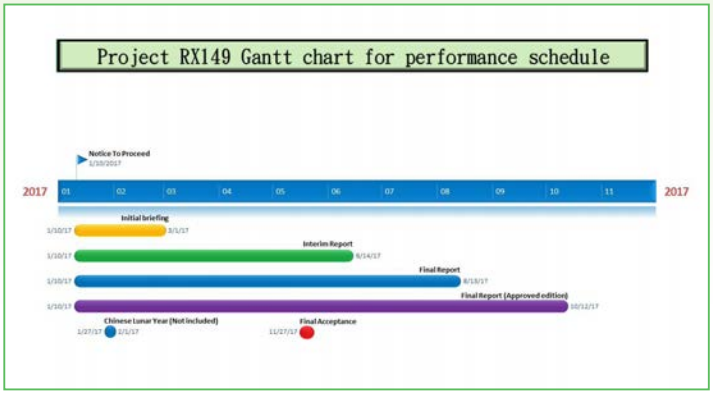



Figure 3. Gantt chart for performance schedule

## Implementation Results

For this project, the upward/downward shield tunnel between Jingmei Station and Dapinglin Station along the Songshan-Xindian line was chosen as the image scanning demonstration section. We used the Z+F Profiler 9012 full-section laser scan, equipped with a powered rail car, to obtain high-density and high-precision point cloud data of the MRT tunnel. We further used the Z+F Imager 5010 static laser light system to achieve comprehensive data construction and collection. Related field operations are shown in Figure 4 and Figure 5, while the scanning operation and results are shown in Figure 6 and Figure 7.

The demonstration section was divided into one profile for every 5 m, with 48 feature points taken along this section, while the data of these 48 feature points were compared to the best-fit circle. Furthermore, the proposed range that the deformation warning values have yet to reach, i.e. between -16 mm and +16 mm, was set as the safety zone (colored in green), while the range of deformation warning values, i.e. between -16 mm and -20 mm and between +16 mm and +20 mm was set as the warning zone (colored in yellow). Finally, the range exceeding the deformation warning values, i.e. greater than +20 mm and less than -20 mm was set as the action zone (colored in red). As shown in Figure 8, the colored blocks in the demonstration section were green, thus demonstrating that the magnitude of deformation did not exceed the safety zone of ±16 mm.

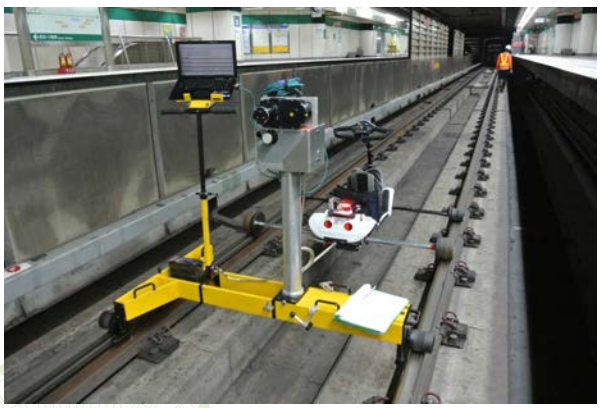


Figure 4. Field operation

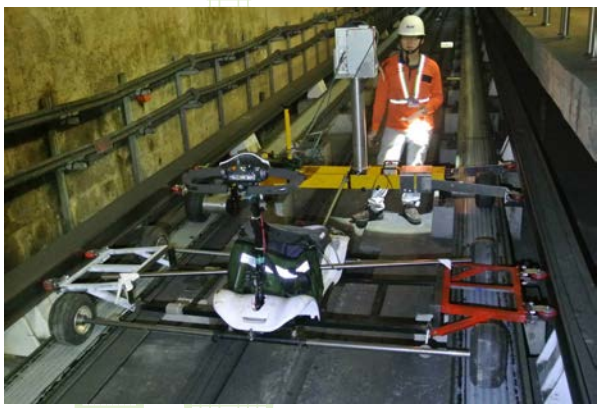


Figure 5. Field operation

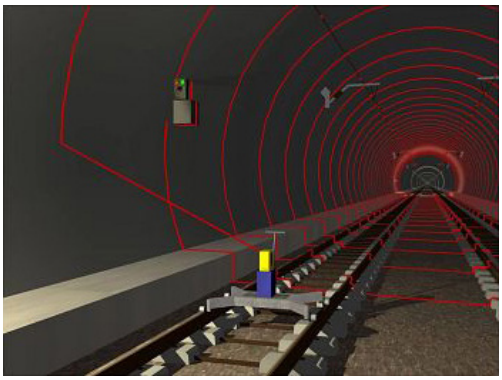


Figure 6. Results presentation

Figure 7. Scanning results

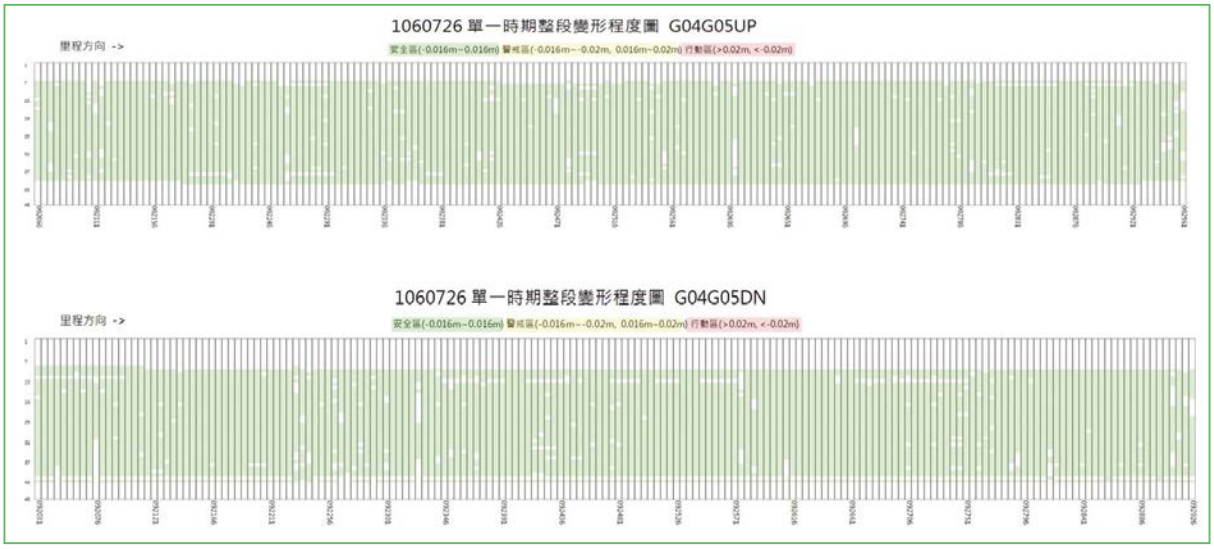



Figure 8. Deformation of the upward/downward shield tunnel between Jingmei Station and Dapinglin Station

## Recommendations

In the implementation results summary report, the commissioned technical service provider, TCRI, provided the following recommendations to DORTS for reference:

1. Since the allowable deformation values are relatively conservative compared to those in Europe and the U.S. (Table 1. Allowable deformation values of shield tunnel rings in MRT systems located in various countries), setting 80% of the allowable deformation values as warning values to be monitored and 100% of the allowable deformation values as the critical values to be monitored is appropriate. We suggest that a database of long-term deformation of the MRT entire shield tunnel should be established to improve the structural safety of the Taipei MRT.
2. This project focused on studying the relative deformation of the tunnel ring and proposed the wire layout operation method and expenses for the entire operating route and certain sections of the operating route (e.g., Bannan line) to DORTS or TRTC as a reference for the future development of absolute displacement.

3. Professional manufacturers are recommended to adopt the client-server model design and establish the Tunnel Lining Scanning Database Management System.

Table 1. Allowable deformation values of shield tunnel rings in MRT systems located in various countries

| MRT System | Inner Diameter of Tunnel (mm) | Thickness of Ring (mm) | Number of Ring Segments | Allowable Values of Ring Deformation |
|---|---|---|---|---|
| Taipei/Taiwan | 5,600 | 250 | 5 + 1 key | 1. The design should be adequate to withstand the bending stress caused by a 0.33% change in the diameter of concrete lining.<br>2. Allowable deformation values: Do not cause the tunnel to radially deform more than 20 mm in any direction. |
| Shanghai/China | 5,500 | 350 | 5 + 1 key | The cumulative radial deformation should be less than 0.5% of the diameter. |
| Mass Transit Railway/ Hong Kong | - | - | - | The overall movement caused by the railway structure/plant should be <20 mm; while the deformation effect on the railway structure/device should be <1/1000. |
| Metro Silicon Valley/U.S. | 5,440 | 254 | 5 + 1 key | The lining design shall be able to withstand the load caused by a lining construction error, and the radial torsional deformation shall be less than 0.5% of the diameter. |
| Channel Tunnel Rail Link (CTRL)/England | 7,150 | 350 | 9 + 1 key | Precast ring tunnel lining should be able to resist an absolution deformation of 1% of the lining radius. |
| Down Town Line/ Singapore | 5,800 | 275 | 5 + 1 key | 1. Under any load overlap, the maximum deflection should be less than 25 mm.<br>2. In addition to deflection caused by surface load and the appropriate load or overload noted in the literature, the lining should be able to withstand a radial torsional deformation of +/- 15 mm caused by future development projects. |

## Conclusion

The goal of this project is to establish the structure of a database that can be incorporated and used when TRTC implements tunnel maintenance and inspection for the entire route. Therefore, for this project, we invited TRTC to participate in the tender stage, as well as various stages of the entire contract implementation process, including initial meeting, preliminary presentation, mid-term review, final review, and training. During this period, the Civil Engineering and Architectural Design Division also invited manufacturers and TRTC to a working conference to discuss such implementation details as data

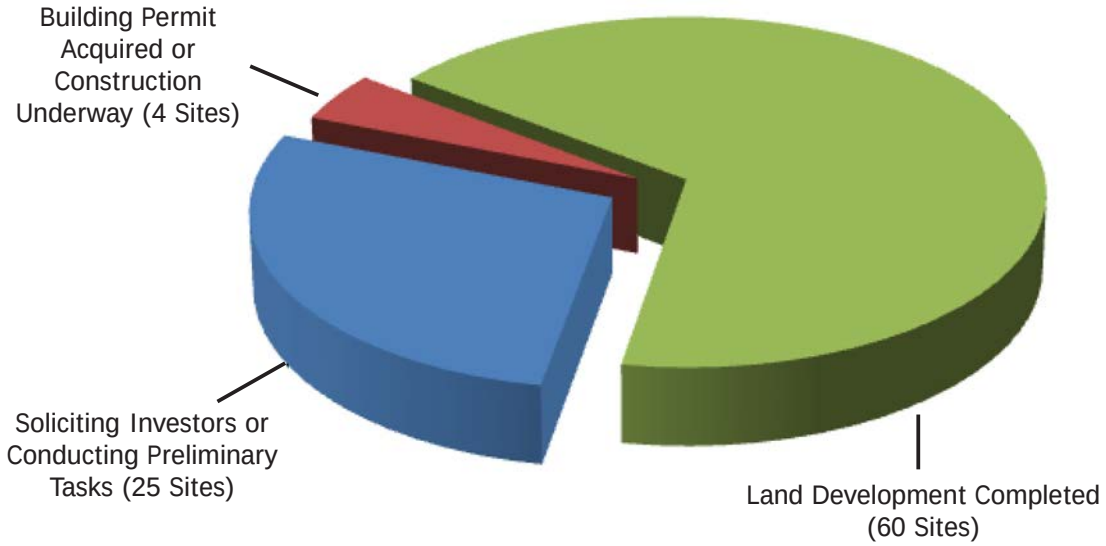
construction format and database structure. The format and precision of the tunnel lining surface image data and the integration of old and new data have been adopted and applied by TRTC for regular maintenance and inspection of the entire tunnel every six years.

# Land Acquisition and Land Development Fund Implementation Results

## An Overview of Land Development

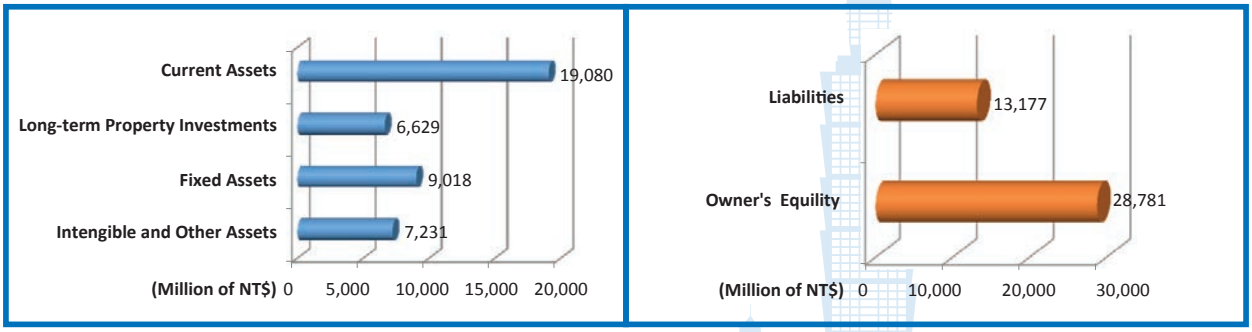
### ➢ MRT Land Development Fund Status

The following chart shows 89 station sites approved for land development (including seven sites on the Circular line).




### ➢ MRT Land Development Fund Status

Fund Status: As of late December 2017, performance of total assets amounting to more than NT$41,958,140,000 was as follows:



## Sites in the Building Permit Acquisition or Construction Stage

Four sites under construction: Zhongshan Station (M1), Xinyi Anhe Station (M5), Daqiaotou Station (M2), and Sanchong Station (M6)

➢ **Zhongshan Station (M1): As of late December 2017, construction was 99% complete.**

Rendering photo

Construction photo

➢ **Xinyi Anhe Station (M5): As of late December 2017, construction was 69.54% complete.**

Rendering photo

Construction photo

➢ **Daqiaotou Station (M2): As of late December 2017, construction was 87.68% complete.**

Rendering photo

Construction photo

➢ **Sanchong Station (M6): Building permit was acquired on November 4, 2013. Construction has not yet commenced.**

Rendering photo

## Operation and Management of Publicly Owned MRT Land Development Property—for Rent

| MRT Route | JD Building | Number of Offices | Number of Stores | Number of Shopping Malls | Number of Residential Spaces | Total | Number of Units Rented | Number of Units for Rent |
|---|---|---|---|---|---|---|---|---|
| Tamsui Line | Taipei Main Station (T1) | 9 | | | | 9 | 9 | 0 |
| | Tamsui Station | | | 5 | | 5 | 3 | 2 |
| Wenhu Line | Technology Building Station (T7) | 4 | 1 | | | 5 | 4 | 1 |
| | Daan Station (T6) | 7 | | | | 7 | 7 | 0 |
| | Gangqian Station (T9) | | | 3 | 20 | 23 | 17 | 6 |
| | Zhongxiao Fuxing Station (T4, T10) | | | 1 | | 1 | 1 | 0 |
| Bannan Line | Yongchun Station (T19) | | 3 | | | 3 | 3 | 0 |
| | Yongchun Station (T21) | | 1 | | | 1 | 1 | 0 |
| | Houshanpi Station (T24) | 1 | 1 | | | 2 | 2 | 0 |
| | Houshanpi Station (T25) | | 3 | | | 3 | 2 | 1 |
| | Jiangzicui Station (M1) | 2 | | | | 2 | 2 | 0 |
| | Longshan Temple Station (T1) | | | | 11 | 11 | 11 | 0 |
| Xindian Line | Guting Station (T14) | 4 | | | | 4 | 3 | 1 |
| | Guting Station (T15) | 5 | 2 | | | 7 | 7 | 0 |
| | Taipower Building Station (T13) | 4 | | | | 4 | 3 | 1 |
| | Gongguan Station (T11) | 27 | | 4 | | 31 | 31 | 0 |
| | Wanlong Station (T6,T7) | 1 | 1 | | | 2 | 2 | 0 |
| | Jingmei Station (T3) | 1 | | | | 1 | 0 | 1 |
| | Jingmei Station (T4) | 5 | | | | 5 | 5 | 0 |
| | Qizhang Station (M10, 11) | | | 4 | | 4 | 4 | 0 |
| | Xindian District Office Station (M22) | 25 | | | | 25 | 17 | 8 |
| | Xindian Depot (MeHAS) | 396 | | 9 | 258 | 663 | 571 | 92 |
| Zhonghe Line | Dingxi Station (M2) | 11 | | | | 11 | 10 | 1 |
| | Dingxi Station (M3) | | | 2 | | 2 | 2 | 0 |
| | Jingan Station (M5) | 4 | | | | 4 | 0 | 4 |

| MRT Route | JD Building | Number of Offices | Number of Stores | Number of Shopping Malls | Number of Residential Spaces | Total | Number of Units Rented | Number of Units for Rent |
|---|---|---|---|---|---|---|---|---|
| Xinlu Line | Zhongxiao Xinsheng Station (M14) | 13 | | | | 13 | 13 | 0 |
| | Xingtian Temple Station (M5) | 12 | 1 | | | 13 | 11 | 2 |
| | Xingtian Temple Station (M7) | 4 | | | | 4 | 4 | 0 |
| | Xingtian Temple Station (M8) | 1 | | | | 1 | 0 | 1 |
| | Dongmen Station (M1) | 5 | | | | 5 | 5 | 0 |
| | Taipei Bridge Station (M2) | | | | 272 | 272 | 272 | 0 |
| | Luzhou Station | | 14 | | | 14 | 3 | 11 |
| Xinyi Line | Daan Station (M3) | 5 | | | | 5 | 5 | 0 |
| Songshan Line | Nanjing Fuxing Station (M4) | 6 | | | | 6 | 6 | 0 |
| | Total | 552 | 27 | 28 | 561 | 1,168 | 1,036 | 132 |

## Current Status of Unified Management at Each Development Building

| Site | Commissioned Unified Management Period | Notes |
|---|---|---|
| Zhongxiao Fuxing Station (T4, 10) | June 30, 2016 – December 29, 2025 | This building is for shopping mall use. Operated by Pacific SOGO Department Stores Co., Ltd., it has good operating performance with unified management. The original lease period ended on June 29, 2016 and was renewed with a fixed rent method. |
| Tamsui Station (Triangle Square) | November 17, 2012 - May 16, 2022 (Operation lease terminated on May 31, 2015) | All of the public real estate for this building has been returned to DORTS by all investors. 9th, 10th, and 11th floors have already been leased. Leasing operations will continue on the 4th and 5th floors. Commissioned lawyers are currently engaged in court proceedings for investor rent claims and other matters. |
| St. Ignatius High School Station (M1) | December 1, 2017 – May 31, 2027 | The scope of this unified project includes a shopping mall on levels B1 and B2 (covering an area of 814.24 $m^2$) and 20 parking spaces. As of December 1, 2017, operation and lease contracts have been signed with investors. The leasing period is from December 1, 2017 to May 31, 2027, and the preparation time for transfer of use is 90 calendar days and handled according to fixed-rent with an additional profit sharing mechanism. |
| Neihu Station (T11) | December 1, 2017 – May 31, 2027 | The scope of this unified project includes a shopping mall on the 1st and 2nd floors, two stores on the 1st floor, and the corresponding parking spaces for the shopping mall. Operations will be handled by Ruentex Development, Co., Ltd. The rental period is from December 1, 2017 to May 31, 2027, and the preparation time for transfer of use is 120 calendar days and handled according to fixed-rent with an additional profit sharing mechanism. |

## Taipei Main Station District Parcel C1/D1 Land Development Project

Taipei Main Station District Parcel C1/D1 land development project is the highlight of the West District Gateway Plan. All public facilities of the Taipei West Gateway Plan have fallen into place one after another. The inauguration of Taiwan Taoyuan International Airport MRT line on March 2, 2017, together with the MRT-integrated structure of Taipei Main Station Twin Towers (C1/D1) development project with Taoyuan Airport MRT A1 Taipei Main Station have provided more advantageous investment conditions for this development project. On October 14, 2014, Taipei City Government announced the termination of the 5th open tender for the project, and the government has already proclaimed new standard land development operating procedures for the improvement of land development tasks. For the Taipei Main Station Twin Towers (C1/D1) development project, international biddings will be utilized to attract investment, and standard operating procedures will be employed to select professional service consultants with international investment experience as well as for tasks in preparation for the recruitment of contractors. The selection of investors is expected to be carried out in March 2018.

## Commissioning of Urban Renewal for City-owned Land

- DORTS was commissioned to conduct urban renewal on six sites, and solicitation and signing of contracts has been completed.
- Solicitation of investors and signing of contracts has been completed, and the progress of the six sites is as follows:
  - Urban renewal tasks at city-owned military dormitory land and adjacent land on Roosevelt Road, Wenshan District, Taipei: 44 city-owned units were handed over to buyers after a one-year warranty period. It was the first such project conducted by Taipei City Government.
  - Urban renewal tasks consisting of six plots on Land No. 107-2, Subsection 2, Yixian Section, Xinyi District, Taipei: On June 13, 2016 construction permits were obtained, and the acceptance and property handover for 37 city-owned units have been completed.
  - Urban renewal project on Land No. 781, Nanshan Section, Zhonghe District, New Taipei City and urban renewal project on Land No. 140, Xinhe Section, Zhonghe District, New Taipei City: Construction permits issued by New Taipei City Government were received for two projects which will be built according to schedule.
  - Urban renewal project consisting of eight plots on Land No. 580, Subsection 4, Zhongshan Section, Zhongshan District, Taipei: The urban renewal business plan review is underway.
  - Urban renewal project consisting of 38 plots on Land No. 623, Subsection 3, Muzha Section, Taipei: The urban renewal business plan review is underway.

