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Widening and Expansion and Projects

1.Planning and Design

(1).Freeway Bridges Seismic Assessment and Retrofit Projects (The first priority road section)

In order to strengthen the disaster resistance capability of Taiwan's transportation infrastructure against the extreme global climate changes, the Taiwan Area National Freeway Bureau (TANFB) is planning to conduct "seismic assessment and retrofit project" on the bridges of National Freeway No. 3, which have been in use for over 20 years, including the north section bridges as well as bridges in southern Taiwan that have been evaluated to be in urgent need for such work. Under the concept of "sustainability, safety, and ecology," the planning and design of the retrofitting work applies full life cycle management, composite disaster prevention strategy, and environmental conservation.

The seismic assessment and retrofit project covers all the bridges at the north section of National Freeway No. 3, which extends from the Xiahi



System Interchange in the north down to the Siangshan Interchange the first priority section which connects the three major economic hubs - the Taipei Metropolitan Area, Taoyuan Aerotropolis, and Hsinchu Science-based Industrial Park. This project also included the bridges on the south section from Xinhua to Yanchao inter section of National Freeway No. 3 and some bridges on National Freeway No. 10. A total of 278 bridges are covered in the assessment and retrofitting project, which will cost up to NTD 6.2 billion. Initial plans call for four construction phases. The first phase will start in July 2012 and completed by the end of 2014. Active planning and designing are currently underway.

The bridge seismic assessment and retrofit project will adopt the concept and practices of sustainable development while the retrofitting work will be completed using safer, faster and the latest technologies. Details of the work are as follows:

- a). Full life cycle management strategy: The concept of full life cycle management and life cycle cost is introduced in the phases of planning, designing, construction, and maintenance management, so that the best retrofitting solution can be developed.
- b). Composite disaster prevention strategy: As extreme weather conditions are becoming the norm, bridges not only face the threat of earthquakes, landslides and mudflows which must also be considered and fully reviewed, so that the best strategy can be developed.
- c). Environmental conservation: For habitat restoration hot spots and sensitive areas in the ecological corridors, must considering how to avoid, minimize or lower the impact to the environment, the feasibility for ecosystem restoration should also be discussed.

Upon completion of the seismic retrofitting of the bridges in the north section of National Freeway No. 3, National Freeway No. 1 and National Freeway No. 2 which can be linked together to form the "Northern Taiwan Twin-Circle, Life Line Network." Through the new conception of sustainability, safety and ecology, new life will be given to these bridges, which is sustainable development of National Freeway bridges.



Coverage of the bridge seismic assessment and retrofit works (top priority sections) in national freeways

(2) Planning and designing works of Additional Dawan Interchange on National Freeway No. 1

To make Dawan Interchange operate successfully, the local access roads need to be widened accordingly with proper traffic measures. When Tainan County and Tainan City Governments have the widening projects duly submitted and approved with budgets allocated for County Highway 180, Arterial 3-1 Road and the City South 10 among other access roads, the preparatory operations for Dawan Interchange shall begin.

Following the approval the planning report for filing by the Ministry of Transportation and Communications on August 26 2011, in the review conference called for the basic designs on November 21 2011, the Analytical Environmental difference analysis Report was approved and revisions are made based on the comments of the project deliberation team of environmental Protection Agency reached on November 23 2011.



Diagram of neighboring areas of Dawan IC



Schematic diagram of National Freeway No. 1 additional Dawan Interchange project program



(3) Improvement operations for overall Traffic in the Dingjin System Interchange in the National Freeway No. 1

As the population in the Zuoying and Renwu Districts in Kaohsiung City has grown rapidly, traffic flows in the Dingjin System Interchange and the perimeter has increased accordingly. As a result, congestions in Dazhong Road on peak hours usually force vehicles back up to the artery of the National Freeway No. 1. Traffic improvement plans were then proposed for the Dingjin System Interchange and the neighboring areas.

On March 21 2011, local administrations and competent authorities were called for a second meeting for overall solutions for traffic in the Dingjin System Interchange and the neighboring areas. The meeting adjourned with proposals for long-term and short-term improvement measures. On September 22 2011, the Kaohsiung City Government called a meeting for preliminary review of the Feasibility Study of Adding Bagualiao Interchange (previously known as ramp) to National Freeway No. 10 and the City Government was requested to produce revisions before producing it for deliberation in the preliminary deliberation meeting. Besides, for the feasibility study of Adding Southbound Ramp to the Dingjin System Joining Dingli Road, the City Government notified this office on December 16 2011 for preparations of deliberation.