## Land Development Fund Implementation Results in 2017

### ➢ Reduction of Land Expropriation Costs and Smooth Acquisition of Land for MRT Use

Among the 45 sites on the initial network, publicly and privately held land in land development programs with completed contract signing accounted for 37.79% of the total land development sites, saving NT$15.06 billion in land acquisition costs. For the subsequent network of 44 base sites, apart from Songjiang Nanjing Station (M9) on the Xinzhuang line, which were expropriated as city-owned land and R03 Station (M3) on the Xinyi Eastern Extension and ten locations on the Wanda line, which have proceeded with land acquisition after completing urban rezoning operations, negotiation for the remaining 32 sites has been completed and a total of NT$21.25 billion was saved in land acquisition costs. Internal and external benefits created are as follows:

- ✧ Internal benefits: Contracts were signed and usage permits were acquired at 60 sites. The private sector invested NT$105.79 billion and provided more than 670,000 pings of floor area for commercial and residential use.
- ✧ External benefits: To facilitate transfer between transportation modes, transfer facilities established at ten sites provided 460 parking spaces for cars, 1,268 spaces for scooters, and 994 spaces for bikes. Taipei City Government also established YouBike facilities near MRT station entrances/exits to provide an accessible, convenient, and environmentally-friendly mode of transportation.

### ➢ Provision of Land for MRT Facilities and Integrated Construction to Achieve MRT Operational Goals

Construction permits were requested for land development buildings, whether or not they were integrated with MRT facilities. In 1987, the Executive Yuan defined MRT facilities as special buildings which were required to be completed prior to the scheduled operation date in order to ensure the smooth operation of the MRT. Therefore, DORTS typically launched design and construction of integrated structures or MRT facilities prior to investor solicitation.

### ➢ Yielding of MRT Facility Construction at Land Development Sites to Investors to Increase Efficiency and Reduce Interface

Investors were permitted to launch construction at eight sites: Xinzhuang line's Xingtian Temple Station (M8); Daqiaotou Station (M2); Xinyi line's Daan Park Station (M2) and Daan Station (M3); Songshan line's Nanjing Sanmin Station (M9, 10); Nanjing Fuxing Station (M4); and Songjiang Nanjing Station (M10). This practice not only led to efficient implementation and fewer design changes but also reduced disbursement for integrated construction.

## Land Acquisition

➢ **Land Acquisition and Compensation Operations:**

(1) Public Land

Circular Line Phase I Construction:

a. 71 plots of land were allocated for use in Zhonghe District, and on June 27, 2017 the payment for land requisition was approved by the Executive Yuan. (Official letter Ref. No. 10600189870)

b. 38 plots of land were allocated for use in Banqiao District, and on July 26, 2017 the payment for land requisition was approved by the Executive Yuan. (Official letter Ref. No. 10600224850)

Wanda-Zhonghe-Shulin Line Phase I Construction (Referred to below as Wanda Line Phase I Construction)

a. One plot of land was allocated for construction on the New Taipei City area ventilation shaft project, and on May 26, 2017 the land requisition without compensation was approved by the Executive Yuan. (Official letter Ref. No. 10600165020)

b. 27 plots of land were allocated for the depot MRT development zone (including Station LG08A and on August 11, 2017 the payment for land requisition was approved by the Executive Yuan. (Official letter Ref. No. 10600242180)

(2) Private Land

a. Circular Line Phase I Construction: All tasks for the acquisition of private land have already been completed.

b. Wanda Line Phase I Construction:

✧ Station LG01 (T1 & T3) cases of expropriation of land for construction use: As approved by the Ministry of the Interior on May 22, 2017, Taipei City Government acquired lands on June 6, 2017. (Official letter Ref. No. 10631364600), and compensation payments were completed on July 18-19.

✧ A total of three plots of land including 11 landowners were acquired through annotation for the underground crossing works from Station LG02 to the boundary land between Taipei City and New Taipei City. On August 10, 2017 (Official letter Ref. No.10631364500) the government notified related landowners to proceed with compensation payment from August 29, 2017 to September 21, 2017. On October 13 (Official letter Ref. No. 10632018300), relevant landowners were notified for the second time, to complete the compensation payment on October 31, 2017.

✧ Land used for MRT construction at Station LG03 (M10): A purchase negotiation of land expropriation with seven private landowners was approved on October

6, 2017, and the transfer of land ownership registration was completed by Jiancheng Land Office on November 30.

- ✧ Land used for MRT construction at Station LG04 (M9): A purchase negotiation of land expropriation with three private landowners was approved on September 22, 2017, and the transfer of land ownership registration was completed by Daan Land Office on October 13. Handover of purchased lands and related land use payments were completed in the middle of December.
- ✧ Land used for Station LG05 ventilation shaft construction: A purchase negotiation of land expropriation with five landowners was approved on June 9, 2017, and the transfer of land ownership registration was completed by the Zhonghe Land Office on July 7. In the middle of August handover of purchased lands and land use payments were completed.
- ✧ Land used for depot construction in the New Taipei City: As of December 31, 2017, over 240 landowners agreed to proceed with purchases according to the price negotiation, and land purchase contracts have been signed by about 200 landowners for the complete acquisition of 36 lots of private land covering an area of more than 2 hectares. The land lots have gradually been handed over for construction, and coordination will continue with landowners in order to reduce conflicts over compensation.

➢ **Land Acquisition Status:**

**2017 Purchased or expropriated land agreements**

| Project Name | Acquisition Method | Number of Landowners | Number of Land Lots | Shared Land Area ($m^2$) | Approved by Ministry of the Interior (Date and Ref. No.) |
|---|---|---|---|---|---|
| Wanda line Phase I Station LG01 (T1, 3) construction | expropriation | 97 | 2 | 304.1966 | May 22, 2017 (Ref. No. 1061304280) |
| Wanda line Phase I LG03 Station land development (M10) | purchase | 7 | 20 | 632.863783 | Approved by the mayor on October 6, 2017 |
| Wanda line Phase I LG04 Station land development (M9) | purchase | 3 | 3 | 163 | Approved by the mayor on September 22, 2017 |
| Wanda line Phase I land used for Station LG05 ventilation shaft construction | purchase | 5 | 1 | 639.95 | Approved by the mayor on June 9, 2017 |

## Annotation Compensation for MRT Routes Passing Beneath Private Land Conducted in 2017

| Project Name | Number of Land Lots | Number of Landowners | Amount of Compensation (NT$) | Land Area($m^2$) |
|---|---|---|---|---|
| Underground crossing works at the Wanda line Phase I Station LG02 ( Taipei City section) | 3 | 11 | 3,166,042 | 44.24 |
| Underground crossing works of the Xinyi eastern extension | 76 | 272 | 323,407,697 | 6,392.11 |

## Land Appropriated for Public Construction in 2017

| Project Name | Acquisition Method | Landowner | Land Administrator (Authority) | Number of land lots | Shared Land Area ($m^2$) | Approval Reference No. |
|---|---|---|---|---|---|---|
| Circular line Phase I (Dapinglin Station – Banxin Station, Banquiao District) elevated bridge construction | Paid appropriation | Republic of China | Taiwan Railways Administration | 38 | 1,873.28 | Allocation of property approved by the Executive Yuan on July 26, 2017 (Ref. No. 10600224850) |
| Circular line Phase I (Dapinglin Station – Banxin Station, Zhonghe District) elevated bridge construction | Paid appropriation | Republic of China | Taiwan Railways Administration | 71 | 1,460.26 | Allocation of property approved by the Executive Yuan on June 27, 2017 (Ref. No. 10600189870) |
| Land used for Wanda line Phase I Station LG05 ventilation shaft construction | Unpaid appropriation | Republic of China | National Property Administration Ministry of Finance | 1 | 159.93 | Allocation of property approved by the Executive Yuan on May 26, 2017 (Ref. No. 10600165020) |
| Wanda line Phase I depot construction (including LG08A Station) MRT development construction | Paid appropriation | Republic of China | National Property Administration Ministry of Finance | 27 | 2,332.73 | Allocation of property approved by the Executive Yuan on Aug. 11, 2017 (Ref. No. 10600242180) |

## ➢ Demolition Compensation for Land Improvements:

### 2017 Results of Land Improvements Assessment for the Wanda Line Phase I

| Number | Site Name | Date of Completion | Complete Contents |
|---|---|---|---|
| 1 | MRT Station LG01 (M4) | July 25 | Price negotiation meeting of demolition compensation for land improvements has been completed. |
| 2 | MRT Station LG01 (M4) | December 13 | On-site assessment of legal structures has been completed (after coordinating four households which declined to cooperate but are willing to comply with now). |
| 3 | MRT Station LG03 (M10) Land Development Site | May 26 | On-site assessment and demolition compensation for 20 households and 5 shops have been approved. |
| 4 | MRT Station LG03 (M10) Land Development Site | July 7 | Price negotiation meeting of demolition compensation for land improvements has been completed. |
| 5 | MRT Station LG03 (M10) land development site | November 2 | Demolition compensation agreement has been completed. |
| 6 | MRT Station LG04 (M7) Land Development Site | Landlord disputes in progress | Due to protests from landowners, on-site assessment has not commenced. Land compensation fees will be processed along with the preliminary evaluation result. |
| 7 | MRT Station LG04 (M7) Land Development Site | December 8 | Demolition compensation agreement has been completed (a protest gathering of over 100 people was held on the first floor of DORTS prior to the agreement). |
| 8 | MRT Station LG04 (M9) Land Development Site | May 8 | Compensation fees inventory for the on-site assessment has been made and the documents of price negotiation meeting have been approved. |
| 9 | MRT Station LG04 (M9) Land Development Site | June 20 | Price negotiation meeting of demolition compensation for land improvements has been completed. |
| 10 | MRT Station LG04 (M9) Land Development Site | August 25 | Demolition compensation agreement has been completed. |
| 11 | MRT Station LG04 (M9) Land Development Site | December 15 | Transfer of land to South District Project Office for construction completed. |
| 12 | MRT Station LG05 Station (M1) Ventilation Shaft | April 28 | On-site assessment of public/private land improvements (830.14 $m^2$) and price negotiation of demolition compensation have been completed. |
| 13 | MRT Station LG05 (M1) Ventilation Shaft | June 5 | Demolition compensation agreement has been completed. |
| 14 | LG05 Station (M1) Ventilation Shaft | August 17 | Transfer of land to South District Project Office for construction completed. |
| 15 | MRT Station LG06 North Side (Land Development Site 1) | October 31 | The first public hearing for the demolition compensation of the land for construction has been completed. |
| 16 | MRT Station LG06 South Side (Land Development Site 2) | May 16 | Compensation fees inventory for the "Royal City Motor Inn" and "Gold Stick Metals Co. LTD Factory" has been made and the documents of price negotiation meeting have been approved. |
| 17 | MRT Station LG06 South Side (Land Development Site 2) | August 31 | Price negotiation meeting of demolition compensation for land improvements has been completed. |

| Number | Site Name | Date of Completion | Complete Contents |
|---|---|---|---|
| 18 | MRT Station LG07 North Side (Land Development Site 3) | March 8 | On-site assessment for 5 shops and 1 factory (total area of 1,791 $m^2$) has been completed along with the on-site identification by the Public Works Department, New Taipei City Government. |
| 19 | MRT Station LG07 North Side (Land Development Site 3) | August 19 | Price negotiation meeting of demolition compensation for land improvements has been completed. |
| 20 | MRT Station LG07 South Side (Land Development Site 4) | February 23 | On-site assessment for 74-floor buildings (12 households and 9 shops) has been completed along with the on-site identification by the Public Works Department, New Taipei City Government. |
| 21 | MRT Station LG07 South Side (Land Development Site 4) | August 28 | Price negotiation meeting of demolition compensation for land improvements has been completed. |
| 22 | MRT Station LG08 North Side (Land Development Site 5) | Landlord disputes in progress | Originally on-site assessment was scheduled to commence on November 7, 2016; however, they were subsequently discontinued due to landlord disputes. |
| 23 | MRT Station LG08 North Side (Land Development Site 5) | August 4 | On-site assessment has been completed for 3 consenting households; however, approximately 14 households (including an agricultural association) have declined to cooperate with inspections. |
| 24 | MRT Station LG08 North Side (Land Development Site 5) | August 10 | The third on-site demolition compensation public hearing has been completed. |
| 25 | MRT Station LG08 South Side (Land Development Site 6) | January 19 | On-site assessment for one parking lot (1,894.05 $m^2$) has been completed along with the on-site building improvements identification by the Public Works Department, New Taipei City Government. |
| 26 | MRT Station LG08 South Side (Land Development Site 6) | May 18 | Compensation fees inventory has been made and the documents of price negotiation meeting have been approved. |
| 27 | MRT Station LG08 South Side (Land Development Site 6) | July 21 | Price negotiation meeting of demolition compensation for land improvements has been completed. |
| 28 | Wanda Depot and MRT Station LG08A (Land Development Site 7) | January 10 | On-site assessment for construction improvements of 112 households (71 households in Tucheng District and 41 households in Zhonghe District) and 26,000 $m^2$ of ancillary buildings, 56 factories (including illegal constructed buildings), 34 graves, and 56,000 $m^2$ of agricultural improvement structures along with on-site identification completed by the Public Works Department, New Taipei City Government. |
| 29 | Wanda Depot and MRT Station LG08A (Land Development Site 7) | July 21 | Price negotiation meeting of demolition compensation for land improvements has been completed. |
| 30 | Wanda Depot and MRT Station LG08A (Land Development Site 7) | December 28 | Transfer of land use for construction has completed: 36 complete privately-owned lots covering a total area of 26,232.03 $m^2$, and 17 public land lots covering a total area of 2, 126.98 $m^2$. A total of 28, 359.01 $m^2$ of land was transferred. |

## 2017 Results of Land Improvements Assessment of the Xinyi Eastern Extension

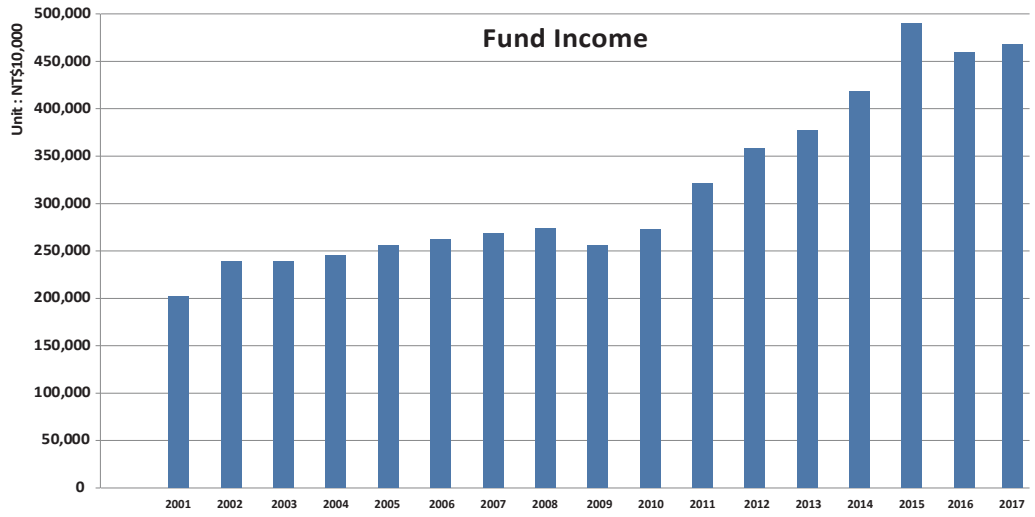
| Number | Site Name | Date of Completion | Complete Contents |
|---|---|---|---|
| 1 | MRT Station R03 (M3) (land development) | January 15 | On-site assessment has been completed for 131 household structures in construction project area with the exception of 6 households that did not cooperate with the assessment. |
| 2 | MRT Station R03 (M3) (land development) | July 7 | Price negotiation meeting of demolition compensation for land improvements has been completed. |

# Replacement Fund and Asset Management

## Taipei MRT Fixed Asset Replacement Fund

### ➢ Fund Income

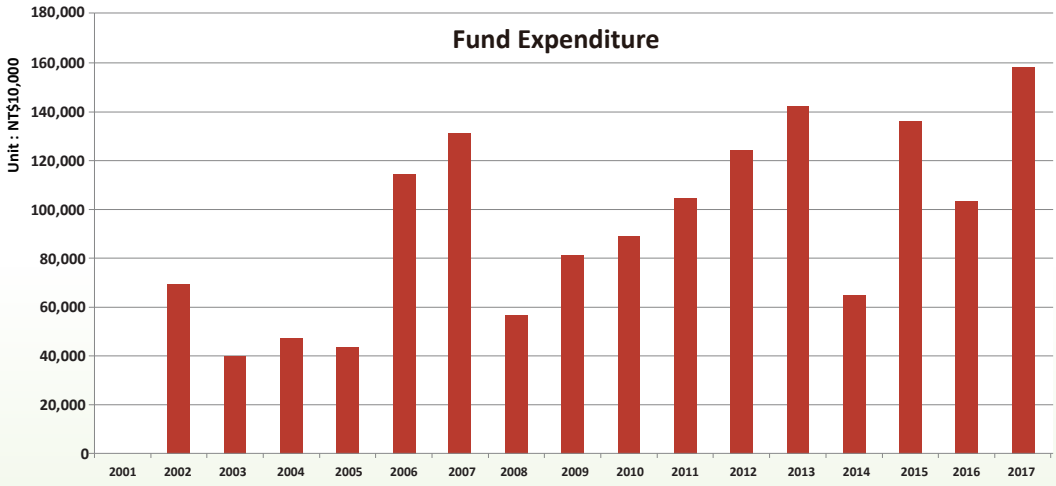
As of December 31, 2017, fund income totaled NT$54,105,475,710. Historic fund income is shown in the following chart:




### ➢ Fund Expenditure

As of December 31, 2017, fund expenditures totaled NT$15,069,264,064.

Historic fund expenditure is shown in the following chart:

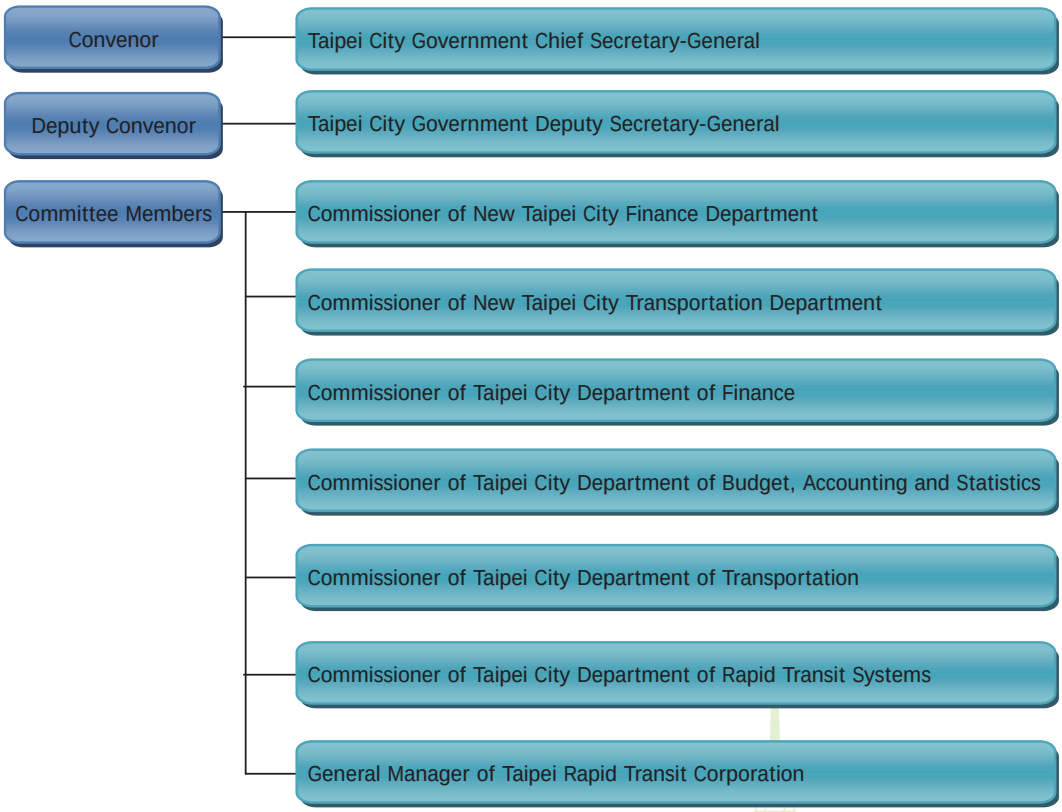


## ➢ Operation Status

1. Duties of Fund Management Committee:

- ✧ Deliberation of systemwide facility replacement plan
- ✧ Supervision of systemwide facility replacement of in-service routes to meet operation needs
- ✧ Deliberation of external financing of the fund
- ✧ Deliberation of other major businesses associated with fund management and operation

2. Organization of Fund Management Committee




## ➢ Business Performance Review

- ✧ A total of NT$4,362,563,943, including NT$4,241,299,629 for rental income, NT$106,264,314 for interest income, and NT$15,000,000 for miscellaneous income was arranged for the fund in 2017.
- ✧ Fund purposes: In 2017, the fund was mainly spent on replacement of electrical and mechanical equipment, civil works facilities on the MRT Muzha, Tamsui, Zhonghe, Xindian, Nangang, Banqiao, and Xinlu lines, as well as administrative business

associated with the fund. A total of NT$1,618,622,462, including NT$34,000,000 for the MRT facility replacement plan, NT$19,794,755 for general administrative management operations, and NT$1,564,827,707 for building and facility plans, was arranged. According to the resolution of the first committee meeting in 2017, DORTS' Civil Engineering and Architectural Design Division, its subordinate North District Project Office, and Taipei Rapid Transit Corporation (TRTC) were commissioned to conduct budget performance of fixed asset purchases.

➢ **Annual Performance:**

1. Business Plans:

(1) Scheduled Plans: A total of 33 capital expenditure plans (including continued and new plans) in 2017.

(2) Non-scheduled Plans: A total of 8 capital expenditure plans in 2017 were subject to procurement of facilities/assets, domestic/foreign import and market prices.

(3) Deferred expenditure: A total of 13 deferred expenditure plans in 2017 were subject to house repairs and construction.

2. Budget Performance:

(1) Fund Sources:

a. Asset revenues: Compared with the 2017 statutory budget of NT$4,347,563,943, as of December, actual expenditures were NT$ 4,528,852,862.

b. Other revenues: Compared with the 2017 statutory budget of NT$ 15,000,000 as of December, actual expenditures were NT$144,275,980.

(2) Fund Uses:

a. MRT facilities replacement plans: Compared with the 2017 statutory budget of NT$34,000,000, as of December, actual expenditures were NT$31,006,995.

b. Regular administrative plans: Compared with the 2017 statutory budget of NT$19,794,755, as of December, actual expenditures were NT$18,870,213.

c. Building and facilities plans: Compared with the 2017 statutory budget of NT$1,564,827,707 as of December, actual expenditures were NT$ 1,532,211,959.

(3) Budget Deficit:

Compared with the 2017 statutory budget surplus of NT$2,743,941,481, as of December, the actual surplus was NT$3,091,039,675.

3. Financial Management:

(1) The primary source of the fund is facility replacement and flexible rent allocations

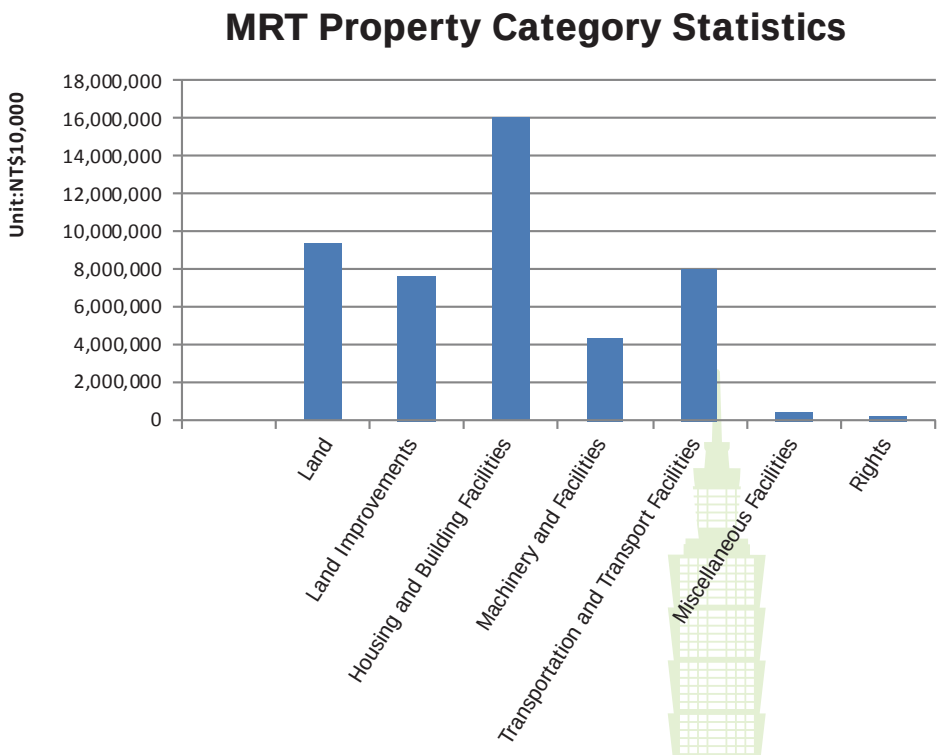
made by TRTC, which includes 2% of annual business revenue and 50% of profits, with the total not to exceed 4% of revenues. The purpose of the fund is to be used as a short-, medium-, and long-term replacement for MRT system equipment. To alleviate financial difficulties for fund implementation and municipal treasury distribution demands, DORTS acted in accordance with a resolution of the Taipei MRT Fixed Asset Replacement Fund Management Committee's first meeting (held on April 23, 2008) by submitting an official notice to Taipei City Government on June 13, 2008. It received approval for MRT fixed asset replacement fund management to be transferred to the Department of Finance on the provision that the exclusive fund account establishment purpose should not be violated.

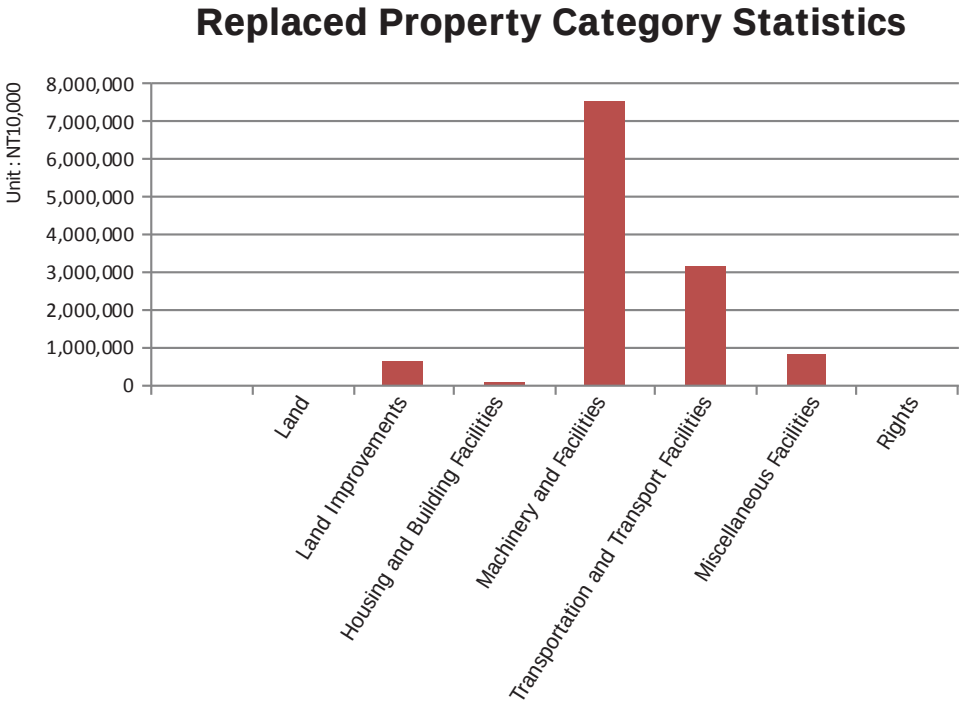
(2) The fund had borrowed NT$28,198,810,000 (with a yearly interest rate of 0.162%) from the municipal treasury as of December 31, 2017.

## MRT Property Management

### ➢ MRT Properties

The amounts of MRT properties and replaced properties for each of the MRT routes as of late December 2017:






## ➢ Property Inspection Tasks

In order to manage MRT property thoroughly and effectively, DORTS inspects MRT properties annually with designated staff members from subordinate project offices. These inspections allow DORTS to understand how TRTC manages, uses and maintains the city-owned properties which are commissioned by DORTS, and how TRTC handles the illegally occupied or idled land and buildings along MRT routes. Staff members from DORTS' associated offices conducted a routine check from October 17 - November 1, 2017. Results were subsequently sent to TRTC for improvement and follow-up.

## ➢ Insurance

### Taipei MRT Insurance Claims Statistics

Claims Statistics as of December 31, 2017 (Unit: NT$)

| Route | Claims Amount Prior to Dec. 31, 2016 | Claims Amount from Jan. 1, 2017 to Dec. 31, 2017 | Total |
|---|---|---|---|
| Xinzhuang Line | $ 201,522,443 | $ - | $ 201,522,443 |
| Luzhou Line | $ 257,192,062 | $ - | $ 257,192,062 |
| Neihu Line | $ 144,115,151 | $ - | $ 144,115,151 |
| Xinyi Line | $ 88,195,881 | $ - | $ 88,195,881 |
| Songshan Line | $ 107,821,708 | $ 5,729,920 | $ 113,551,628 |
| Circular Line Phase I | $ 29,018,675 | $ 6,539,914 | $ 35,558,589 |
| Taichung Wuri-Wenxin-Beitun Line | $ 11,712,217 | $ 554,248 | $ 12,266,465 |
| Total | $ 839,578,137 | $ 12,824,082 | $ 852,402,219 |

# Public Relations and Marketing Activities

## Advocacy Events

To coincide with the 30th anniversary of the establishment of the Department of Rapid Transit Systems (DORTS) and to strengthen advocacy of MRT construction and network planning achievements, DORTS has produced a 30th anniversary construction documentary and L-shaped folders entitled "30 Years of Taipei MRT Construction". In addition, DORTS also compiled advertising designs with content related to core MRT engineering technologies on the Taipei MRT Report, diversified promotion brochures, and a variety of different types of announcements and advertisements for social groups, associations, and annual meetings, using a variety of different MRT construction achievements to enable the public to gain a deep understanding of how MRT teams utilize core technologies to create world-class MRT construction projects.

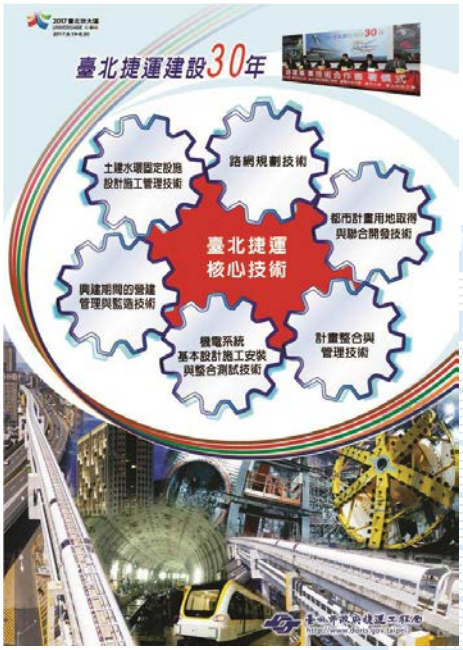
The Taipei 2017 Universiade began on August 19, 2017, and to assist in the city government's mobilization for this historical event in Taiwan, DORTS displayed the Universiade logo on all construction fences and building construction scaffolds as well as on all related websites, publications, advocacy, lightbox advertisements, and other marketing applications/public welfare promotional materials and internal events. DORTS also displayed the visual logo, the (basketball) mascot, slogans, and messages in full cooperation with the dissemination of all advocacy information.

The advocacy activities in 2017 included "Mayor Ko Wen-je's Inspection of Taipei Heping Basketball Gymnasium" and the "Eastern Taipei North-South MRT Citizen Participation Advocacy Event."

Mayor Ko Wen-je inspected Taipei Heping Basketball Gymnasium (June 8)


Universiade Taipei Tennis Center Inspection (June 12)

Citizen Participation Advocacy Event for Eastern Taipei North-South MRT System (August 28)




Advertising designs for all social groups, associations, and annual meetings have been compiled for the 30th Anniversary of Taipei MRT.

## Marketing Activities

In cooperation with all municipal marketing activities, this year the government's Cultural Affairs Department held "Universiade 99 Countdown," and Daan District Office held the "Universiade Dance Competition" and the "Daan District Office Bravo Goodwill Group Service Station." In addition, at the William Jones Cup Basketball Competition, the Universiade was publicized in order to increase awareness of competition events and participation of all citizens.

In cooperation with the "Universiade 99 Countdown" event held by the Cultural Affairs Department, DORTS set up a booth (May 19)


In cooperation with the advocacy activity "Universiade Dance Competition" held by Daan District Office (May 20)


In cooperation with the "Daan District Office Bravo Goodwill Group Service Station" held by Daan District Office, DORTS set up an exhibition stand (July 15)

The Universiade was publicized at the "2017 William Jones Cup Basketball Competition" (July 15-23)

## Visiting Activities

DORTS arranged discussions and informational briefings with a wide variety of social groups at a total of four sessions with 82 participants.

Ohio State University (USA) Department of City and Regional Planning Faculty and Students visited on March 14

CRRC Qingdao Sifang Locomotive & Rolling Stock Co., Ltd. External Division visited on June 23

Members of KKHTNN, Department of Civil Engineering, National Taiwan University Graduate School visited on November 4

Dongguan City Urban Planning Bureau (Mainland China) visited on December 27

# MRT Routes Under Construction

The MRT routes currently under construction include Xinzhuang Depot, the Circular line Phase I, Taichung MRT Wuri-Wenxin-Beitun line, Wanda line Phase I, and Xinyi eastern extension.

## Section Contract CK570J - Xinzhuang Depot Construction

In line with the Lo-Sheng Sanatorium Hospital Cultural Heritage Preservation Project, the Xinzhuang Depot Construction Project was re-tendered in 2008 after a design change and officially commenced on November 26, 2008. The scheduled completion date for this project is March 26, 2018. The detailed design consultant for this project is CECI Engineering Consultants, Inc., Taiwan, and the contractor is Continental Engineering Corporation. The main project items are as follows: a connecting bridge between the new and old buildings of Lo-Sheng Sanatorium Hospital, slope retaining facilities, mountain tunnel, working shaft, cut-and-cover tunnel, cut-and-cover tunnel for the extension section, depot connection tunnel, stabling yard (including 400 series stabling tracks), maintenance plant (including employee office), facility substation/power distribution room, bulk supply substation (BSS), sewage treatment plant, electric multiple unit (EMU) cleaning area, MRT police branch office, warehouse for specialized goods, steel structure platform, spare parts warehouse, Huilong Station transfer facilities, plant drainage, landscaping, and surrounding road works.

Due to the Image Project of Lo-Sheng Sanatorium Hospital at the entrance, which was approved by the Executive Yuan in May 2016, the scheduled substantial completion date for this project has been postponed to May 30, 2019. Furthermore, due to the gentle slope platform solution proposed by civil groups, this policy is still under evaluation at the moment.

➢ **The construction overview of this project is as follows:**

✧ Completed construction:

- Connecting bridge between the new and old buildings of Lo-Sheng Sanatorium Hospital
- Side slope earthwork and gird-type anchor construction
- Bulk supply substation, facility substation/power distribution room
- Sewage treatment plant and EMU cleaning area
- Mountain tunnel
- Cut-and-cover tunnel, cut-and-cover tunnel for extension section, and connection tunnel
- Steel structure platform

- Maintenance plant (including employee office), spare parts warehouse, structure of police branch office

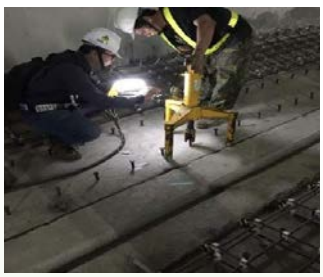
✧ Construction in progress:

- Maintenance plant, stabling yard, spare parts warehouse, police branch, and architecture finishing works for special warehouse, and HVAC systems
- Plant drainage system and piping arrangement
- Surrounding drainage system, roads, and wall works
- 2nd land bridge and structural platform in line with the Image Project of Lo-Sheng Sanatorium Hospital at the entrance

Bird's-eye view of the construction status of Xinzhuang Depot

## Xinzhuang Depot CK571A Track Construction

The flash-butt rail-welding machine for the Xinzhuang Depot CK571A track project arrived at the site so that rail welding could be performed. Rail welding for the maintenance plant was completed and delivered on July 24, 2017, while rail welding along the non-ballasted section within the tunnel was completed on July 31. At present, the construction of concrete plinth along the non-ballasted section in the tunnel is ongoing.



Pullout force test of dowel in concrete plinth

Rebar installation for concrete plinth prior to concrete pouring

Inspection prior to concrete plinth pouring

Demoulding after concrete plinth pouring

## Circular Line Phase I Construction

The Circular line Phase I, totaling 15.4 km in length, includes 1.2-km underground section and 14.2-km elevated section. This route, which is located in New Taipei City, begins at Dapinglin Station in Xindian and passes underground Zhongzheng Road along Minquan Road in Xindian; then, the route goes at elevated level across the Xindian River before running along Jingping Road, Zhongshan Road, and Bannan Road. Next, the route continues through Banqiao Railway Station, Wenhua Road, and Minsheng Road, across the Dahan River, and along Siyuan Road to Wugong Road in Xinzhuang.

There are 14 stations in the Circular line Phase I construction, with only one underground station and the rest are elevated; a maintenance depot was constructed in Shisizhang, Xindian. This route enables transfer to a number of mass transit systems, including Xindian line, Ankeng line (under construction), Zhonghe line, Wanda-Zhonghe-Shulin line (under construction), Banqiao-Tucheng line, Xinzhuang line, and Taoyuan International Airport MRT line, as well as High Speed Rail (HSR), Taiwan Railways (TRA), and medium and long-haul buses, all of which allows for easy and convenient traveling in all directions between Taipei City and New Taipei City, thus achieving the goals of synchronous development and mutual prosperity.


Route map of Circular line Phase I

➢ **The construction overview of this project is as follows:**

✧ Contract CF641 Dapinglin Station Structure Construction:

- The structure of this station has been completed, but renovation is currently ongoing.

Finishing works in the connecting channels at Dapinglin Station on the Xindian line

Finishing works in the concourse area

Finishing works at Exit 2

Finishing works at the platform

✧ Section Contract CF640 - South Depot, Tunnel Section, Daylight Section, and Shisizhang Station Construction:

★ Contract CF642: Civil works at South Depot

- Currently, finishing works at various plants, construction of surrounding roads, facilities of E&M and HVAC systems, preparations for fire safety inspection are in progress.

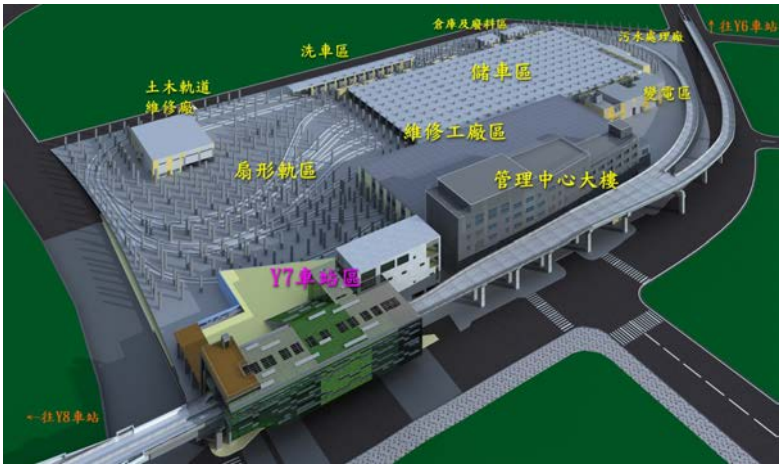
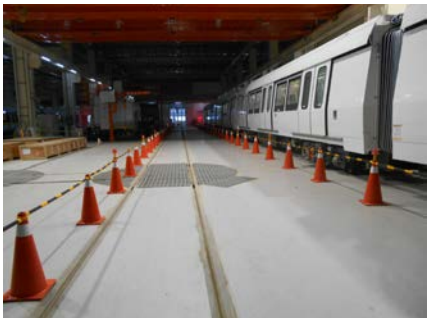



Diagram of Circular Line South Depot

Current status of South Depot



Current construction of maintenance plant

Current construction of surrounding roads and sidewalks

Preparations for fire safety inspection

★Contract CF643A - Tunnel Section and Daylight Section Civil Construction Works

- The structure of the shield tunnel and cut-and-cover tunnel in the tunnel and daylight sections have been completed. At this point, road restoration, landscaping, and civil works are coming to an end.

Backfilling on Minquan Road

Asphalt concrete paving along Minquan Road

Full-section floodgate installation test

Completion of track laying in shield tunnel

Completion of track laying in cut-and-cover tunnel

Construction of sound barrier for daylight section

★Contract CF643B - Shisizhang Station Civil Construction

- Elevated station's furnishing, facilities of E&M and HVAC systems, and new roads are currently under construction.

Bird's-eye view of Shisizhang Station and the elevated section

Current appearance of Shisizhang Station

MRT train operation test in the river section

Finishing works of the concourse area

Construction status of the parking lot

Finishing works of the platform

✧Section Contract CF650 - Xiulang Bridge Station to Banxin Station Construction

★Contract CF651A - Xiulang Bridge Station to Banxin Station (Excluded):

- Land development and station renovation works are currently in progress at Xiulang Bridge Station, Jingping Station, and Jingan Station. Construction of noise barriers on viaduct, and pipelines relocation between stations, facilities of E&M and HVAC systems, and roads restoration (median island) are currently being carried out.

Construction of Xiulang Bridge Station and land development building

Construction of the noise barrier in the elevated collinear section along Expressway 64

Construction of Jingping Station and land development building

Construction of roof and curtain at the elevated Jingan Station

Construction of the noise barrier in the non-collinear section along Jingping Road

Road restoration and construction of median island

★Contract CF651B - Zhonghe Station to Banxin Station Construction

- Land development and station finishing works are currently in progress at Zhonghe Station, Qiaohe Station, Zhongyuan Station, and Banxin Station. Construction of noise barriers on viaduct, and facilities of E&M and HVAC systems, and restoration of road surfaces are currently being carried out between stations.


Construction of land development building at Zhonghe Station

Construction of noise barrier on viaduct along Section 2, Zhongshan Road

Construction of noise barrier on viaduct along Bannan Road

Finishing works of Zhongyuan Station and land development building

Construction of noise barrier on viaduct across Expressway 64 to Banxin Road

Restoration of median island along Banxin Road

✧ Section Contract CF660A - Banqiao Station to Xinpu Minsheng Station Construction:

- The construction works of CF660A for viaducts between the Banqiao Station and Minsheng Station, continue the year. Construction items for this contract include hoisting and erecting steel structures, lock welding, RC structure, renovation of the machine room, E&M and HVAC systems, and construction of escalators, as well as upper and lower structures of the viaduct section and parapet walkways along the bridge deck, track fasteners, steel bridge deck PU, noise barriers, expansion joints, the coordination and restoration of pipelines, and the restoration of buildings under the Dahan Bridge.