Schematic diagram of National Freeway No. 1 Dingjin System Interchange overall traffic improvement operation



(4) Planning and design operations for the adding of the Nanyun Interchange to the National Freeway No. 3

Situated in the north end of Zhushan Township, travelers leaving the Zhushan Interchange may turn to the County Road 151 heading for Xitou and Shanlin River without having to pass through Zhushan Township, the reason why fewer visitors come to Zhushan. Accordingly, the Nantou County Government, aiming to prosper tourism in Zhushan, proposed adding an interchange at No. 250k, the National Freeway No. 3, in the south end of Zhushan Township.

Following MOTC's approval of the feasibility study report for the project on January 7 2011 for filing, planning and design operations began and local hearings for planning proposals were called on Nov. 18 2011 and December 27 2011.



Schematic diagram of Nanyun Interchange

(5) Planning and design operations for the adding of the Liuying Interchange to the National Freeway No. 3

The Liuying Interchange is to be added at the National Freeway No. 3321k+445~324k+220 in Liuying District, Tainan City; when completed, it will join the Liuying Technology Park in the west as a complete traffic network.



The report was basically approved by MOTC on May 4 2011 and EPA approved the Explanatory on Environmental Impacts on September 7 2011. The contract for the works of the adding of the Liouying Interchange was granted on October 15 2011.



Liouying Interchange construction on National Freeway No. 3



Diagram 2 of completion Liouying Interchange construction National Freeway No. 3



(6) Planning and design operations for the adding of the Gukeng Interchange to the National Freeway No. 3

For the population in Gukeng, Yunlin County, to reach the National Freeway No. 3, they have to travel west by taking the County Highway 149 A (or the County Highway 158 A) and the Tai 78 Highway from the Tai 3 Highway in the East-West Expressway Taixi Gukeng Line (Tai 78 Line) before traveling east and taking the Gukeng Interchange; as solution, the Yunlin County Government proposed adding an interchange at the intersection between the County Highway 149 A (or the County Highway 158 A or County Road 158 Jia) and the National Freeway No. 3.

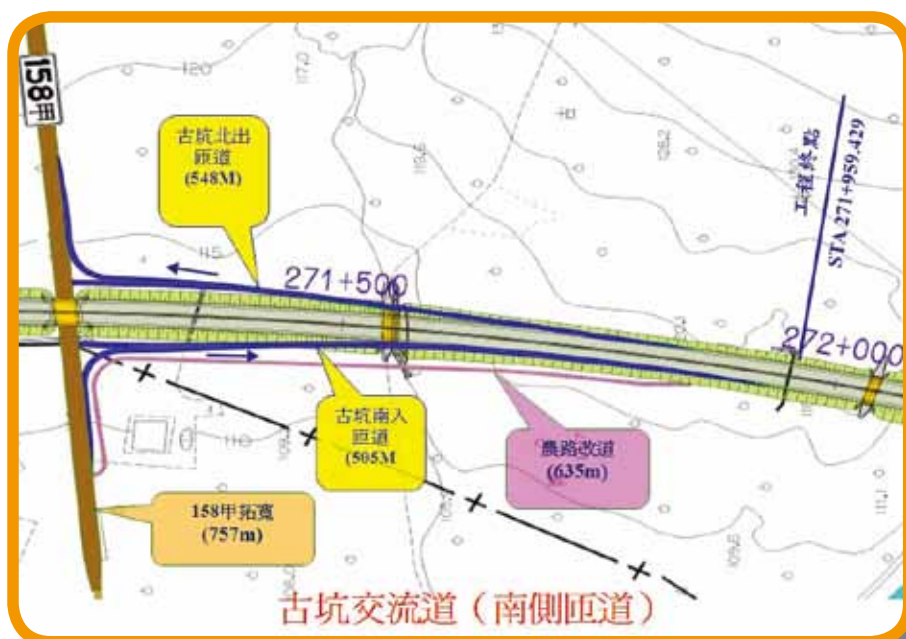
On October 13 2010, MOTC approved the planning report for filing and on August 29 2011, MOTC approved the outcome of the basic design stage while on October 5 2011, MOTC approved the erosion control plan for filing.