Structural construction of land development building at Banqiao Station

Construction of land development building at Xinpu Minsheng Station

Completion status of viaduct along Banxin Road

Completion status of viaduct along Xianmin Boulevard

Completion status of viaduct along Section 1, Wenhua Road

Completion status of viaduct along Section 3, Minsheng Road

✧ Section Contract CF660B - Touqianzhuang Station to New Taipei Industrial Park Station Construction:

- The main construction items for this contract this year were the finishing works of Touqianzhuang Station, Xingfu Station, New Taipei Industrial Park Station, and land development buildings. Also, the installation of noise barriers and the restoration of pipelines, sidewalks, drains, median island, Siyuan Bridge, and Dahan Bridge were carried out along the viaducts between stations.

Finishing works of Touqianzhuang Station

Finishing works of Xingfu Station

Construction of New Taipei Industrial Park Station and land development building

Construction of noise barrier between the elevated stations across the Dahan River to Touqianzhuang Station

Construction of noise barrier between the elevated Touqianzhuang Station and the elevated section of Xingfu Station

Construction of noise barrier and median island under the bridge between the elevated Xingfu Station and the elevated section of New Taipei Industrial Park Station

✧ Contract CF610/CF611/CF617 – Electrical and Mechanical Systems

- Anticipated project progress by the end of November 2017: 61.75%; actual progress: 61.78%.
- These contracts were awarded on March 2, 2009, signed on March 31, 2009, and commenced on April 7, 2009; they are expected to be completed on September 29, 2018. Currently, in the third Extension of Time (EOT) based on the construction progress review, the contractor officially proposed the third EOT for contract CF610/CF611/CF617 (Version A) on November 19, 2017.
- The detailed designs of vehicle monitoring and depot maintenance facilities, EMUs,

power supply, communications, and automatic fare collection systems have been completed, as have the final designs of these items.

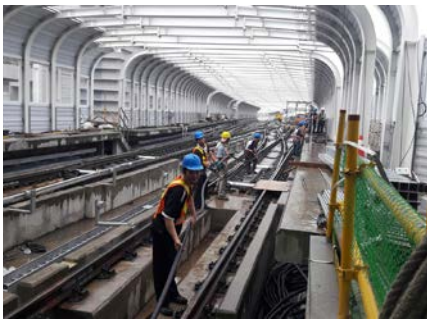
1. EMUs are currently being produced and assembled. 12 EMUs will arrive at the South Depot upon completion of assembly before the end of this year for subsequent inspection and testing. Furthermore, the first EMU was tested on the test track for the first time on August 4, 2017. On November 30, 2017, real vehicle verification interface operations were carried out along the main line on the upper track from Shisizhang Station to Jingping Station. On December 18, 2017, two EMUs were connected to the towing performance test on the upper track along the main line from Shisizhang Station to Jingping Station. Subsequent EMU test operations will be continuously conducted on the test track at the depot and sections of the main line.
2. The signaling system and cab signaling facilities for vehicle monitoring, the chain system, the CBTC system, and MRT operation control center equipment have all arrived. So far, the equipment has been transported to 13 stations, MRT operation control center, and the depot, and equipment installation and testing will be continuously performed.
3. Regarding power supply systems, equipment installation and testing are being carried out at 13 stations. 161KV GIS power transmission was completed at Bulk Supply Substation 1 (BSS1) at South Depot on June 2, 2017. By November 25, 2017, power transmission of the third rail was completed from South Depot to Banxin Road. Various types of equipment began to arrive at BSS2 and be installed in September.
4. Regarding communication systems, equipment installation and testing were carried out at a total of 15 depots and stations, including 13 stations and South Depot. The cable layout from South Depot to the Y14 DCS backbone network was completed at the end of this year. Installation and validation of such terminal equipment as CCTV, broadcasting system, and radios are currently ongoing at each station.
5. For depot facilities and subsystems, installation and validation of 21 equipment items, such as the train cleaning system and the roof installation platform, have been completed.
6. All the facilities for the automatic fare system have been completely manufactured. Installation of electric cable troughs, cable work, and equipment has been subsequently completed at 11 stations.

Installation of boring machine at South Depot

Switch installation at South Depot

Installation of vehicle cleaning system at South Depot

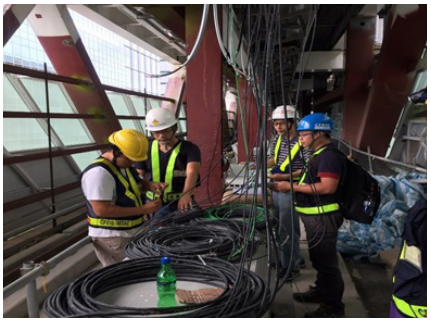
Clearance inspection from Xiulang Bridge Station to Jingping Station along the main line



22kV cable work along the main line

Installation of automatic fare gates

Installation of video-wall at MRT operation control center



Inspection of communication cables/guide pipes/electric cables

Installation of platform doors

✧ Contract CF610/CF611/CF617 - Electrical and Mechanical Systems - Power Transmission Operation:

- 161KV power transmission from Bulk Supply Substation 1 (BSS1) along the Circular line:

  Power transmission from BSS1 along the Circular line began on June 2, 2017

- Power transmission along the Circular line:

  Power transmission from equipment substations and traction substations began along the main line, station by station, in August 2017, and power transmission to Banxin Station was established on November 25, 2017.

161KV power transmission from BSS1

22KV power transmission from BSS1

Power transmission from FPSS at Jingan Station

Power transmission from PPSS at Banxin Station

✧ Contract CF610/CF611/CF617 - Electrical and Mechanical Systems- EMU Testing:

- Test track testing along the Circular line:

  The first EMU was tested on the test track on August 4, 2017. A variety of subsequent tests will be continuously carried out.

- Main line testing along the Circular line:

  Real EMU verification interface operations were completed along the main line from Shisizhang Station to Jingping Station on November 30, 2017.

First EMU test track operation

Real EMU verification interface operation-1

Real EMU verification interface operation-2

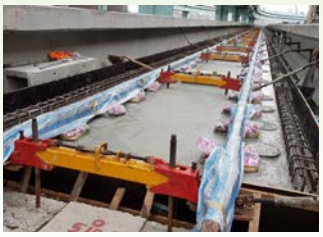
✧ Contract CF610/CF611/CF617 - Electrical and Mechanical Systems - Track Construction:

★ The final design operation has been completed (100%). In line with the timeline for the delivery of the track bed area in the civil construction project, the construction of the track bed and steel tracks and the installation of conductor rails for the entire line are currently ongoing. So far, the construction of the track bed and steel tracks and the installation of conductor rails at South Depot, around the stations and depot, and sections Y6-Y14 along the main line have been completed. System approaches were provided on June 30, 2017 and September 1, 2017, respectively, and clearance inspection is continuously conducted.

Inspection of concrete plinths before concrete placement

Completion of concrete placement and installation of concrete plinths and steel rails

Rebar installation for floating ballast board before concrete placement

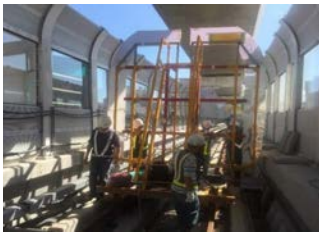


Completion of concrete placement for floating ballast board

Flash butt rail welding

Installation of special rails

Installation of conductor rails



Clearance inspection

## ➢ Financial Plan

✧ On April 30, 2008, the Executive Yuan approved the revision of financial plan for the Circular line Phase I. Due to price fluctuations and adjustment of construction period, as well as items added by regulation requirements, the estimated relevant funding was vastly insufficient during the implementation process after the project was approved. Therefore, the second revision of proposed plan was approved by the Executive Yuan on May 6, 2015. However, the construction project was affected by public protests, non-compliance with policies and public measures, pipeline relocation and underground obstacles, safety concerns, and other factors. After meetings and negotiations were jointly held between the officials of Taipei City and New Taipei City, the third revision plan was proposed on June 12, 2017. On October 17, it was submitted to the Ministry of Transportation and Communications (MOTC) in response to review comments made by MOTC on August 3, 2017. Upon approval, the MOTC submitted this revision plan to the Executive Yuan for further review on December 18, 2017.

## ➢ Environmental Impact Assessment

✧ The third difference analysis report was approved during the 311$^{th}$ meeting of the Environmental Impact Assessment Review Committee under the Environmental Protection Administration held on April 19, 2017, and the final version of this report was approved by the Environmental Protection Agency under the Executive Yuan on July 26, 2017.

## ➢ Circular Line Contract Honors in 2017

✧ The East District Project Office (CF651B) won the 2016 Excellent-performing Agency

Award under the Public Oversight Program in Public Works Projects given by the Public Construction Commission, Executive Yuan on May 25, 2017.

- ✧ Contract CF651B won the 2017 Engineering Excellence Award awarded by the Chinese Institute of Engineers on June 2, 2017.
- ✧ Contract CF634A won the Taipei City Government Public Works Excellence Award - Civil Engineering Category on August 16, 2017.
- ✧ Contract CF634A won the National First Prize - Civil Engineering Group under the Public Works Category awarded by the National Enterprise Competitiveness Development Association during the 19th National Golden Award for Architecture on November 7, 2017.
- ✧ Section Contract CF650 won the Golden Award for Track Engineering in the Civil Engineering Group under the Public Works Category awarded by the National Enterprise Competitiveness Development Association during the 19th National Golden Award for Architecture on November 7, 2017.
- ✧ Contract CF643A won the Superior Award in the Civil Engineering Category awarded by the Public Construction Commission under the Executive Yuan during the 17th Golden Award for Public Construction on December 21, 2017.
- ✧ Contract CF651B won the 2017 Structural Engineering Technology Award awarded by the Chinese Society of Structural Engineering on December 23, 2017.
- ✧ Contract CF660B won the Taipei City Government Public Works Excellence Award - Civil Engineering Category on August 16, 2017.
- ✧ Contract CF660B won the 2017 New Taipei City Government Public Works Superior Award on September 19, 2017.

## Taichung Wuri-Wenxin-Beitun Line

This route begins somewhere near the Songzhu Road No. 2 Bridge in Beitun District, Taichung City and runs westward along Songzhu Road in an elevated mode across Taiwan Railways before turning left onto Beitun Road. This route then continues along Beitun Road until the intersection of Wenxin Road Section 4, before turning right onto Wenxin Road. Then, this route runs along Wenxin South Road and turns onto Jianguo Road from the rear section of Chung Shan Medical University and across the elevated bridge along Huanzhong Road through Taichung-Changhua Expressway before entering the area of Taichung's HSR station from the north side of the Taiwan Railway across the Fazi River. This route uses a medium-capacity transit system. The entire route is 16.71 km long, with 15.94 km in the elevated section and 0.77 km in the ground section. The route passes through various regions in Taichung City, including Beitun District, North District, Xitun District, Nantun District, South District, and Wuri District, with 18 stations along the line and the Beitun Depot established on the west side of the Han River in Beitun District.


Route map of the Wuri-Wenxin-Beitun line of the Taichung Mass Rapid Transit System

➢ **The construction of this contract is summarized below:**

✧ Section Contract CJ910:

- The construction site of this section contract is located to the north of Songzhu Road, with the Han River on its east side and Jiushe Lane adjacent to its west side. This base covers an area of approximately 19.5 hectares, including a 336 m-long viaduct, Beitun Depot, and one ground station (Station G0).
- In this section contract, Beitun Depot began construction on December 31, 2012, and a miscellaneous-item construction license was successfully obtained on July 19, 2013; then it commenced the construction of miscellaneous items on September 23, 2013. On May 29, 2014, a construction license was successfully obtained, and construction work officially commenced. As of the end of 2017, various structures in Beitun Depot, including the bulk supply substations, guard room, sewage treatment plant, training center, administrative building, vehicle model exhibition room, north stabling yard, main maintenance plant, track maintenance plant, depot substation, car wash factory, waste disposal area, special goods warehouse, water tower, cut-and-cover tunnel, viaduct, north-south flood detention pond, and peripheral retaining wall/flood wall for the depot and Station G0, have been completed, while finishing, E&M and HVAC systems works are still in progress. The installation of ballasted track (9,794 m) and non-ballasted track (72 m) in the depot area, as well as the installation of ballasted track (3,654 m), non-ballasted track (27,890 m), floating track (3,130 m), conductor rail (9,677 units), and turnouts (55 units) along the main line, has been completed. Furthermore, work of Section Contract CJ920 was completed and handed over to the E&M systems contractors on April 7, 2017;

that of Section Contract CJ930 was completed on May 31, 2017 and handed over to the E&M systems contractors, while in this Section Contract, the first EMU arrived at Beitun Depot in February 2017, and the EMUs participated in track testing along the main line in August. All 18 EMUs to be in service on the Taichung MRT Green line arrived at Beitun Depot in December 2017.

Bird's-eye view of the entire construction area

North stabling yard

Administrative buildings

Primary Maintenance Plant and Track Maintenance Plant

Current status of Station G0

Installation of low-voltage switchboard at the administrative building

Installation of generators at the bulk supply substation

Installation of cooling tower at the administrative building

Current status of rail tracks at Station G0

✧ Section Contract CJ920:

- This section begins from the west bank of the Han River (near Songzhu Road No.2 Bridge) and runs westward along Songzhu Road. The route crosses the Taiwan Railways and turns right onto Beitun Road before running along Beitun Road to Section 2, Wenxin Road Section 2, and Shizheng North 3rd Road. The section contract is 8.064 km long, encompassing a viaduct (including a pocket track) and

eight elevated stations (Station G03 to Station G08, Station G08a and Station G09).

- This section contract began construction on March 15, 2013, and an elevated-mode design was applied to the entire section. As of the end of 2017, the construction of well foundations, pier caps and cap beams, cast-in-place beams, precast beams, a steel structure station, and noise barriers has been completed, while the finishing work of the exterior and interior of various stations is still on-going. For E&M and HVAC systems, equipment installation and the construction of various systems and pipelines were carried out. Hardware-software connection and integration testing were also performed at each station along the entire line upon completion of the BMS system.

Construction of Station G03 from Jiushe Lane to Hanxi West Road

Construction of Station G04 from Qiaoxiao Street to Songzhu Road

Construction of Station G05 from Chongde Road to Hebei Road

Construction of Station G06 from Chongde Road to Hebei Road

Construction of Station G07 from Zhongqing Road to Xiaxi Road

Construction of Station G08 from Ningxia Road to Henan Road

Construction of Station G08a from Yinghua Road to Xitun Road

Construction of Station G09 from Taiwan Boulevard to Dalong Road

Construction of firewater piping in the public area at Station G04

Installation of fuses on the viaduct from Station G05 to Station G06

Movable frog at Station G03

Current status of rail tracks at Station G09

✧ Section Contract CJ930:

- The route for this section begins from Wenxin Road Section 2 to somewhere near Shizheng North 3rd Road, then runs southward along Wenxin Road Section 2, and connects to Wenxin Road before crossing Tuku Drainage Ditch via Wenxin 2nd Bridge. Next, the route runs across the empty land behind Chung Shan Medical University before turning onto Jianguo North Road and reaching G13 Station, which is located near Daqing Street. Then, the route continues to run along Jianguo North Road and crosses Huanzhong viaduct. After passing the Zhongzhang Expressway, the route crosses the Fazi River and ends at Station G17, which is located at TRA Taichung Station, as well as tail track. The entire route is 8.69 km long, including viaducts, eight elevated stations (Station G10 to Station G16, and Station G10a) and one ground station (Station G17).
- This section contract began construction on March 1, 2013, and an elevated-mode design was applied to the entire section. As of the end of 2017, the main structures of viaduct (including steel box girders, cast-in-place U-beams, precast U-shaped girders, and cantilever beams) and stations have been completed. Auxiliary bridge facilities, such as bridge decks, cable troughs, parapets, central walkways, noise barriers, lipped channels, and expansion joints, have also been completed. The track section of this section contract (a total of 8,696 m) was completely handed over to the contractor on December 1, 2016. In line with the EMU operational testing performed by the Systemwide E&M Project Office, track clearance retest operations began in mid-December.
- The steel structure part of the Fazi River Steel Bridge has been hoisted and erected, as have all the steel box girders (a total of 45 units). The steel structures at all stations have been hoisted and erected, except for the connecting channel at Station G11 which has not been completed due to the construction of entrances/exits for joint development building. As for the steel structure of entrances/exits, the south exit of Station G13, Station G15, and Station G16 were affected due to the delayed handover of land by Taichung City Government; as a result, the hoisting and erection of steel structures and electric welding at the stations are currently being carried out.
- The embankment box culvert structure, parapets, and central sidewalks have been completed. Backfilling and the bottom layer of ballast in the tail track have been completed and handed over to the track work contractor, while the construction of chain fences and protective screens have also been completed. The fences around BSS and landscape drainage ditches are currently under construction.
- The BSS, the machine rooms for entrances/exits at all stations and the automatic fare collection area, cash room, PAO, and the auto fare equipment rooms have been completed, and the E&M systems contractors have begun construction. Meanwhile, the finishing works at BSS and all stations are continuously in progress

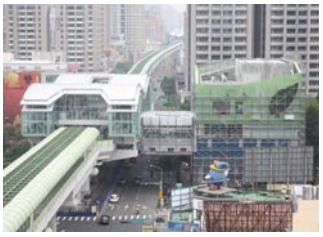
(including wall painting, aluminum roofing panels, aluminum-clad boards for exterior walls, enamel wall panels, green walls, PAO, bathroom wall tiles, floor granite bricks, steel doors, electric rolling doors, aluminum shutters, platform equipment belts, glass curtains, light compartments, and ceiling sealing boards). As for E&M and HVAC systems, low-voltage power distribution tests and power supply preparations were completed at all stations on May 12, 2017. On April 28, 2017, the results of the sampling test conducted on fire extinguishing agent with low-pollution gas at BSS were in compliance with the contract. The subsequent lighting, maintenance sockets, and platform equipment belts along the tracks, lighting in machine rooms, and equipment pipelines for the fire protection system are currently under construction, and the construction of elevators and escalators have also commenced alongside other on-site works.

- Road restoration and landscaping works for this section contract have already started. At present, the restoration of drainage ditches and sidewalks from Taichung-Changhua Expressway to Guangri Road is currently in progress, while landscaping at the central median island in the Wenxin section of the construction area is also being carried out.

Current construction of Station G10 and entrances/exits along Wenxin Road

Current construction of Station G10a and entrances/exits along Wenxin Road

Current construction of Station G11 along Wenxin Road



Current construction of Station G12 and entrances/exits along Wenxin Road

Construction status of Station G13 and entrances/exits along Jianguo Road

Construction status of Station G14 and entrances/exits along Jianguo Road

Construction status of Station G15 and entrances/exits along Jianguo Road

Construction status of Station G16 and entrances/exits along Jianguo Road

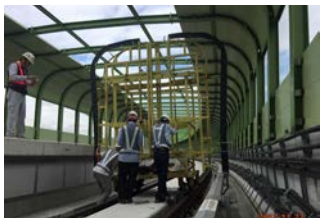
Construction status of Station G17

Landscaping along median island

Extraction of fire extinguishing agent at Wuri BSS

Establishing protection coordination for the switchboard at Wuri BSS

Installation of track mileage indicator between Station G14 and Station G15



Clearance inspection between Station G12 and Station G13

Clearance inspection at Station G17

Crossing diamond at tail track

✧ Section Contract JJG091:

- This section contract began construction on May 31, 2016, the three construction sites-- G09-1, G09-2, and G10--were handed over to the contractor at the same time. Currently, rebar installation for raft foundation of G09-1 in the north section is ongoing, while the erection of FB ground beams and concrete placement is being carried out at the sub-base of G09-2 in the south section. Meanwhile, parking lot roof protrusion work and finishing works of E&M and HVAC systems for the MRT facilities are also ongoing.

Construction status of Station G09-1

Rebar installation at raft foundation of Station G09-1

Construction status of Station G09-2

Removal of the sixth layer support at Station G09-2

Construction status of entrances/exits at Station G10

Ceiling painting on level B1F at Station G10

Escalator installation on level 1F at Station G10

Backfilling at parking lot of Station G10

✧ Section Contract JJG051:

- This section contract began construction on July 8, 2016, the four construction sites-- G05, G06, G08a, and G11--were handed over to the contractor at the same time. As of the end of 2017, construction works related to semi-circular full casing retaining piles, artificial retaining columns, middle piles, and building protection have been completed. Excavation works on concrete plinth are still ongoing at

G06 and G08a, but placing concrete for the plinths at G05 and G11 have been completed, and rebar installations for foundation is currently in progress.


Waterproofing membrane and placing concrete works for the structural construction of land development building at Station G05


Earth excavation for the structural construction of land development building at Station G06

Earth excavation for the structural construction of land development building at Station G08a


Grounding work for the structural construction of land development building at Station G11

✧ Section Contract IJG031:

- A construction license was successfully obtained for this project on April 10, 2017. This project was awarded to Far Eastern Construction Company on May 15, 2017. The commencement of construction work for this project was declared on June 21, 2017, and work began the next day. As of the end of 2017, construction works related to retaining piles, middle piles, building protection, earth excavation for the first and second layers, net hanging on retaining wall forgunite-shooting, construction platform, and the first- and second-stage supports have been completed, while third layer earth excavation works are currently underway (a total of five layers).

Construction of full casing piles

Construction of first-stage supports and construction platform

Second-layer earth excavation works

Net hanging on retaining wall forgunite-shooting

✧ Contract CJ900 – E&M systems:

- This contract was officially signed on April 1, 2011 and began construction on April 21, 2011. After the approval of the second Extension of Time (EOT), the expected substantial completion date is November 24, 2018, and the final completion date is anticipated to be May 25, 2020.
- Currently, all sub-systems of the E&M systems are in the process of design documents for review, equipment procurement, manufacturing, installation and testing.

- To meet with the second revised planning schedule, the construction sequence of E&M systems work are being adjusted based on the present construction status of civil works in line with the station delivery schedule, with a view to reaching the goal of commissioning test in November 2018.

✧ Contract CJ900 - Current status of E&M systems:

- The first EMU for the Taichung line was shipped to Taichung Port on February 5, 2017 and was transported to Beitun Depot on February 12, 2017.
- The last (18th) EMU for the Taichung line arrived at Beitun Depot on November 30, 2017.
- The EMUs for the Taichung line traveled to the depot for the first time for running test on the test track on April 12, 2017 and first traveled along the main line for testing on August 12, 2017.
- From July 29, 2017 to August 11, 2017, ATS equipment function, software integration, automatic tests, and equipment continuity tests were carried out in Bangalore, India to verify that the functions and performance of the ATS equipment complied with those stipulated in the contract.
- Since switches are linked to the safety of cars in the MRT system, this test was able to confirm whether the design and durability of switching equipment provided by the vendors complied with the specifications.
- Beginning May 2, 2017, the SIT10 static testing of cars No. 1, 2, 3, 4, and 7 was completed subsequently to verify the electric integration of CC boxes and their I/O modules and the installation and electric integration of under-vehicle equipment (beacon antenna and odometers), in order to ensuring safe driving.
- Beginning February 6, 2017, beacons, impedance bonds, integrated racks, SMART I/O, and work stations for the fourth batch to the 40th batch of OCS arrived and were examined subsequently.
- Beginning March 14, 2017, the hoisting and installation of large OCS equipment cabinets were completed subsequently.
- Regarding the communication system for the Taichung line, the construction of equipment for the signal and communication room at all stations for the entire line has been completed. The fiber optic system and the digital radio system in the subsystems have been connected to the power supply and undergone trial operation, and can now be used for testing by related contracts.
- As for the communication system for the Taichung line, the installation of pipelines and troughs and cabling work at each station and depot are currently being accelerated. In line with the fire prevention inspections planned for each station in the near future, the construction of the relevant broadcasting systems is currently in progress.

- On February 16, 2017, in conjunction with the arrival of the first EMU, the Stinger Power supply of the maintenance plant at depot was completed.
- On February 24, 2017, power transmission from the 161kV BSS system was completed.
- On March 17, 2017, power transmission from the third-rail 750V direct current power system of all plants at depot was completed.
- From June 20, 2017 to July 2, 2017, the 22kV system and the third-rail 750V direct current power supply at Station G9 were completed.
- From August 10, 2017 to August 20, 2017, power transmission from the 22kV system and the third-rail 750V direct current power system at Station G13 were completed.
- On September 15, 2017 and September 24, 2017, power transmission from the 22kV system and the third-rail 750V direct current power system were completed, respectively, thus completing power transmission to the entire line, which could then be used for train testing.
- The direct current short-circuit verification test on integrated systems at the depot and Station G0 to Station G17 along the main line were completed.
- Factory testing of the "Waste Oil Recovery System and Lubrication Device" at the depot along the Taichung line:

  On October 12, 2017, factory testing of this equipment was carried out in the country. The scope of this test covered specification verification, dimensional inspection, visual inspection, pressure testing, and leak testing. This test was designed to verify the discharge of lubricating oil from the gearbox on the EMU bogie after the arrival of the system. The previously used lubricating oil was then stored in the waste oil recovery tank.
- Factory testing of the "Bogie Cleaning Machine" at the depot of the Taichung MRT line:

  On November 16, 2017, factory testing of this equipment was carried out in the country. The scope of this test covered the specification verification, dimensional inspection, visual inspection, insulation resistance measurement, and functional testing of both the bogie cleaning room and the high-pressure cleaning machine. This test was designed to manually deliver cleaning liquid at high pressure. It can be used to clean bogies, bogie frames, and dismantled parts with wheels. Before cleaning a bogie in the cleaning room, components on the upper part must be dismantled with a jack used for installation/disassembly. The bogie frame and axle set are then dismantled after cleaning.
- Overseas factory testing of the "Rail Grinding Car" and the "Rail Cleaning Car (including Water Tank Platform Vehicle)" before arrival: On November 20, 2017, the rail maintenance plant at Beitun Depot handled the arrival of these items for checking and inspection.

EMU manufactured by a Japanese manufacturer

First EMU trial operation on the main line from Station G0 to Station G4 (entry into Station G3)

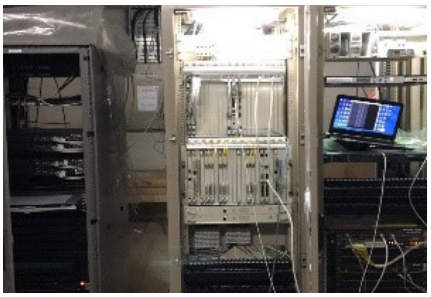
Arrival of the fist EMU at Beitun Depot in Taichung City

Overseas factory inspection of ATS software

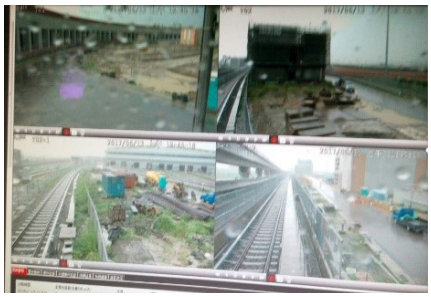
Life cycle test on switches in the train monitoring system within one million times

Acceptance and inspection of OCS equipment

Testing of preliminary two-way voice call function provided by the TETRA system and the SDH system, and testing of EMUs along the main line



Establishing equipment parameters for the communication system



Monitoring of EMUs on the test track at the Operation Control Center (OCC) in the administrative building of Beitun Depot using the rail CCTV cameras

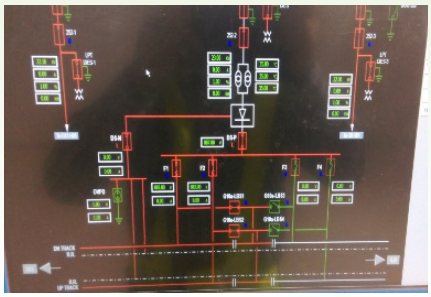
Waste oil recovery system and lubricating device - pressure pump test

Bogie cleaning machine for depot equipment - testing of heating time function on control panel

Arrival of rail grinding car

Hoisting and erection of 161kV gas-insulated switchgear at BSS located at Beitun Station

Power transmission to equipment via C-GIS in the 22kV system



Remote monitoring screen for three-rail 750 VDC power transmission

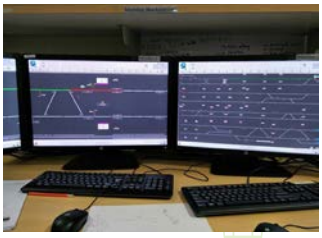
✧ Contract CJ900 - E&M systems overseas inspection:

- Testing of Supervisory Control and Data Acquisition (SCADA) system equipment at the Operation Control Center (OCC)/Backup Control Center (BCC) along the Taichung line:

  The Supervisory Control and Data Acquisition (SCADA) system at the Operation Control Center and Backup Control Center can provide trains and systems with a complete automatic monitoring human-machine interface and functions, including train identification, train tracking, and train dispatching models. It performs simulation testing using the timetable management model and the minimum operating distance of the system to ensure that trains are automatically dispatched for operation, and trains are then activated for operation according to the pre-planned timetable. The position and operation of all trains will be automatically monitored to ensure their normal operation. A system operating performance report can be provided in accordance with the contract requirements to demonstrate the complete monitoring functions of the system.

Bay Speed Restriction (BSR) management test

Magenta sections on the human-machine interface during system startup



Train operations according to the timetable

Train parking and dispatch management testing

## ➢ Taichung MRT Wuri-Wenxin-Beitun Line Contract Honors in 2017

✧ Contract CJ910 won the Top Award for Public Construction and the Excellence Award for Public Construction in the construction quality category under the public works group at the 2017 Taiwan Integrity Brand and the 18th National Golden Award for Architecture on December 5, 2017.

✧ The Cantilever Construction Platform Solution for Construction Safety and Protection

in the CJ920 was the winner of the Advance Award at the 2017 Creative Proposal Competition organized by Taipei City Government.

- ✧ Contract CJ920 won the Excellence Award for Public Construction in the planning and design category under the public construction group at the 2017 Taiwan Integrity Brand and the 18th National Golden Award for Architecture on December 5, 2017.
- ✧ Contract CJ920 was the 2nd runner-up in the 2017 High-level Disaster Prevention Operations and Military Exercise Rating for Vendors in All Projects organized by our government.
- ✧ Contract CJ930 won the Excellence Award for Public Construction in the planning and design category under the public construction group at the 2017 Taiwan Integrity Brand and the 18th National Golden Award for Architecture on December 5, 2017.

## Wanda Line Phase I Construction

The entire route of the Wanda line has already been approved, and its construction has been divided into two phases. The first phase construction started in 2010, the matters including basic design, urban rezoning, land acquisition, detailed design, and construction contracting were carried out subsequently. In the second phase of the construction project, beginning in 2012, operations including the development of surrounding land and financial planning are handled by the Department of Rapid Transit Systems of the New Taipei City Government.

Phase I construction: The route begins from Chiang Kai-shek Memorial Hall Station, runs westward under Nanhai Road and passes through Heping Road before connecting to Xizang Road and turning onto Wanda Road. Next, the route crosses the Fruit and Vegetable Market and the Xindian River, then runs along Baoshun Road and Baosheng Road in New Taipei City before turning onto Zhongshan Road, Liancheng Road, and Jincheng Road. A depot has been established in the agricultural area located north of Jincheng Road, while a branch line station has been established adjacent to Juguang Road. The entire route is 9.5 km long (8.8 km along the main line and 0.7 km along the branch line), with a total of nine underground stations and one depot.


Route map of the Wanda line

## ➢ Revision of Urban Planning

The routes in both cities are explained as follows:

✧ Taipei City section:

- For Station LG01, the main plan came into operation by announcement on September 17, 2015, and then the detailed plan on November 27, 2015.
- For Station LG03 and Station LG04, the main plan came into operation by announcement on October 30, 2015, then the detailed plan on March 22, 2016.

✧ New Taipei City section:

- The main plan came into operation by announcement on May 10, 2016.
- The detailed plans for Tucheng and Banqiao urban plan came into operation by announcement on June 30, 2016; while the Zhonghe urban plan came into operation by announcement on August 19, 2016.
- Landowners on the north side of Station LG06, the revised MRT land development M2, did not submit applications to New Taipei City Government for pre-registration within three months from the date in accordance with Article 9 of the Agreement for Changing 3 Pieces of Industrial Land, including Parcels No. 23, 29, and 67 in the Anbang Section of Zhonghe District, New Taipei City and for the implementation of land development. Therefore, according to aforementioned provision, the revision operation for the M2 land-use scope which had ever announced in an

open exhibition held on August 30, 2011 based on the main plan was required to re-inaugurated, where the MRT development area was converted to land used for MRT systems. Then the main plan came into operation by announcement on September 20, 2017, and the detailed plan was discussed in the 70th meeting of the Urban Planning Commission of New Taipei City Government on November 17, 2016, and was approved in the 81st meeting on November 16, 2017. The New Taipei City Government was in progress of preparing for the promulgation of the detailed plan.

➢ **Planning of MRT stations**

✧ The positions of the MRT stations are as follows:

- (LG01) Chiang Kai-shek Memorial Hall Station: located near the intersection of Roosevelt Road and Nanhai Road in Taipei City (transfers to both the Tamsui-Xinyi line and Songshan-Xindian line can be made).
- (LG02) Taipei Botanical Garden Station: located near the intersection of Nanhai Road and Heping W. Road in Taipei City.
- (LG03) Xiaan Station: located near the intersection of Xizang Road and Zhonghua Road.
- (LG04) Jiala Station: located near the intersection of Wanda Road and Changtai Street.
- (LG05) Yonghe Station: located on Baosheng Road in front of Yong Ping Elementary School in Yonghe District, New Taipei City.
- (LG06) Zhonghe Station: located near the intersection of Liancheng Road and Jingping Road in Zhonghe District, New Taipei City (transfer to the Circular line can be made).
- (LG07) Shuang Ho Hospital Station: located near the intersection of Liancheng Road and Jinhe Road in Zhonghe District, New Taipei City.
- (LG08) Zhonghe Senior High School Station: located near the intersection of Liancheng Road and Yuanshan Road in Zhonghe District, New Taipei City.
- (LG8A) Juguang Station: located in the land allocated for MRT depot to the south of Juguang Road in Zhonghe District, New Taipei City.

➢ **The construction of this project is summarized below:**

At present, the contracts that have been awarded in Taipei City section include Contract CQ840 (civil works for Station LG01 and Station LG03 and shield tunnel from Station LG03 to Station LG04), which began construction on February 6, 2017; Contract CQ842 (civil works for Station LG02 and shield tunnels from LG02 Station to LG03 Station and from Station LG02 to Station LG01) which began construction on December 11, 2014; Section Contract CQ850A (civil works for Station LG04 and shield tunnel from Station LG04 to Station LG05) which began construction on December 31, 2016. The contracts in New Taipei City section include Contract CQ850 (civil works

for Station LG05 and shield tunnel from Station LG05 to Station LG06), which began construction on January 19, 2016; Contract CQ861 (civil works for Station LG06), which began construction on December 2, 2014; Contract CQ860 (civil works for Station LG07 and Station LG08 and shield tunnel from Station LG06 to Station LG08), which began construction on October 15, 2015; and Contract CQ870, which began construction on December 15, 2017.

✧ Contract CQ841 - Civil Works for Station LG01 and Shield Tunnel:

- Based on the content of this contract, Station LG01 is located underground along Nanhai Road, near Roosevelt Road Section 1. This station is the ending point and the transfer station to Chiang Kai-Shek Memorial MRT Station, and is located approximately 427 m from Station LG02. Station LG01 and Chiang Kai-Shek Memorial Hall Station are connected via an underground passage. This station is an underground two-level island platform station. This project began construction on February 6, 2016 and will take a total of 2,892 days to complete. The scheduled completion date is January 6, 2025. After completing a preliminary survey of buildings, safety monitoring system, and sidewalk reduction operations for this project, the first stage of traffic maintenance and fence erection operations was completed on July 8, 2016. The temporary relocation of underground pipelines and construction of the guide ditches for diaphragm walls at the east of the station have also been carried out.

Status of traffic maintenance and fence erection in the first stage

Construction of building protection (piles)

Construction of the guide ditches for diaphragm walls

✧ Contract CQ843 - Civil Works for Station LG03 and Shield Tunnel :

- Based on the content of this contract, Station LG03 is located underground along Xizang Road in front of Zhongyi Elementary School and is situated approximately 390 m from Station LG02, with a 484 m long pocket track. This station is an underground two-level island platform station. This project began construction on February 6, 2016 and will take a total of 2,892 days to complete. The scheduled completion date is January 6, 2025. After completing a preliminary survey of buildings, safety monitoring system, and sidewalk reduction operations for this project, the first stage of traffic maintenance and fence erection operations was completed on August 5, 2016. The construction of the diaphragm walls is ongoing

at the south of the station. The central pocket track is located underground along Wanda Road at the intersection of Xizang Road and Wanda Road and is situated 484 m from Station LG03 and approximately 350 m from Station LG04 (exclusive). This station is a cut-and-cover tunnel, and the first stage of traffic maintenance and fence erection operations was completed on August 19, 2016. The construction of guide ditches for diaphragm walls is currently underway.

Status of the first stage of traffic maintenance and fence erection operations


Hoisting and erection of rebar cage for diaphragm walls

Concrete placement for diaphragm walls

✧ Contract CQ842 - Civil Works for Station LG02 and Shield Tunnel :

- This contract primarily includes civil works (station, tunnel, and the basic construction of Taipei Mandarin Experimental Elementary School MRT integrated building), heritage preservation, substation works, and landscaping at Taipei Mandarin Experimental Elementary School. This station is a three-level island platform station. This construction began on December 11, 2014 and will take a total of 2,922 days to complete. The scheduled completion date is December 10, 2022. Station LG02 is to be built within the Botanical Garden Ruins where are the heritage sites of an approximately 2,000-year-old "Botanical Garden Culture" and an approximately 4,000-year-old "Xuntanpu Culture". To maintain the completeness of historical remains and preserve cultural relics, an archaeological team first entered the historical site to carry out excavation works in conjunction with traffic maintenance and fence erection. The first stage was completed on August 5, 2016, while excavation works, construction of retaining diaphragm walls, erection of king posts, first-layer excavation support works, decking system and dewatering works were completed at the heritage site during the second stage of traffic maintenance and fence erection on October 6, 2017. After completing excavation and support works at the heritage site during the third stage of traffic maintenance and fence erection operations on December 15, 2017, excavation works at the heritage site, construction of retaining diaphragm walls, erection of middle piles, first-layer excavation and support works, covering system and dewatering works on the Jingmei layer during the fourth stage of traffic maintenance and fence erection are continuously being carried out. Meanwhile, in the construction site for the Taipei Mandarin Experimental Elementary School MRT integrated building, excavation

works, construction of diaphragm walls, erection of middle piles, and excavation support works at the heritage sites have been completed, but underground structures are currently under construction.

Heritage preservation in the middle of Nanhai Road (third stage of traffic maintenance) and construction of excavation support for the Taipei Mandarin Experimental Elementary School MRT integrated building

Heritage preservation in the north of Nanhai Road (fourth stage of traffic maintenance) and construction of underground structure for the Taipei Mandarin Experimental Elementary School MRT integrated building

Excavation support works in the construction area for the Taipei Mandarin Experimental Elementary School MRT integrated building

Construction of underground structures for the Taipei Mandarin Experimental Elementary School MRT integrated building

Construction of underground structures for the Taipei Mandarin Experimental Elementary School MRT integrated building

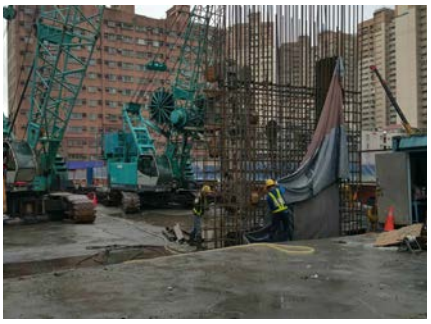
Dewatering works on the Jingmei layer at the station

✧ Contract CQ850 - Civil Works for Station LG05:

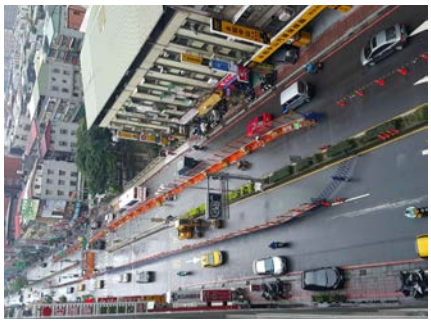
- This contract involves civil construction works (including the station, up and down track tunnel, and ventilation shafts) and the reconstruction of escalators at Exits 3, 5, and 7 at Guting Station. Station LG05 is a three-level island platform station. This project began construction on January 19, 2016 and will take a total of 2,677 days to complete. The scheduled completion date is May 18, 2023. This project so far consists of the first and second stages of traffic maintenance works, construction of diaphragm walls at ventilation shaft X, and the first stage of improvement works at the mirror face of shield tunnel at Station LG06. The third stage of traffic maintenance works is currently in progress and includes the following: construction of diaphragm walls on the east and west side of the station and Ventilation Shaft X (construction of middle piles and pipeline relocation have been completed). The

construction of culverts for drain pipes with a diameter of 1,200 mm have been completed on the north side of the station and are now channeling water. Culverts for wastewater pipes with a diameter of 500 mm are currently under construction. In the CP6 service channel of the tunnel section, the construction of protection measures, including special single-element deep guide ditches and wastewater pipes with a diameter of 1,200 mm along the diaphragm walls in the first stage of traffic maintenance works, are currently in progress. Meanwhile, the land to be used for ventilation shafts has been officially acquired. The contractor has started constructing guide ditches (packed-in-place piles) and temporary diversion drains for the diaphragm walls.

Construction of sewage pipes of with 500 mm diameter on the north of the station (installation of steel pipes in the working shaft)

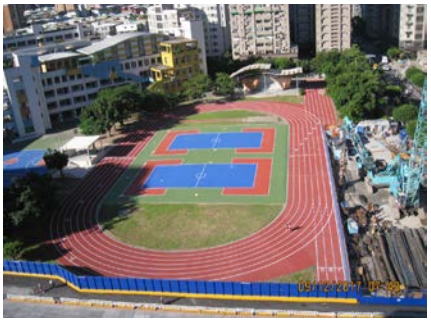


Construction of diaphragm walls at Ventilation Shaft X on the south of the station



First stage of fence erection operations at CP6 in the tunnel section of Station LG05

Improvement works in the shield tunnel to the mirror face site at Station LG06



Improvement works of basketball courts and temporary running track in the field within the area of Yung Ping Elementary School

Setting up beautification canvases during fence erection on the south of the station

✧ Section Contract CQ851 - Civil Works for Station LG04 and Shield Tunnel:

- This contract includes construction works for a three-level island platform station and one section of shield tunnel (including upper and lower tunnels), as well as water, electricity and HVAC systems works and construction works for common ducts. This project began construction on December 31, 2016 and will take 2,677 days to complete. The scheduled completion date is April 29, 2024. Pre-construction works, such as sidewalk reduction, station security monitoring system, and building surveys, have been completed. On July 29, 2017, the first stage of

traffic maintenance and fence erection operations was completed. Diaphragm walls on the west of the station are currently under construction. As of December 31, 2017, 27 out of 58 units have already been completed.