The range chart of Gukeng Interchange construction range of National Freeway No. 3



Gukeng Interchange construction of National Freeway No. 3



Gukeng Interchange construction of National Freeway No. 3



2. Works under construction

(1). Widening Project on National Freeway No. 2

The length of National Freeway No. 2 is approximate 20.4km in total. Because the traffic volume of Taoyuan International Airport has been growing, and Taoyuan Area has been developing in recent years, the traffic loading of National Freeway No. 2 mainline has been increasing, and frequently caused traffic jams. Therefore, the Bureau implemented the widening project on Freeway No. 2 to widen the section between Dayuan Interchange and Airport System Interchange to 8 lanes, and the eastern section from Airport System Interchange to 6 lanes from 4 lanes. The total cost of the project is NTD 12.068 billion. The section between Taoyuan International Airport and Airport System Interchange was completed and open for traffic in April 2011; the section between Airport System Interchange and Nantaoyuan Interchange was completed and open for traffic in late December 2011; the widening project for the section between Nantaoyuan Interchange and Yingge System Interchange will be completed at the end of May 2012. This is one of the major construction projects registered in the Executive Yuan. The section between Taoyuan International Airport and Airport Systematic Interchange was completed and the main line was open for traffic on April 1 2011, 5 months ahead the schedule set for September 1 2011. Due to the effort of the cooperative construction agencies and local agencies, Danan Viaduct to the east of Nantaoyuan Interchange was open by section for traffic before the Lunar Year in January 2012 with the expectations of alleviating the increasing load in the area in peak hours when traffic congestions are part of the day-to-day living of the population.

The project is divided into seven construction bids of which the priority bid (Bid H21B, the section between Dayan interchange and Dazhu Interchange) has been completed on June 14, last year (2011), and the bid H21A, the section between Airport system and Dayuan Interchange was completed on August 17, 2011, and the widening project for main line of the western section on Nantaoyuan Interchange has been completed and open for traffic on December 31 2011, traffic in the area in peak hours was remarkably alleviated. As of December 31 2011, this project expected progress is 90%; and the actual



Hoisting the gantry staging for Bid H42



Construction works for the Danan Interchange in Bid H61

progress is 90.19%, 0.19% ahead of schedule.

(2). Seismic Assessment and Retrofit Project National Freeway (sections open for traffic) Bridges

The seismic assessment and retrofit project (Stage 1) has a total budget for NT\$7,990,000,000 and aims to retain the Freeway No. 1 a life-saving line after a major seismic movement. Except for Bid M12 of which the contract with the contractor was terminated leaving the rest of the works to be carried out along with the project Stage 2, the rest had been completed in April 2010



ahead of schedule.

Stage 2 of the project for NT\$20,535,000,000 was approved by the Executive Yuan on November 26 2010. For the 3 sections that are to be carried out in priority, the one of top priority covering the Xizhi System through Zhunan sections in the National Freeway No. 3, the planning and design began in 2011



Retrofitting the piers of the bridge over the Tamshui River as ongoing bid M12 works in the bridge seismic assessment and retrofit project



Retrofitting the piers of the bridge over the Tamshui River as ongoing bid M12 works in the bridge seismic assessment and retrofit project



Retrofitting the piers of the bridge over the Tamshui River as ongoing bid M12 works in the bridge seismic assessment and retrofit project

and is scheduled to complete in 2014.

(3).Works of the Improvement Plan for the HSR Yunlin Station Access Road System-The Newly-Open-For-Traffic Douliu Access Road-Adding of the Huwei Interchange to the National Freeway No. 1 (Bid 524)

This project is located at the National Freeway No. 1 234k+300~237k+200 and the intersection of the newly-open Douliu access road to the planned HSR Yunlin Station. An over-cross diamond-type interchange will be added to join the access road at the HSR Yunlin Station the Yunlin County Government is responsible for. The construction works of the access road at 3k+451 ~ 5k+068 will be part of the works in this project.

At NT\$823,400,000, the contract has been awarded to Lien Cheng Feng Construction Co., Ltd. The work began on December 28 2009 and was for 840 calendar days. Besides, the widening works for the main line of the freeway for this project were completed by late December 2011 and 3 lanes on both the northbound and southbound were open for traffic. As of December 31 2011, this project developed an accumulated progress of 89.35%. Completion is scheduled for April 16 2012, when traffic volume on the freeway is expected



to grow and the HSR Yunlin Station would have easy access to the freeway. In the future, TANFB will closely monitor the contractor for smooth operations that



Aerial view of stage 4 diversions construction of Huwei interchange



Stage 4 diversions construction of Huwei interchange



are expected to be completed in the quality as anticipated and on date as scheduled.

(4).Project of Additional Tongluo Interchange on National Freeway No. 1 (Bid 434 of National Freeway No. 1)

As manufacturing activities have been switching to the area of high technology for more than 10 years, the Hsinchu Science-Based Industrial Park is earning remarkable upgrading of its standing and importance. The Science Park Administration, by developing the 2 bases located in Tongluo and Zhunan into satellite fields to the Hsinchu Science-Based Industrial Park and, by extending the solid foundation and taking advantage of the resources available in the Science-Based Industrial Park, is carrying out the pioneer program of the high-tech island in central Taiwan before accelerating the development of high-tech activities in Taiwan, strengthening industrial competitiveness and eventually promoting local prosperity.

In order to meet the demand for future development and accessibility, the installation project for the Tongluo Base Access Road System consists of 1 main entrance each in the south and north to the east of the base, which are known as the north access road and the south access road. The north access road will have 4 lanes in 2 directions linking the Tongluo outer ring road of Tai 13 Provincial Highway and, on the other side, through the new interchanges, leading to the Zhongshan Freeway (National Freeway No. 1) that will allow fast movement of both cargoes and passengers in and out of the industrial park in the future.

The project will allow the north access road to the Tongluo Base link the National Freeway No. 1 as a expressway to the Tongluo Base that leads to the Tongluo outer ring road as a sound road system; as the north access road continues stretching eastward after crossing over the National Freeway No. 1, local traffic links the National Freeway No. 1 rapidly for transfers. The works began on May 6 2010 and are scheduled to be completed on April 19 2012. As of December 31 2011, 76.07% of the project was completed.



RC pouring for bridge deck AA1~PA7 in Ramp A



Hoisting P5~P6 steel box beams

(5).Improvement project of Xintaiwu Road Interchange and Nangang Interchange on National freeway No. 3 (Bid B14)

The works for the new interchange ramp and the traffic lanes are roughly located between Xintaiwu Road Interchange and Nangang Interchange at National Freeway No. 3 (12k+400 ~ 14k+500), where Nangang Interchange has an on-ramp and an off-ramp from and to Nangang Hengke Road. The partial improvement achieved by Xintaiwu Road Interchange is contributed by the widening of the ramps available and the adding of lanes for scooters.

At NTD 372.54 million and three thousand seven hundred and one, the project in question was awarded to Gaoyuan Construction Engineering Co.,



Ltd. The works began on July 10 2011 and are scheduled to be completed on February 28, 2013. Upon completion of the project, the on-ramp and the off-ramp added to Nangang Interchange will be available for access to vehicles coming from and going to Nangang Hengke area to and from National Freeway No. 3 without taking Xintaiwu Road Interchange and the new access would significantly alleviate the traffic congestions seen on Datong Road and Xintaiwu Road in Xizhi, New Taipei City. As of December 31 2011, mean progress in the project accumulated to 18.49%.



Schematic diagrams of improvement works for Nangang Interchange on National freeway No. 3

(6).Project of Additional Touwu Interchange on National Freeway No. 1 (Bid 425)

The location of Touwu Interchange is at the intersection of National Freeway No. 1 and Provincial Highway No. 13 (Sta. 125k+800 on National Freeway No. 1). The project was the result of "Discussion on the feasibility of East-West Expressway Provincial Highway 66, 68 and 72 and their connection to the No. " and No. 3 National Freeway" meeting held by the Directorate General of Highways. The meeting recommended to add a northbound on/off access ramp to the intersection of Provincial Highway No. 13 and National Freeway No. 1. the new interchange will not only benefit the regional locals in the area, but also a connect with the 2 interchanges in Touwu by Provincial Highway 72,



the Gongguan Interchange and the Miaoli Interchange in National Freeway No. 1 will provide a more complete transformation function of expressway connecting system for both the locals and the system interchange.

On May 4 2010, MOTC basically approved the planning report for the project and EPA approved the Analysis Report on the Difference of Environmental Impacts on March 23 2011 for approval. The works for the additional interchange began on June 12 2011 and would last for 24 months.