Removal of pedestrian bridge piles

First stage of traffic maintenance works

Construction of diaphragm walls

✧ Contract CQ861 - Civil Works for LG06 Station:

- All 51 units of the diaphragm walls on the south of the station were completed as of February 12, 2017. Diaphragm walls on the north of the station are currently under construction.

Excavation works for the diaphragm walls

Hoisting and erection of rebar cages for the diaphragm walls

Setting up of cover plates

✧ Contract CQ860 - Civil Works for Stations LG07 and LG08 and Shield Tunnel:

- This contract began construction on October 15, 2015, with the underground MRT design applied to the entire section. Construction works for this project include two underground stations, two cut-and-cover tunnels, and three shield tunnels. In addition to continuing the temporary relocation of pipelines along the construction route, the construction of Station LG07 and central pocket track on the south of the station, and shallow excavation works in several sections, the following works are also on-going: construction of the diaphragm walls on the south of Station LG08, propulsion of waste water pipes with a diameter of 1,350 mm, and construction of the diaphragm walls on the south of the cut-and-cover section along Jincheng Road Section 3.

Erection of middle piles on the central pocket track along Liancheng Road

Erection of building protection piles on the central pocket track along Liancheng Road

Excavation works for the diaphragm walls at Station LG07

Excavation works for the diaphragm walls on the central pocket track along Liancheng Road

Hoisting and erection of rebar cages for the diaphragm walls on the central pocket track along Liancheng Road


Temporary relocation of pipelines and protection works at Station LG08

Erection of building protection piles at Station LG08

Excavation works for the diaphragm walls at Station LG08

Hoisting and erection of steel cages for the diaphragm walls at Station LG08

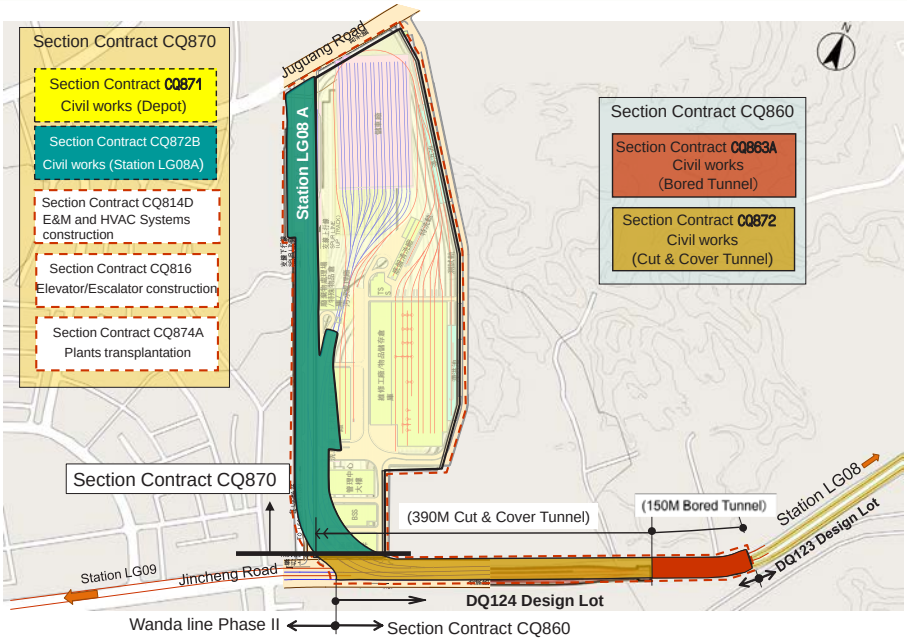
Excavation works for the diaphragm walls in the cut-and-cover tunnel section along Jincheng Road Section 3

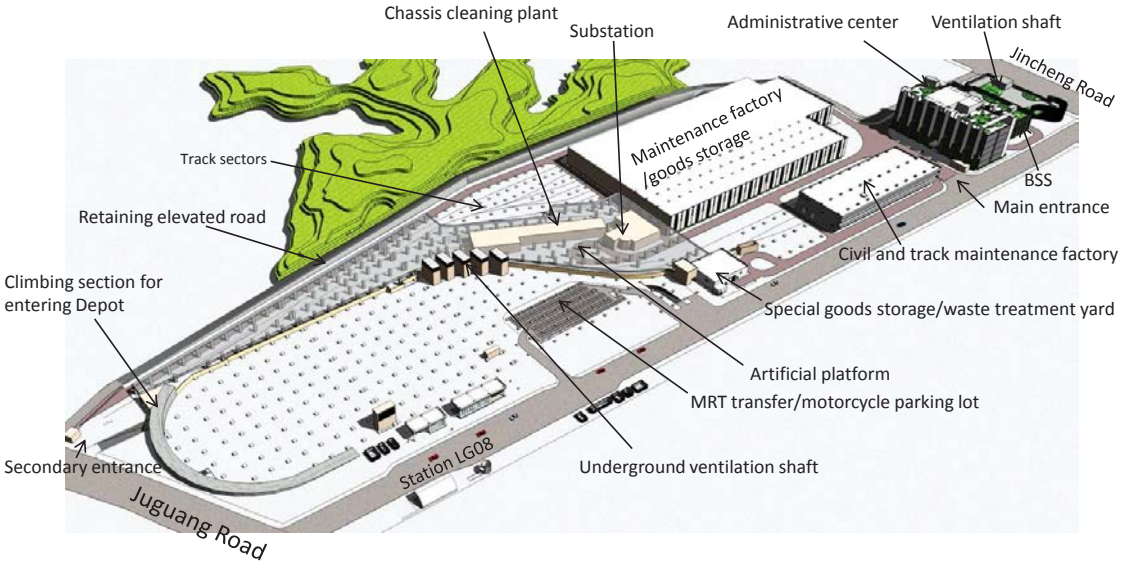
Hoisting and erection of steel cages for the diaphragm walls in the cut-and-cover tunnel section along Jincheng Road Section 3

Propulsion of wastewater pipes

✧ Section Contract CQ870 - Civil Works for Jincheng Depot and Station LG08A:

- This contract was awarded on October 6, 2017 and was signed on November 6, 2017. This project began construction on December 15, 2017, will take 88 months to complete, and is scheduled to be completed in 2025. It shall be carried out in conjunction with land acquisition.




Floor map of Jincheng Depot

## ➢ Wanda Line Phase I E&M Systems Preparation Works for Tendering:

- ✧ The Executive Yuan approved the Wanda line Phase I construction in March 2010. The E&M core systems were opened for tender on December 13, 2010, February 21, 2011, May 16, 2011, and July 13, 2011. However, the opening of tender failed since no venders submitted a tender. The main reason for this was that the originally approved budget was inadequate.
- ✧ After the 4th tendering for the Wanda line E&M system failed, TRTC sent a letter on December 30, 2013, recommending that the original automated driverless system be replaced with a high-capacity automated control and manned system (requiring that cabs be set up) and proposed a number of system function enhancements. After our department made a request to the Taipei City Government, it agreed on September 29, 2015 to retain the "Fully Automated Driverless System."
- ✧ The revised financial plan was approved by the Executive Yuan on September 23, 2014. The budget for E&M core systems procurements was revised from NT$7.93 billion to NT$13.97 billion, an increase of approximately NT$6.04 billion which was approved by the Taipei City Council after three readings on January 15, 2016.
- ✧ Based on fair, just, and open principles, vendors are expected to provide with reference materials after inspecting the tender documents in order to enhance the quality of public works planning and design and reduce bidding and performance disputes. The request for Reference Materials from vendors was carried out from August 8, 2016 to August 15, 2016 in accordance with Article 34 of the Government Procurement Act, with a view to collecting opinions and feedback from vendors. A vendor opinion review committee was formed by scholars and experts to review the opinions and feedback provided by vendors.
- ✧ Based on current practice, our department published the results of the vendor opinion review committee on our website, sent letters to respond to the opinions and feedback of relevant vendors and revised the tendering documents.
- ✧ After the review results were submitted for approval on November 18, 2016, the hard copy, text, and scanned files for the Particular Technical Specification (PTS), Bill of quantities (BOQ), and preface of Contract CQ810 E&M System, Contract CQ817 Automatic Fare Systems, as well as General Standards (GS) of Electrical and Mechanical Systems, grounding, connection, and corrosion protection were delivered to the Project Document Control Center (PDCC) and uploaded to our department's document management system. A letter was also sent to Systemwide Electrical & Mechanical Project Office for notice.

## ➢ Traffic Maintenance Plan

The Wanda line Phase I construction consists of four design contracts, namely DQ121, DQ122, DQ123, and DQ124. The traffic maintenance plan for each design project is summarized as follows:

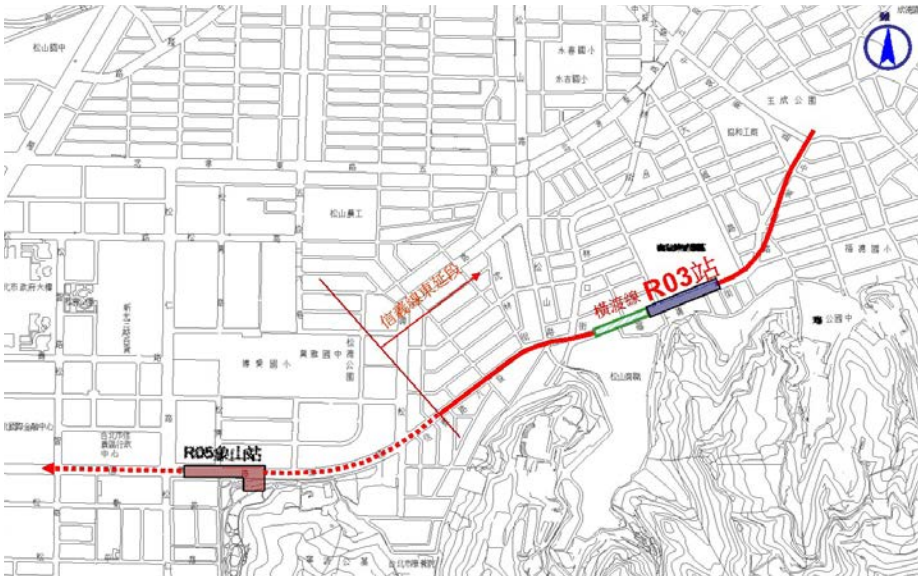
- ✧ DQ121: The traffic maintenance plan for Station LG02 was reviewed and approved by the City Road Traffic Safety Supervisory Committee of Taipei City on May 4, 2015, while the traffic maintenance plan for Station LG01 (including the crossover) and LG03 Station (including the central pocket track) were reviewed and approved by the Road Traffic Safety Supervisory Committee of Taipei City on December 13, 2016 and March 14, 2017, respectively.
- ✧ DQ122: The traffic maintenance plan for Station LG04 was reviewed and approved by the Traffic Safety Committee of Taipei City on November 22, 2016, while the traffic maintenance plan for Station LG05 was reviewed and approved by the Road Traffic Safety Supervisory Committee of New Taipei City on February 3, 2016.
- ✧ DQ123: The traffic maintenance plan was reviewed and approved by the Road Traffic Safety Supervisory Committee of New Taipei City on October 6, 2014.
- ✧ DQ124: The traffic maintenance plan was reviewed and approved by the Road Traffic Safety Supervisory Committee of New Taipei City on December 31, 2015.

➢ **Environmental Impact Assessment**

- ✧ In response to the staged construction approved by the Executive Yuan, the Comparison Table for Content Changes was prepared and submitted to the Environmental Protection Administration under the Executive Yuan on December 14, 2012 for approval and future reference.
- ✧ In response to changes to the type of station for Station LG08A and the adjustment of the shape of the MRT line in the river crossing section from Station LG04 to Station LG05, the First Environmental Impact Difference Analysis Report was prepared and submitted to the Environmental Protection Administration under the Executive Yuan on December 29, 2014 for approval and future reference.
- ✧ In response to the adjustment of the position of Station LG03, the Second Environmental Impact Difference Analysis Report for the Wanda line Phase 1 construction project was prepared and submitted to the Environmental Protection Administration under the Executive Yuan on February 15, 2017 for approval and future reference.

## Xinyi Eastern Extension Construction

The route of this contract continues from the east side of tail track at Xiangshan Station (R05) along the Xinyi line, which extends eastward with high-capacity system. This route runs underground Xinyi Road Section 6 (the originally planned Station R04 was scrapped) to the front of Guangci Care Home on the Fude Street, where Station R03 is set up, and the front end of the crossover. Then, the route continues from the east of the station and runs through the shield tunnel along Fude Street, Zhongpo South Road, and Yucheng Park. The entire route is 1.4 km long, comprising one underground station and a tail track to be used for dispatch operation.




Route map of Xinyi line eastern extension

### ➢ Urban Planning Revision

✧ The primary plan came into operation by announcement on September 16, 2015.

✧ The detailed plan came into operation by announcement on October 22, 2015.

### ➢ Planning of MRT Stations

✧ The station position is described as follows:

- Station R03: Underground along Fude Street in front of Guangci Care Home in Xinyi District, Taipei City

### ➢ The construction of this project is summarized below:

✧ Section Contract CR580C (Station R03 and Shield Tunnel Construction):

- Section Contract CR580C in the Xinyi eastern extension covers Contract CR285 (civil works), Contract CR380E (E&M and HVAC systems), Contract CR386K (elevator and escalator), Contract CR581A (track engineering), and Contract CR571A (track engineering for Xinzhuang Depot). Civil works in the CR285 include cut-and-cover

tunnel works at Station R03 and civil works involving the shield tunnel from the tail track of Xiangshan Station, Station R05 to Station R03, and shield tunnel of tail track, which began construction on October 17, 2016.

- The main construction items currently include sidewalk reduction works, the replacement of ditch covers with cast-in-place ditch covers, the relocation of power and telecommunication equipment boxes and underground pipelines, geological supplementary drilling survey, surveys of existing buildings, the erection of mini-piles on the south of Fude Road and Yucheng Park, and the construction of diaphragm walls.

Prayer ceremony for the construction of diaphragm walls along Xinyi line on June 20, 2017

Erection of mini-piles along Fude Street

Construction of diaphragm walls along Fude Street

Construction of diaphragm walls in Yucheng Park

## ➢ Financial Plan

As the use of private land for MRT facilities met with opposition from residents along the MRT route, the land acquisition operation was not smooth. Upon review, Station R04 was scrapped, which subsequently reduced construction costs and land acquisition costs. Meanwhile, the project benefits should be reviewed. Furthermore, the project planning schedule was adjusted due to the timing for approval of changes to urban planning revision. Therefore, the plan was revised for a second time, and the second revised plan was submitted to the MOTC on December 14, 2015 for deliberation. The plan was reviewed by the MOTC in on January 29, 2016, in a preliminary review meeting on May 17, 2016, and in a review committee meeting on August 9, 2016 and then MOTC submitted to the Executive Yuan on December 20, 2016 for review. In the letter issued by the Secretary-General of the Executive Yuan dated February 16, 2017 (forwarded by the MOTC on February 22, 2017), it stated “Please review again before submitting the plan to the Executive Yuan.” As a result, the plan was revised according to the opinions of the Secretary-General of the Executive Yuan before being submitted to the MOTC on April 18, 2017. The plan was then forwarded by the MOTC to the Executive Yuan on July 4, 2017 and was submitted by the Secretary-General of the Executive Yuan to the National Development Council (NDC) on July 6, 2017. On July 10, 2017, the NDC provided their opinions and feedback to the relevant departments under the Executive Yuan for deliberation. A letter compiling the opinions of the NDC was delivered to the Executive Yuan (Secretary-General) on August 18, 2017. However, since some relevant

opinions were yet to be reviewed, the Executive Yuan (Secretary-General) wrote to the NDC on August 25, 2017, requesting the council to meet the relevant authorities for review before reporting to the Executive Yuan. On September 19, 2017, the NDC held a conference on the revision of the project plan. The plan was revised according to the conclusions made in the conference before the being submitted to the MOTC on November 9, 2017. On November 29, 2017, the MOTC forwarded a letter to the NDC, indicating that no approval had been made.

- **Traffic Maintenance Plan**

  The Road Safety Supervisory Committee of Taipei City approved the traffic maintenance plan on August 3, 2016.

- **Changes of Content in the Environmental Impact Statement**

In line with the cancellation of Station R04, a Comparison Table for Changes of Content in the Environmental Impact Statement (first version) was prepared, and the final version of this table was submitted to the Environmental Protection Administration under the Executive Yuan on September 5, 2016 for approval and future reference.

# Innovative Measures and Improvements

## Cantilever Construction Platform with Both Safety and Protection-Innovations and Improvements in Elevated MRT Station Exterior Wall Scaffolding

### ➢ Origin

In order to increase construction efficiency and improve the working environment of the exterior wall curtain of the elevated stations for Taichung MRT Section Contract CJ920, a review of the overall implementation procedures (including traffic maintenance, lifting, and positioning of installation) along with past construction experience were employed in order to attain knowledge of the implementation processes of the traffic maintenance and lifting, positioning and installation. This knowledge can significantly influence the time period of construction, and because the closing of the two-way roads at night has been traditionally adopted for the construction of the exterior wall curtain systems in elevated MRT stations, during the process of construction it has been necessary to carry out traffic diversions, causing inconvenience to passers-by. Furthermore, construction noise during the night has also impacted the lifestyle quality of residents in surrounding areas, which has had the tendency to trigger negative perceptions and resistance to MRT construction among the general public. In addition, poor visibility at night also brings about construction safety risks, and limited construction times result in increased uncertainty in terms of construction quality, costs, and scheduling control. In view of these factors and in consideration of construction characteristics of exterior walls for elevated MRT stations, DORTS' construction team applied their experience from past MRT construction and has actively begun to research improvements with a view to decreasing the negative impacts and uncertainty to the minimum and finally develop an advanced solution for "cantilever construction platforms" and a suspension-type steel structure module, which makes use of standardization, specifications, and systematization. The creation of this simulated work platform for ground construction can be utilized to overcome traffic maintenance and construction time limitations and significantly improve construction efficiency and construction quality. The range of protective surfaces is also increased on construction platforms, dramatically reducing risks from falling construction materials. These measures can minimize the influence of unfavorable factors related to falling objects and road diversions and create a high-quality, safe, and high-efficiency construction environment. Furthermore, this progressive construction method is the first of its kind in the nation, and in the future it can provide as a learning reference for all types of domestic construction teams.


Figure 1. The cantilever platform trial and design manuscript

## ➢ Method of Implementation

Taichung MRT Section Contract CJ920 is located in densely populated parts of Taichung Metropolitan Area, and all of the eight elevated stations are being constructed above the main road on Wenxin Road, which is a heavily trafficked roadway. In order to reduce the time required for construction, the cantilever construction platform is adopted for conducting the exterior wall curtain construction of the elevated stations since the platform can appropriately cater to the construction environment due to its advantages and characteristics, and also provide optimized construction line and safety protection. In addition, traffic diversions and occupation of sidewalks can also be avoided, and the overall impact of traffic can be minimized.

✧ Implementation, actual planning content and innovations:

The exterior wall curtain construction methods and implementation procedures can mainly be divided into the following major stages: traffic maintenance, lifting, and positioning for installation. However, if these construction methods are done by traditional means, they will encounter restrictions in the local environment, and they will only be able to work at night and have to close traffic in both directions on that section of road. In addition, factors such as the rate of mobilization for workers during nighttime hours and poor field visual conditions influence variables during construction, such as accuracy, welding defects, and staff safety also dramatically increase, further adding to construction difficulties. Furthermore, construction procedures also produce noise at night and traffic detours, which tends to cause

residents in nearby areas to have negative views of the construction projects and complaints. As a result, DORTS invited the construction teams to engage in discussions and conduct research studies from the following perspectives: the labor force, machine tools, materials, and construction efficiency, and to consider these topics in association with the past experiences of the MRT in order to develop the use of steel structures in the stations as temporary supports and make use of standardization, specification, and systematization of suspended steel components. Using the mechanical principles of the cantilever beams, the cantilever steel components extend outwards with high tension bolts locked onto the steel structure of the original stations and then a cantilever construction platform is installed above roadways, this corrective construction method creates safety protection in the construction areas and has significantly resolved the issues of traffic diversions and detours. Therefore, this innovative method has won the approval of the construction teams and been implemented on-site in construction areas to provide construction partners with a high-quality, safe, and efficient construction environment.

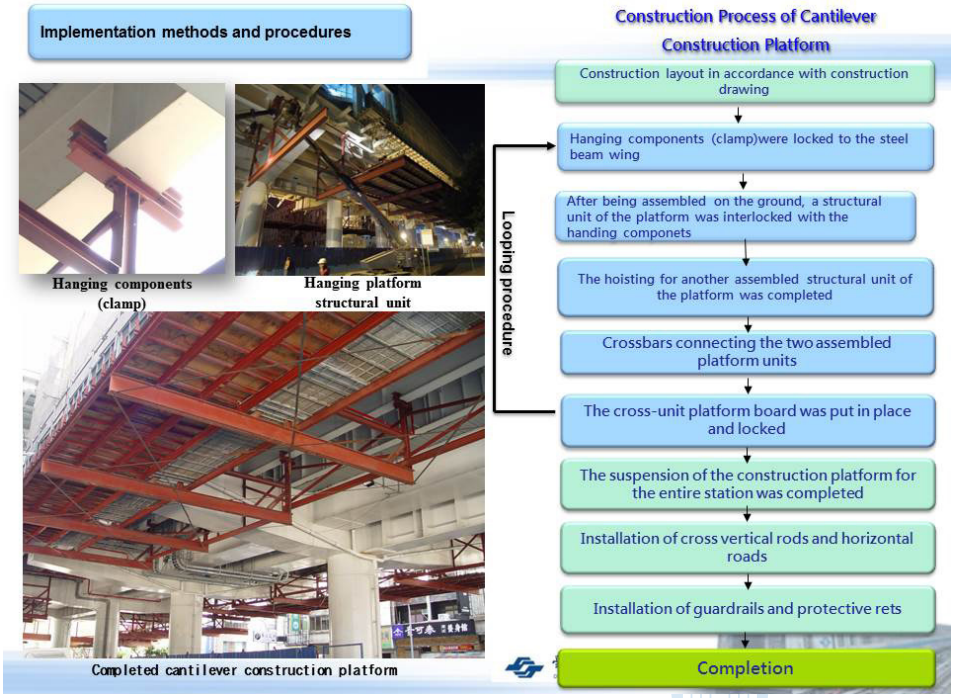



Figure 2. Cantilever construction platform implementation process

✧ Using on-site inspection tasks, the construction teams were able to actively make breakthroughs in handing the construction difficulties that they encountered. Related innovative solutions and strategies are described below:

1. Cantilever construction platform: The originally planned construction platform was required to carry live loads of 0.65ton/$m^2$, construction loads of 0.15ton/$m^2$, and wind loads of 0.19ton/$m^2$. Furthermore, the width required for the construction platform would have to have been extended approximately 4M from the vertical

plane of the station, and in order to comply with the styling surfaces of each station, field support frames were to have been utilized. There were fears that the original road width of 15 m would have to be reduced to just 7-8 m, which would only be wide enough for two ways to have been used and would have a severe impact of urban traffic. As a result, after being reviewed by the construction team, a cantilever construction platform was developed to surround the stations, which would not influence the flow of traffic or pedestrian walkways. It also avoided the necessity of making traffic detour at multiple stages while effectively increasing work efficiency and reducing the direct cost of the project.

2. Pedestrian walkways updates and improvements: Construction of the MRT Green line on Wenxin Road has affected pedestrian walkways, planting landscapes, and traffic conditions. When considering the new image and look of the city, widening the width of sidewalks to comply with the establishment of bicycle lanes along the line and having planting troughs as separate partitions between pedestrian walkways and bicycle lane to significantly reduce the number of people and cars on the roads. In addition, the cantilever construction platform enables the pedestrian walkways to upgrade and improve simultaneously so as to save time.
3. Safety and protection: through the implementation of this project, by having the cantilever construction platforms fully cover existing stations. During the construction stage, a safe environment can be provided in order to avoid having the incineration and welding affect the lines of motion for vehicles when the exterior wall curtain is set up with wind-resistant beams and columns. In addition, construction can be undertaken during the daytime so that other construction personnel can have preventative safety equipment, such as full-sized fences, covers, and safety nets in order to provide an environment with safety protection against falling and avoid occupational disaster and other incidents.

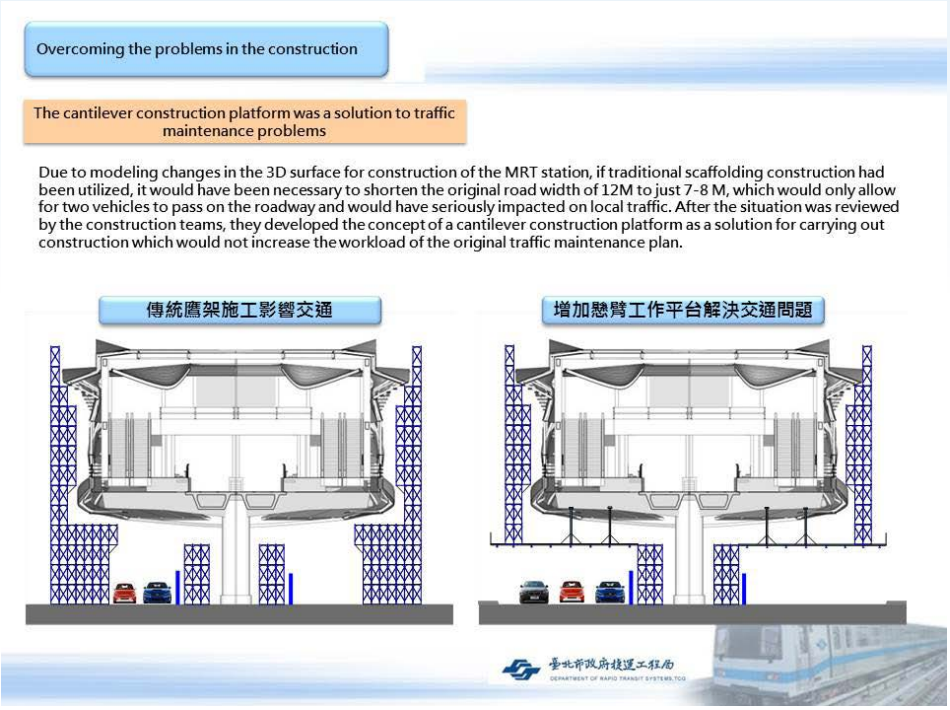



Figure 3. Cantilever construction platform solves problems of traditional scaffold and traffic maintenance

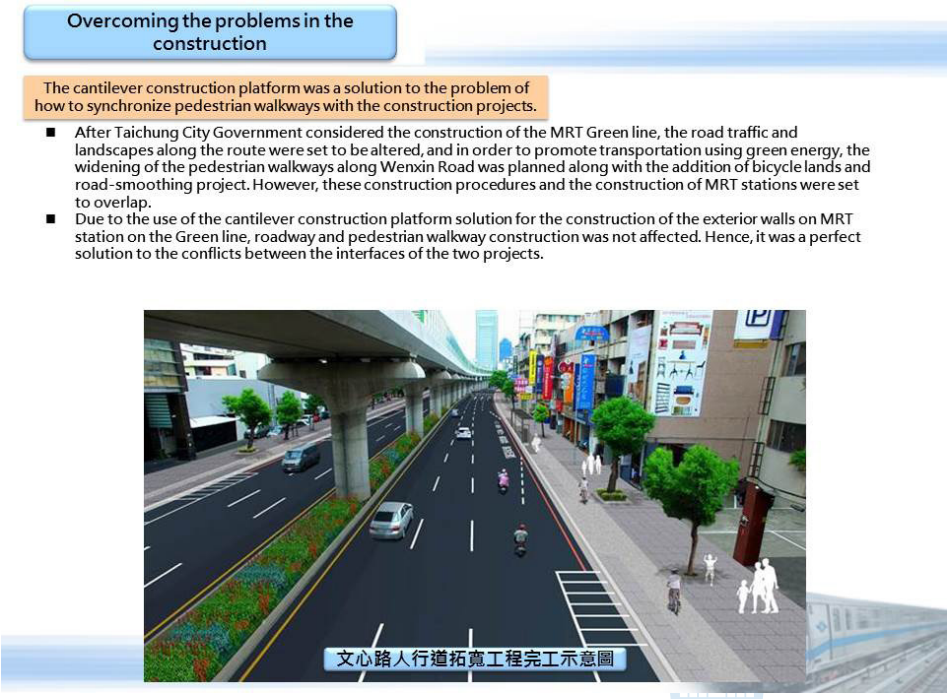



Figure 4. Cantilever construction platform solves the problems of widening pedestrian walkways and MRT Station construction when the two constructions were conducted simultaneously

## ➢ Actual Implementation and Effectiveness

After reviewing the progress of the construction platform for the elevated MRT station of Taichung MRT Contract CJ920, a simple external and internal cost-benefit analysis is explained below:

✧ Cost-benefit analysis (5M):

1. Manpower: After refining the construction methods and procedures, construction during the nighttime could be avoided, and labor power resources could be invested in response to the required adjustments during the construction stage. The adjustments to the workforce were highly flexible, and in comparison with the manpower which would have been needed for the originally-planned closure of the upper and lower roads, 30%-40% was saved in direct labor costs.
2. Machine: The construction methods only required common machinery and tools to carry out the construction project, and large-scale construction crane equipment was unnecessary. Hence the joint-monopolization of the project by a small number of specialized companies was avoided along with price increases. The construction could be smoothly implemented in areas where obtaining resources was difficult and in remote areas, and 50% was directly saved in machinery costs.
3. Materials: The steel structures utilized in the cantilever steel parts could be repeatedly used in different stations, and following the completion of construction, the steel mold materials were recycled and reused, which achieved the effects of environmental protection, energy conservation, and carbon reduction.
4. Money: The refinements and improvements of the construction contribute considerably to the anti-falling and traffic maintenance. Therefore, the handling for expenses related to safety & health and environmental-protection can be carried out in the same manner as for regular projects, and in comparison with the considerable amount of money that it would have cost to meet the environmental requirements carrying out construction at night in urban areas, the results and directions were completely different. Furthermore, the direct costs of safety & health and environmental protection expenses were drastically reduced, and cases of public petitioning were also effectively reduced.
5. Methodology: Making the construction surface completely open enabled the relevant resources to be concentrated and reduced the time that the surrounding environment would be affected by the construction. In addition, all of the time required for equipment production and mobilization was also reduced, and additional resources could be allocated in response to construction needs. This significantly improved construction progress and facilitated improvements in the overall progress of construction and dramatically reduced the influence of natural acts of god while also reducing and avoiding indirect costs from connecting gaps in working time.


Figure 5. Cantilever construction platform application case at Station G7

✧ Analysis of Internal and External Efficiency (QCDS):

1. Quality: After refinements, the cantilever construction platform had the capacity to allow for easier and precise measurement control of the curtain construction operations. Therefore the construction quality and results caused a dramatic reduction in variables which could influence construction (workers falling, construction deviations, and propagation of errors etc.), and large-scale traffic detour were also avoided. They also caused a reduction in negative public impressions and cases of petitions.
2. Cost: Refinements and improvements were made to the construction methods so that the original requirements for nighttime construction and traffic diversion tasks were adjusted and construction instead took place during the daytime. Especially, for the traditional production and construction industry, the new labor law “One Fixed Day off and One Flexible Rest Day Policy” made it especially convenient and easy to recruit construction personnel and obtain equipment. This effectively saved 30%-40% in direct costs, and also prevented free professional subcontractor companies from insisting on high prices on the grounds that the scope of MRT construction is large and maintained the stability mechanisms of the free market.
3. Delivery: The cantilever construction platform’s standardization, specifications, and systematization of construction method contributes to a drastic increase in open working surfaces of construction within a short time and reduced impacts of traffic while also shortening the scheduled time of the construction. From the perspective of the construction teams, the additional time that they obtained could be spent

targeting other difficult or time-consuming tasks such as upgrades to pedestrian walkways beneath the stations and the relocation of signal pipelines. This gave the construction teams more time to handle these tasks and reduced cost expenditures resulting from expediting construction schedule, while ensuring construction quality. From the perspective of city residents, the increased working surfaces enabled them to sense the promotion of MRT construction and furthered their level of support and feelings of recognition for municipal construction.

4. Safety: Due to the excellent workability and safety of the cantilever construction platform, related uncertain factors of influence could be significantly reduced, and a safe construction environment was provided for the construction partners.

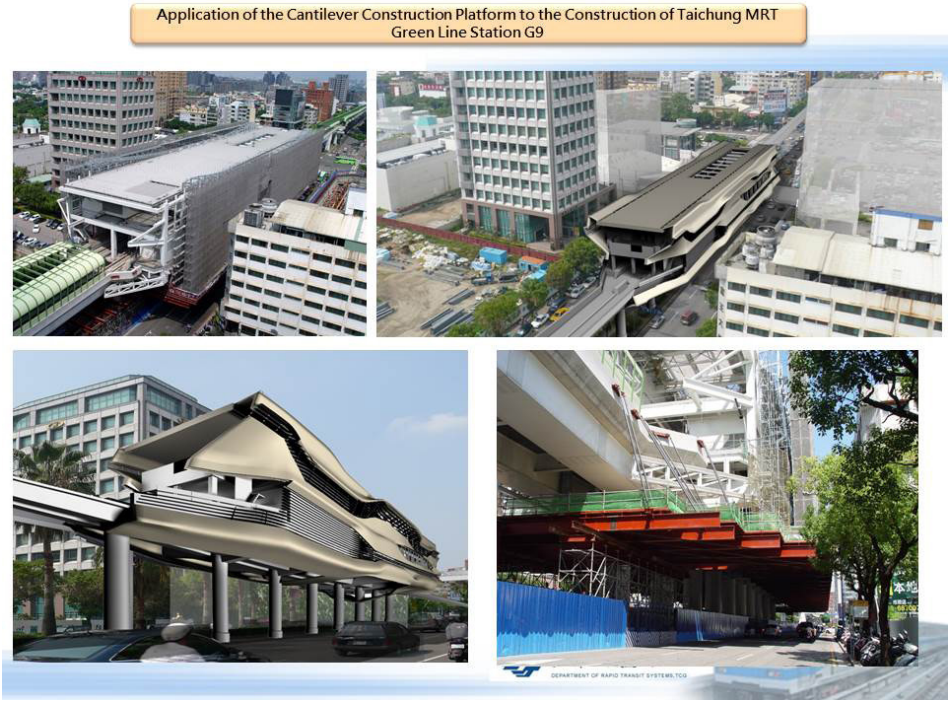



Figure 6. Cantilever construction platform application case at Station G9

## Conclusion

The modeling of all stations on Taichung MRT Green line features both style and variation, and this is especially the case with the use of the “lightweight seamless composite panel system” construction utilized on the exterior walls of Station G7 and Station G9. The degree of difficulty constructing the 3D surface is no less than that of the curved wall structure of the National Taichung Theater. It just so happens that all of the MRT stations are located in the busiest section of roads where the traffic maintenance planning is subject to severe restrictions. Under unfavorable construction environment conditions, DORTS’ construction teams made use of their professional engineering experience and creative ingenuity to come up with the innovative concept of the cantilever construction platform. Through management procedures which included Plan, Do, Check, and Act (PDCA), inductive feedback was utilized to find solutions to related difficulties, which led to progress and improvements in overall construction safety, quality, and efficiency. This project was a contestant in the government’s 2017 Innovative Proposal Contest and was honored with the Champion of Diligence Award. It will be provided as a future reference for other similar engineering and construction projects.

# Planning a Comprehensive MRT Network

Taipei City Metropolitan Area MRT transit network planning continually conducts studies of areas where MRT service is unavailable and extends existing routes to far-reaching areas in order to construct a more complete MRT network service. Plans which are underway include the Circular line north section & south section, the Minsheng-Xizhi line, the eastern Taipei north-south rail transit system, the Shezi, Shilin, and Beitou light rail transit network, and Wanda-Zhonghe-Shulin line Phase II. Upon completion of these routes, the total length of the routes on the network will extend over 270 km with a capacity of 3.6 million passenger trips a day.

## Future Network Planning

### ➢ Circular Line North Section and South Section

Responsible Agency: Taipei City Government

Feasibility Study: Approved by Executive Yuan on November 3, 2014

Comprehensive Planning:

✧ On February 9, 2017, a comprehensive planning report by scholars and experts passed inspection by relevant governmental units in New Taipei City and Taipei City. On July 6, the results of the planning were submitted for discussion and then adoption by a meeting co-chaired by Deputy Mayors of Taipei City and New Taipei City. On August 7, the comprehensive planning report was submitted to the Ministry of Transportation and Communications (MOTC) for review, and on November 11, MOTC replied with an annotated written review of the report. DORTS inspected the comments, drafted response measures, and then revised the report. After the two municipal governments signed approval of the report, the report was resubmitted to MOTC for deliberation.

Environmental Impact Assessment:

✧ The environmental impact assessment report for the (entire) Circular line was conditionally approved on January 23, 2003 after being reviewed by the Environmental Protection Administration.

Urban Planning Revisions:

✧ On November 30, 2016 work commenced on revisions of the land-use drawings (draft) for MRT facilities land use, and on March 30, 2017 the contractor submitted the revised planning draft.

✧ On April 17, 2017 a conference entitled “the Feasibility Study and Related Planning for the Taipei Metropolitan Area MRT Circular Line North Section & South Section and Land Development in the Surrounding Areas” was convened to review the land rezoning draft, and the conference concluded that the principles of the revisions

would be adopted.

✧ On June 7, 2017, a conference entitled "the Comprehensive Planning for Taipei Metropolitan Area MRT Circular Line North Section & South Section and Land Development in the Surrounding Areas" was convened to study the subsequent acquisition of state-owned land.

✧ The handling of the separate cases of routes passing through sections of Taipei City and New Taipei City are as follows:

Taipei City Sections:

- On June 12, 2017, a conference entitled "Control Regulations for the Development of MRT Land Use" was convened, and on June 26 the research conference "Acquisition of Public Land for Use in the Circular Line North Section Station Y27 MRT Facilities" was convened to confirm the revised content.
- On July 31, 2017 the contractor submitted the urban planning draft documents, and on August 1, DORTS submitted a report concerning tasks for hosting public exhibitions to the city government for approval. After numerous discussions with the city government, in addition to agreeing to handle revisions to this urban planning document, they also discussed TOD orientation planning in the areas surrounding MRT stations as well as public land inventory and planning as catalysts to bring about comprehensive renewal of the private properties as well as government-led urban renewal projects to further regulate local development, comprehensive reviewing of zoning adjustments of the master planning, and the movement and distribution of people. The Urban Planning Bureau also included a comprehensive review of local districts under development.

New Taipei City Sections:

- On July 17, 2017, New Taipei City Government submitted a letter confirming the case revisions.
- On August 3, 2017, the urban planning document was submitted to New Taipei City Government to handle the urban planning revisions, and on August 31, New Taipei City Department of Urban and Rural Development convened a meeting discussing the public exhibition of the diagrams draft.
- On October 5, 2017 the contractor submitted revisions to the planning diagrams in accordance with the recorded content from the August 31 meeting. On October 6, DORTS submitted them to New Taipei City Government to handle urban planning revisions.
- On December 6, 2017 New Taipei City Government resent revision comments to DORTS. Based on the contractor's revisions, on December 29 DORTS submitted the revised planning diagrams to New Taipei City Government to continue handling the urban planning revisions.

## ➢ Minsheng-Xizhi Line

Responsible Agency: Taipei City Government

Feasibility Study: Approved by the Executive Yuan on December 19, 2011

Comprehensive Planning:

✧ For implementation of the Minsheng-Xizhi line, DORTS completed the "Taipei MRT Minsheng-Xizhi Line and Surrounding Land Development Comprehensive Planning." On August 28, 2015 and April 25, 2016, it was submitted to central government for review, and MOTC on June 13, 2016 appraisals of the reviews were returned with the request that the government should follow the procedures to complete the environmental impact assessment and urban planning revision review for the Minsheng West and East Roads and the Donghu branch line in Taipei City in accordance with "Guidelines for Application and Review of Plans for Mass Rapid Transit System Construction Projects & Development of Adjacent Land" regulations. Afterwards, the comprehensive planning report should be revised and submitted for approval. In response to MOTC's review and appraisals, on October 18, 2016, DORTS and New Taipei City Government jointly negotiated to proceed with the environmental impact assessment and urban planning review in advance.

Environmental Impact Assessment:

✧ The environmental impact statement Phase I (Neihu-Xizhu) was conditionally approved by the Environmental Impact Assessment Committee under the Environmental Protection Administration (EPA) on July 13, 2009. On January 21, 2010, it was approved by the EPA for future reference.

✧ Tasks relating to the commissioned technical service of the environmental impact assessment for Minsheng West and East Road and Donghu extension line were awarded on April 10, 2017 to MAA Engineering Consultants International Ltd. In accordance with related regulations, an environmental impact assessment development forum was published on the Executive Yuan, Environmental Protection Administration website, in order to complete the analysis of environmentally sensitive locations and limitations of location-specific surveys, groundwater quality, noise and vibration, ecology, historic relics culture, transportation, air quality, and river quality surveys. On December 14, MAA Engineering Consultants International Ltd. submitted the environmental impact statement interim report, and following the completion of the reports in 2018, they are expected to sequentially submit them to the EPA for deliberation.

### ➢ Eastern Taipei North-South Rail Transit System

Responsible Agency: Taipei City Government

Feasibility Study:

✧ In response to the future development requirements of the eastern Taipei City, a rail transit system will be constructed on the east side of the city in order to connect the Wenhu line, Songshan line, Bannan line, and Xinyi line and provide transfer services. A feasibility study of the "Eastern Taipei North-South Rail Transit System" was carried out by the handling of commissioning of technological service tasks. The preliminary study of planning is to form a corridor linking Neihu with Xinyi and expanding to the Wenshan area.

✧ Contracts were awarded on April 28, 2017 for commissioned technological services for the feasibility study, and T.Y. Lin International Taiwan was awarded the contract. Afterwards, the comprehensive feasibility study of the eastern Taipei north-south rail transit system commenced (including the feasibility study of the extension to the Wenshan area).

✧ From August 28, 2017 to September 15, DORTS held the "Seeking Taipei Shortcuts" citizen participation events, and on November 24, the contractor completed the interim report (draft) of the feasibility study. They are expected to complete the report in late 2018 and then submit it to MOTC and the Executive Yuan for review.

### ➢ Shezi, Shilin, and Beitou Light Rail Transit Network

Responsible Agency: Taipei City Government

Feasibility Study:

✧ For the Shezi Island Development Project, the depot was originally to be located on the allotted lands of Shezi Island for train maintenance and dispatch on the Shezi Light Rail. However, in 2015 Taipei City Government began planning research and analysis of an alternative proposal to the area that was originally planned as the site for development on Shezi Island. Thus the planning of Shezi Light Rail route and the depot site will be reconsidered. The subsequent planning tasks will be implemented after a review of the land acquisition schedule for the light rail depot site.