Schematic diagrams of National Freeway No. 1 additional Touwu Interchange project Range



Schematic diagrams of National Freeway No. 1 additional Touwu Interchange project Completion



To the East of Miaoli City, there is Miaoli Interchange, to the West, there is Houlong Interchange by National Freeway No. 3 and the 2 interchanges are 9km s apart in straight line and there is a 12Km-long trip by the Tai 6 Provincial Highway joining the 2 interchanges. The people in the North Miaoli Area and those living in Touwu and Caoqiao traveling by National Freeway No. 1 or heading north by national freeways have to go south first, making the trip an inconvenient detour. Public opinions and repeated studies suggest the necessity of adding an interchange at Touwu. When completed at the cost budget of NTD 450 million as estimated, the trumpet-shaped interchange would not only reduce the travel distance required for travelers heading north by the National Freeway No. 1 from Beimiao area, Houlong, Touwu and Zaoqiao, but also build a sound road system along with the Tai No. 72 East-West Expressway, an easily accessible system that would surely meet the demand developed from the upcoming HSR Miaoli Station and the Houlong Medical Park.

The construction began on June 12, 2011, and is operated by Resource Engineering Services Inc. The expected completion date is set on June 10, 2013. The planned progress is 9.25% as of December 31, 2011.



P15 full circulation piling operations



Piling and DSR1 flood detention pond works

(7).Project of Additional Nantou Interchange on National Freeway No. 3 (Bid C14)

As the population in Nantou City is inaccessible to National Freeway No. 3, the entire area demands overall development and the locals have been repeatedly asking for convenient access systems that could further upgrade the land transportation system in service. Accordingly, the Nantou County Government proposed adding an interchange at 227k~228k, National Freeway No. 3, in Nantou Section. When completed, the new interchange would improve the current road system and the convenient access would mean further contribution to the development in Nantou.

MOTC basically approved the engineering planning report on Aug. 11 2010. As of the Environmental Difference Analysis, EPA approved the revised version on Aug. 16 2011. The construction works for the additional interchange began on September 5 2011 and the works were to be completed in 30 months.



Schematic diagram of National Freeway No. 3 additional Nantou Interchange project range

The National Freeway No. 3 passes through Caotun Township, Nantou City, Minjian Township and Zhushan Township in Nantou County, where interchanges are available in Caotun, Zhongxing, Minjian Zhushan and the Zhongxing Interchange. As the Zhongxing Interchange and the Minjian Interchange are both at more than 7kms from downtown Nantou City, the Tai 3 Provincial Highway links the 2 systems. Besides, as the Tai 3 Highway, which cannot be widened further due to the urbanization restrictions, passes by the Nangang Industry Park, the service level lowers to below Level E in rush hours, and easy access to the National Freeway No. 3 from Nantou City is not possible at present. The local population has been repeatedly claiming for a convenient access system that could upgrade the road system in service. Accordingly, TANFB is proposing adding an interchange in downtown Nantou City to further prosper the Nantou City. The efforts of this project are: (1) Build a sound road system demanded for the area making the National Freeway No. 3 easily



accessible to and from downtown Nantou; (2) Alleviate the traffic congestion created by vehicles on the provincial highways or access roads entering into the Nantou Interchange; (3) Upgrade road transportation performance and, along with the newly-completed Zushi Bridge, provide rapid access to Nantou, Zhongxing Village and Caotun as a way to prosper the area both socially and economically.

The construction began on September 5, 2011, and is expected to be completed on February 20, 2014. The planned progress is 2.8% as of December 31, 2011.



L1 ramp steel cage hoisting



L1 ramp pile steel cage measurement examination



3.Completion of works and open for traffic

(1).Additional Minxiong Interchange on National Freeway No. 1

The proposed interchange is situated on Freeway No. 1 Sta. 257k+190 (between Dalin Interchange and the Jiayi Interchange), and will significantly be helpful for easing the traffic congestion on the connection road (County Road No. 159) of Jiayi Interchange when it is completed. The citizens of Minxiong Township and Xingang Township of Jiayi County, and Beigang Township and Shulin Township of Yunlin County can directly drive on and drive off National Freeway No. 1 to save driving costs.

The project budget is NTD 292,150,000, and is operated by Senrong Construct Co., Ltd. The construction began on December 19, 2009, the construction period is 730 days, and were completed on December 11, 2011 and was open for traffic on December 23, 2011.



Minxiong Interchange project current status



(2).East-West Expressway (Wanli-Rueibin Line) Dahua System Interchange Project (Bid 156)

The project area is approximately located at the original East-West Expressway (Wanli Ruibin Line) Dahua System Interchange where is surrounded by the section between 4k+800 and 6k+500, and the section between 4k+900 and 7k+300 on National Freeway No. 1. The construction areas include the new additional Dahua System Interchange, the widen construction between Dahua and Wudu on National Freeway No. 1 and the cooperative improvement of Wudu Interchange.

The project budget is estimated to be NTD 2.127 billion (NTD 2.267 billion after revising), and is operated by Tongchang Building Unlimited Company. It began on November 16 2007. The new ramp and the widening of the main line of National Freeway No. 1 were both completed and open for traffic on July 31 2011 at 3:00 p.m. and officially completed on October 12 2011. The project can provide substitute roads for elevated roads of Keelung Harbor West Coast, improve the traffic flows at the bottleneck of Keelung Harbor West Coast to and from National Freeway No. 1, and provide more comprehensive traffic connection for road users of Keelung area when it is completed. Accordingly, the traffic flows on Freeways can quickly switch to the near parallel expressway system to improve the traffic congestion of Keelung end of National Freeway No. 1, reduce the traffic burdens of Badu Interchange and Taierding Line is alleviated when service on National Freeway improved and shorten traffic time.



Dahua System Interchange works completed and open for traffic



Dahua System Interchange works completed and open for traffic

(3).Taipei County “the Teh No. 2 Taipei County Highway” connecting to Tucheng Interchange project (Bid B24 of National Freeway No. 3)

The project is located between 41k+160 and 43k + 560 on National Freeway No. 3 consisting of constructions of overpass and approach road of partial mainline of Teh No. 2 Highway, mainline widening construction of National Freeway No. 3, new ramp constructions of Tucheng Interchange, and improvement and new access road construction.

The contract amount of the project is NTD 937,000,000, and is operated by Lianrong Construction Co., Ltd. The construction works began on April 10 2009 and completed on July 29 2011. When completed, it remarkably alleviate the traffic congestions on Tucheng Interchange approach lane and Zhongyang Road backed up to the main line of the National Freeway No. 3 and the traffic load on Zhongyang Road. On the other hand, it helps lead the traffic flow coming from and heading for Banqiao, Xinzhuang and Wugu to Teh No. 2 Highway as a rapid road system.



Aerial view for Tucheng Interchange, National Freeway No. 3



Schematic diagram for the completion of Tucheng Interchange, National Freeway No. 3



(4).Improvement project of Daxi Interchange northbound entrance on National Freeway No. 3

The Daxi Interchange northbound entrance 2 is an entangled access when it joins National Freeway No. 3 (Loop 6 and Ramp 2) when it adjoins the interchange and the mainline traffic does jeopardize the traffic flow on the main line, when traffic congestions are common. As the Daxi Interchange is a main access to and from Taoyuan and it adjoins the Tai 66 Expressway, the large traffic flow creates congestions on the access ramp.

The project in question deals with the widening of the Ramp 2 of Daxi Interchange, National Freeway No. 3 and the widening of the northbound section of Loop 6. The construction works cover National Freeway No. 3 at 62k+135 ~ 62k+885, where the 2 northbound entrances are merged into 1. When done, the new ramp would measure roughly 750 meters.

The project was completed and open for traffic on July 2 2011. The successful construction was a joint effort waged by the Northern Region Engineering Office, Guanxi Construction Section, the supervision company and the contractor. With zero occupational disasters and zero occupational incidents produced during construction, the ramp adjoins to the loop allowing smooth traffic by the mainline.



A view of the completed loop adjoining the ramp



A view of the completed loop



(5).The Rehabilitation project for the slope by the northbound entrance to the Shiding Interchange on National Freeway No. 5

The ramp slope by the northbound entrance to the Shiding Interchange on National Freeway No. 5 is located in the undercut slope section by the Jingmei River. The foundation of retaining walls underwent erosion at about 8:00 p.m. on October 22 2010 by Typhoon Megi that landed northern Taiwan late October 2010. As a result, the ramp slope collapsed as the retaining wall broke down. The Toucheng Branch immediately ordered to close the northward entrance ramp and the external shoulders of the mainline as traffic control was imposed for the sake of safe travel. To keep the slope from collapsing that could worsen the situation, Stage 1 repair works were ordered and traffic by the ramp resumed on November 25 2010 while the slope restoration works in question followed accordingly.

The construction is expected to be completed on January 3 2012, the project budget is NTD 52,180,000, (including CCO1). When completed, the slope would become increasingly resistant to erosion and stable to assure safe travel by the ramp.



Concrete revetments, retaining walls and MRC backfilling