✧ With the "Shezi Eco-island" being selected in the Island Development project via i-voting on February 28, 2016, the government teamwork then proceeded to draw up the main plan of the urban development program and revised the detailed plan. DORTS has already provided the layout of light rail project, and the depot will mainly be located within the transportation land for use in the Beitou-Shilin Technology Park. Should the land be still required for use for the depot, special industrial research land can be planned, and it has been remarked that the ground and underground are reserved for the light rail depot based on the Land Use Control of Urban Planning. Furthermore, no designated public land has been specially allocated in order to

maintain flexible allocation of finance and land use. At the end of 2016, the Island Development project had obtained the support of the Urban Planning Commission, Taipei City Government, and it has been submitted to the Urban Planning Committee, Ministry of the Interior for review.

✧ In late 2016, Beitou-Shilin Technology Park Development Plan commenced the Taipei Smart Eco-Communities Plan, and in January 2017 Taiwan Power Company made a request for the construction of an above-ground substation on a plot of transportation land of the Beitou-Shilin Technology Park Area after the 2nd zone expropriation in order to enable land to be utilized for the following three sites: Shezi Light Rail Depot, Taipei Public Transportation Office's Bus dispatching station, and Taipower Substation. After mutual coordination for the use, and following-up on the approval of the Shezi Island Development Plan, another review of the land used for Shezi Light Rail Depot and development content of areas along the line was undertaken in order to evaluate the direction of the follow-up of the Shezi Light Rail planning.

➢ **Wanda-Zhonghe-Shulin Line Phase II**

Responsible Agency: Taipei City Government

Feasibility Study:

✧ In May 2002, DORTS completed the "feasibility analysis reports for constructing MRT routes in the Wanda area" and submitted them to Taipei City Council. In addition, in December 2002 Taipei County Government (currently New Taipei City Government) completed a "feasibility study for the planning and construction of an MRT route in the Shulin area." On January 28, 2003, the Ministry of Transportation and Communications announced the inclusion of the two projects in a "Taipei Metropolitan Area MRT System Subsequent Network Development Plan."

Comprehensive Planning:

✧ On February 12, 2010 the route for the Wanda line was approved by the Executive Yuan and will be constructed in phases. The entire route falls within the territory of New Taipei City and is funded by the central government and New Taipei City Government. Taipei City Government, the local competent authority, is responsible for all of the design and construction of the Wanda-Zhonghe-Shulin line.

✧ Because financial planning for the route had not yet been approved by the central government, in August 2016 New Taipei City Government completed the first planning revision for Wanda-Zhonghe-Shulin line Phase II. In accordance with "Guidelines for Application and Review of Plans for Mass Rapid Transit System Construction Projects & Development of Adjacent Land", on December 8 DORTS convened a promotion meeting presided over by Deputy Mayors of Taipei City and New Taipei City, and the revisions were reviewed and approved by the meeting (the meeting confirmed division of powers and responsibilities for the land acquisition: DORTS is responsible for the

revision of urban planning projects, and New Taipei City Government is responsible for the reviews of detailed planning content pertaining to land development and helps deliberations for the Urban Planning Commissions in the central and local governments. In addition, New Taipei City Government Department of Rapid Transit Systems is responsible for the land acquisition of the land development.)

✧ On January 26, 2017, Taipei City Government submitted the first revision to the Wanda-Zhonghe-Shulin line Phase II (financial planning) to MOTC for review and then passed them on to the Executive Yuan for approval; meanwhile, it is requested that New Taipei City Government is designated as the authority to be responsible for land development for the Wanda-Zhonghe-Shulin line Phase II.

✧ In response to review comments made by MOTC on April 24, 2017, the government submitted a report to MOTC on June 14, 2017. On August 31 MOTC approved it at the 21st meeting of the "Mass Rapid Transit systems Construction Projects and Development of Adjacent Land" (the report was renamed "financial planning and planning period adjustments" in accordance with the committee's conclusions). The meeting concluded that "with regards to recommendations by Taipei City Government, the local authority for land development on the portion of phase II construction land development is to be assigned to New Taipei City Government. On the basis that the entire route is located in New Taipei City, and that Taipei City Government and New Taipei City Government had already reached a consensus in advance, Taipei City Government and New Taipei City Government were requested to follow up in accordance with the results of both parties." On November 3, the revised report was submitted to MOTC for review and then submitted to the Executive Yuan for approval in order to obtain approval from the Executive Yuan as soon as possible.

Environmental Impact Assessment:

✧ An environmental impact assessment for this plan (the entire line) was approved by the Environmental Protection Administration (EPA) on August 6, 2008 for future reference. Because the construction planning will be conducted in separate stages, the second phase of the project's analysis reports on the differences in environmental impacts due to the adjustment of routes will be conducted during the basic design stage.

Urban Planning Revisions:

✧ Technical consultancy services for urban planning revisions are being handled by commission. On October 20 T.Y. Lin International Group, Ltd. was commissioned to handle the tasks, and the contract was signed on November 3.

✧ On January 16, 2017 the contractor submitted the urban planning diagram drafts to DORTS, and on February 6 and March 17, DORTS convened a document review and a conference.

✧ On April 27, 2017, the urban planning diagram drafts were submitted to New Taipei

City government to handle urban planning revisions.

- ✧ On May 17, 2017, New Taipei City Department of Urban and Rural Development convened a meeting for a public display. DORTS submitted revisions in accordance with the conference's conclusions on June 13 to New Taipei City Government to implement urban planning revisions. New Taipei City Urban Planning Commission on September 7 resubmitted public opinions of the drafted amendments and DORTS completed the revisions on September 30 and October 18 and submitted them to New Taipei City Government to follow up on the urban planning revisions.
- ✧ New Taipei City Government announced the public display of revisions of the urban planning for a period of 30 days beginning on November 20, 2017 and convened five explanatory meetings on December 5, 6, and 7.

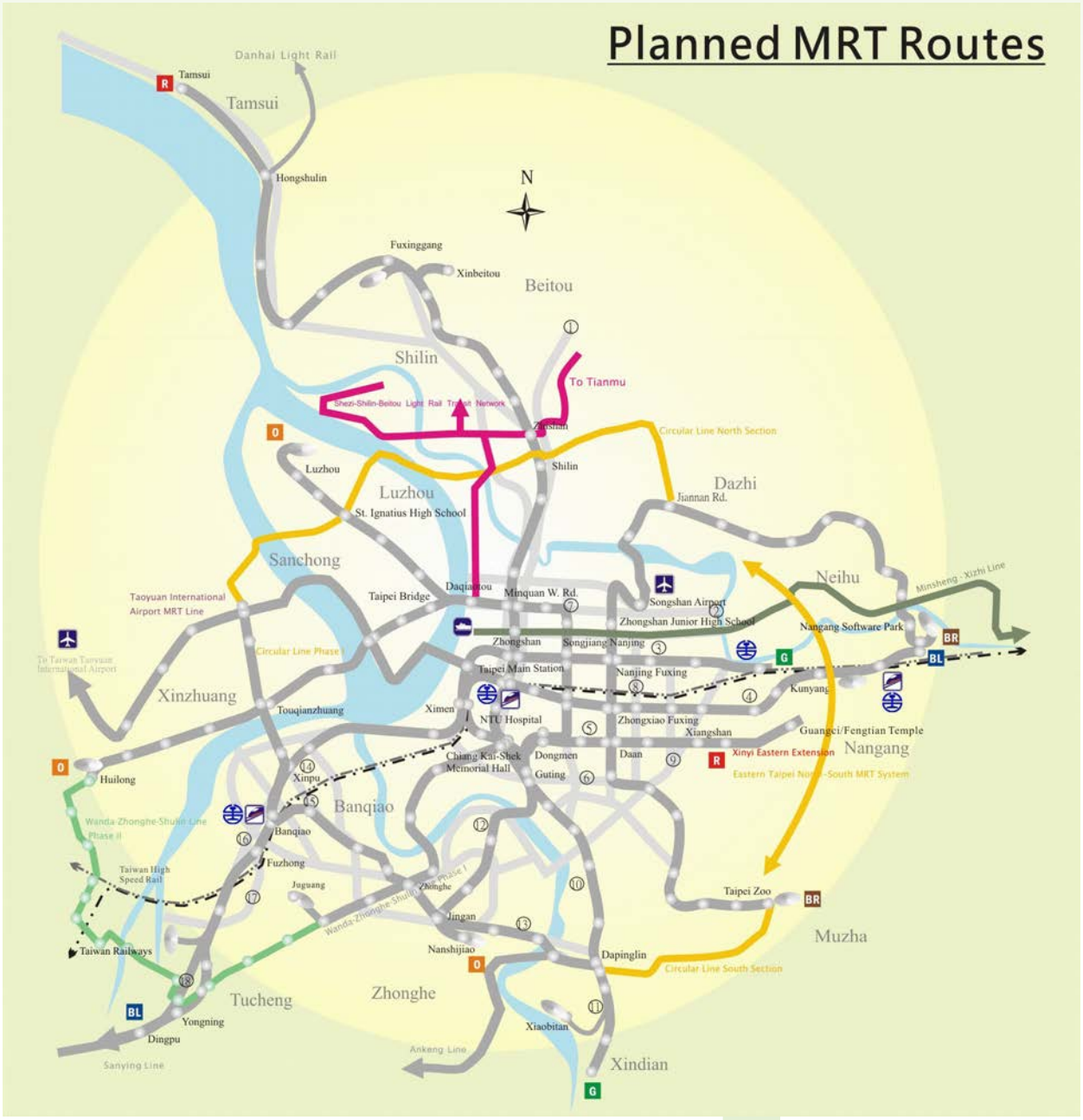
## Other

Taipei-Keelung MRT Extension Responsible Agency: Keelung City Government (Keelung City Government has commissioned DORTS to handle planning, and a task force has been formed consisting of units related to Keelung City Government, New Taipei City Government, and DORTS)

Feasibility Study:

- ✧ Beginning on November 2, 2015, a succession of four tender notices were carried out, and none of manufacturers attended to bid. During the process of handling the tender notifications, Keelung City Government and New Taipei City Government were invited to collectively promote the direction of the implementation on several occasions. The tendering power companies were consulted for their opinions, and the tender documents underwent a succession of reviews and amendments. A public reading was held prior to the fourth tender announcement on October 12, 2016; however, sufficient contractors were still not attracted to bid.
- ✧ The feasibility study of the "Keelung-Nangang Commuter Track Design Plan" carried out by the Railway Reconstruction Bureau, MOTC assessment excluded Taiwan Railways, yet included items for the MRT and Taiwan High Speed Railways. In view that a feasibility study is being conducted by the central government on the construction of a commuter railway in the Nangang-Keelung corridor, in order to save public funds and avoid unnecessary expenditure of public resources, on December 28, 2016, DORTS, submitted suggestions, based on the survey results of MOTC's Railway Reconstruction Bureau, for them to subsequently decide how to handle the project. In addition, on September 18, 2017 the original certificates of project-related expenses were sent back to Keelung City Government. For the remaining funds DORTS will continue proceeding with returning issues.

## Continual Planning and Upgrading of the MRT Network



# Retrospect and Prospects

Taipei Rapid Transit System has been established for nearly thirty years and has amassed a great deal professional talent in the domains of domestic and foreign planning, design, construction and operations, and invested it into the ranks of MRT construction. Under the leadership of the mayors who have served in office during this time and the assistance of the other related units, the construction of 136.6 kilometers of the MRT network has been completed to date. The MRT typically carries a daily load of over two million passenger trips, and the quality of its services has won praise from all social sectors. As a result, there is public demand in each district for the MRT services to be extended. Considering the overall requirements and types of journeys in the Taipei Metropolitan Area, there is still considerable room to make diligent efforts to expand the scope of MRT construction. In accordance with the public's expectations and the requirements of the mayor and commissioner, DORTS will be fully dedicated to further increasing efforts to develop objectives and strategies for future work, with a view to fulfilling DORTS' vision --"Excellent Construction, Efficient MRT, and Easy Travel in Taipei."

Looking to the future, DORTS will continue to implement the on-going construction routes, including the Wanda line Phase I, the Circular line Phase I, Xinyi eastern extension, and Xinzhuang Depot, with a total length of approximately 26.6 km. In addition, DORTS will continue efforts on the planned routes which includes the Circular line north section & south section, the eastern Taipei north-south MRT System, the Wanda line Phase II, the Minsheng-Xizhi line, the Shezi, Shilin, and Beitou light rail transit network, with a total length of approximately 84 km. The Taipei Metropolitan Area Rapid Transit System network will eventually reach 290 km in length (including routes undertaken by New Taipei City, DORTS) upon its completion, with an average daily capacity of over 3.6 million passenger trips. We are confident that after the construction of Taipei MRT network is completed, the number of private passenger vehicles on the road will be reduced, and the traffic congestion problem in the Greater Taipei Area will be alleviated. We also believe that we will provide the residents of New Taipei City and Taipei City with better transportation services, mold an excellent living environment, and create a lively Taipei Metropolitan Area.

# 2017 Major Events

January1 Structure construction for Station Y6 of the Circular line Contract CF641 was completed.

February 12 In collaboration with the Taichung City Government, a series of activities and a parade were held to greet the first train of Taichung MRT.

February 23 The special issue: “The Literature Review in Taipei MRT 30 years of Engineering Technology” was published.


February 23 DORTS and five domestic universities jointly signed “the Memorandum of Technical and Professional Cooperation on the MRT”.

May 11

The first train of the Circular line completed receiving inspection.

June 8

The inauguration ceremony of Contract IZVX33 Taipei Heping Elementary School building and gymnasium project was held.

June 29

“Taichung Wuri-Wenxin-Beitun Line Results Presentation” was held at the National Taiwan University Institute of Applied Mechanics.

July 15

2017 William Jones Cup International Basketball Tournament was held at the basketball gymnasium of Heping Elementary School - Contract IZVX33.

August 9

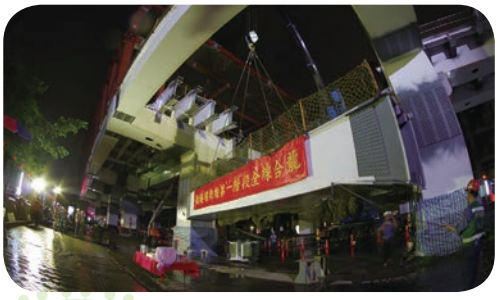
The contractor commenced construction of the project to redevelop the external wall at Taipei Arts Center as the first tender of the commissioned work.

August 11

The first train of the Circular line was tested on the test track.

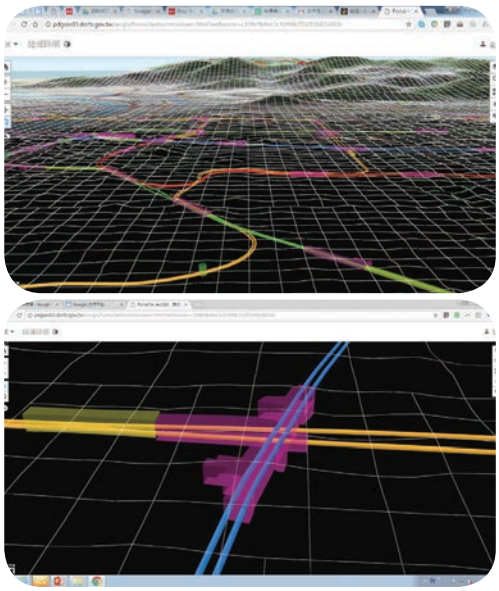

September 16

The beam ceremony of Contract CZ210 for Taan Elders Service and Day Care Center project was held.



October 12

The last girder of the civil engineering was connected for Circular line Phase I.



November 15

Completing the establishment of computer 3D data of the Taipei MRT underground structure, including 75 MRT underground stations, 105 passages and 225-km underground tunnels. The 3D data will also be submitted to Public Works Department, Taipei City Government.

November 17

Leasing contracts were signed, and related notary tasks and site-transfer operations were also completed for the Development Building public real estate at MRT Xindian line Xindian Depot, which includes a 1-4$^{th}$ floor shopping mall and 960 parking spaces.

November 23

The remaining allocation of location, and distribution of the rights and interests for the case of MRT Wenhu line Xinhai Station (T10) Development Building was approved by Taipei City Government.

December 1

The contract for MRT Wenhu line Neihu Station (T11) Development Building was awarded to the operator, Ren Sheng Development Co., Ltd. for unified operation and management.

December 5-7

A public display of the urban planning revisions for the Wanda-Zhonghe-Shulin line Phase II was held.

# 2017 Awards

| Serial Number | Issuing Authority | Prize Time | Award Name | Notes |
|---|---|---|---|---|
| 1 | Ministry of Transportation and Communications | January 19 | Wanda-Zhonghe-Shulin MRT System was awarded the 3rd prize in the 2016 Transportation Engineering Environmental Impact Assessment Follow-up Evaluation. | East District Project Office |
| 2 | Chinese Institute of Engineers | June 2 | Circular line Contract CF651B honored with the 2017 Engineering Projects Excellence Award. | East District Project Office |
| 3 | Taiwan Real Estate Association | July 12 | Works on Contract CZ209 for Taipei Tennis Center won an outstanding prize in the category of best design planning at the 2017 Taiwan Real Estate Excellence Awards. | North District Project Office |
| 4 | Public Construction Commission | July 28 | Circular line Contract CF651B was awarded a "Public Oversight of Public Works" prize for excellent organizational implementation in 2016. | Central District Project Office |
| 5 | Taipei City Government | August 16 | Circular line Contract CF660B won an excellence award in the first class of the civil engineering category at the Public Works Awards. | North District Project Office |
| 6 | Taipei City Government | August 16 | Subcontract CF643A of the Circular line Section Contract CF640 won an excellence award at the 2017 Public Works Awards. | North District Project Office |
| 7 | New Taipei City Government | September 19 | Circular line Contract CF660B won an excellence award at the 2017 Public Works Awards. | North District Project Office |
| 8 | Chinese Golden Stone Award for Architecture Committee | November 13 | The JD project (M2) at the Xinzhuang line Daqiaotou Station won the first prize in the category of public construction in the recreational industry - planning and design group at the 25th Chinese Architecture Golden Stone Awards. | Joint Development Division |
| 9 | Republic of China National Enterprise Competitiveness Development Association | November 7 | Subcontract CF643A of the Circular line Section Contract CF640 won first prize in the public works civil engineering category (for the shield tunnel construction) at the 19th Annual National Golden Award for Architecture. | East District Project Office |
| 10 | Republic of China National Enterprise Competitiveness Development Association | November 7 | Circular line Section Contract CF650 won first prize in the public works civil engineering category (for track engineering) at the 19th Annual National Golden Award for Architecture. | East District Project Office |
| 11 | Taipei City Government | November 28 | Both with construction safety and protection, the cantilever construction platform and innovative exterior rack scaffolding at elevated MRT stations won the champion in 2017 Taipei City Government Creative Proposal Competition. | Central District Project Office |

| Serial Number | Issuing Authority | Prize Time | Award Name | Notes |
|---|---|---|---|---|
| 12 | Formosa Association of Sustainable Care for Living Environment | December 2 | New Joint Construction Projects on the Songshan Precinct, Taipei City Police Department, DORTS Project Office Building Highrise, and Songshan line MRT facilities won Ecological and Environmental Awards of Excellence. | Central District Project Office |
| 13 | Formosa Association of Sustainable Care for Living Environment | December 2 | Songshan line Beimen Station won an award for excellent works in aesthetics and landscaping category. | Central District Project Office |
| 14 | Formosa Association of Sustainable Care for Living Environment | December 5 | Songshan line Zhongshan Station (M2) won the 2017 National Architecture Golden Award in in the construction quality category. | Joint Development Division |
| 15 | Formosa Association of Sustainable Care for Living Environment | December 7 | Taichung MRT Wuri-Wenxin-Beitun line Contract CJ910 won first prize of public works of Excellence Award in the construction quality category at the 2017 National Golden Award for Architecture. | Central District Project Office |
| 16 | Formosa Association of Sustainable Care for Living Environment | December 7 | Taichung MRT Wuri–Wenxin–Beitun line contract CJ910 won a Public Construction Excellence Award in the construction quality category at the 2017 National Golden Award for Architecture. | Central District Project Office |
| 17 | Formosa Association of Sustainable Care for Living Environment | December 7 | Taichung MRT Wuri–Wenxin–Beitun line contract CJ920 won a Public Construction Excellence Award in the construction quality category at the 2017 National Golden Award for Architecture. | Central District Project Office |
| 18 | Formosa Association of Sustainable Care for Living Environment | December 7 | Taichung MRT Wuri–Wenxin–Beitun line contract CJ930 won a Public Construction Excellence Award in the construction quality category at the 2017 National Golden Award for Architecture. | Central District Project Office |
| 19 | The Journal of the National Association OF Architectures, R.O.C. | December 16 | Contract CZ209 of Taipei City Tennis Center won first prize at the 2017 Taiwan Architecture Awards. | North District Project Office |
| 20 | Public Construction Commission | December 21 | Circular line Subcontract CF643A Contract CF640 and won an extraordinary award at the 17th Public Works Awards. | East District Project Office |
| 21 | Public Construction Commission | December 21 | DORTS Commissioner Chang Tzer-hsiung was awarded the Highest Honor for Civil Service Engineers - the Public Engineering Medal of Expertise; DORTS East District Project Office Director Jian won a Personal Contribution Award in 17th Annual Public Works Golden Quality Award. | Commissioner's Office and East District Project Office |
| 22 | Chinese Society of Structural Engineers | December 23 | Subcontract CF651B of the Circular line Contract CF650 won the 2017 Structural Engineering Technology Award. | East District Project Office |


臺北市政府捷運工程局
Department of Repid Transit Systems, Taipei City Government
臺北市中山北路二段48巷7號
No. 7, Lane 48, Sec. 2, Zhongshan N. Rd., Taipei City 10448, Taiwan (R.O.C.)
TEL: 886-2-25215550 http://www.dorts.gov.taipei