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[English Translation]

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Hon Tanya CHAN
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1 Legislative Council Road
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Hong Kong
(Fax : 2521 8660)

Dear Hon CHAN,

**Re: Holistic Assessment Strategy
for Hung Hom Station (HUH) Extension
under the Shatin to Central Link (SCL) Project**

We refer to your letters dated 29 March 2019 and 30 April 2019 on the above subject. After consulting the Highways Department (HyD), our consolidated reply is as follows:

- (1) Requirements for the installation of couplers (Parts (1) and (4) of the letters dated 29 March and 30 April respectively):

According to the information provided by the coupler's supplier, the requirements for the proper installation of couplers are:

- (i) there shall be a maximum of two full threads exposed; and
- (ii) the embedded length of the threaded rebar screwed into the coupler shall be at least 40 mm.

MTR Corporation Limited (MTRCL) uses the Phased Array Ultrasonic Test (PAUT) to verify the embedded length of the threaded steel bar inside the coupler. As the allowable measurement tolerance of the test is 3 millimetres, equipment readings below 37 millimetres are regarded as non-compliances. The Government considers that the contractor should follow the above requirements for the installation of threaded rebars and couplers in the HUH Extension under the SCL Project.

Table 6.3 of the Holistic Assessment Strategy for the HUH Extension (the Holistic Assessment Strategy) of the MTRCL is to illustrate the relationship between the number of failures in the samples and the maximum failure rate in the population based on statistical inference (estimated under a 95 per cent confidence level). "Failure" means that individual couplers and rebars are not installed according to technical specifications. The overall integrity of the platform slabs and diaphragm walls has to be ascertained on the basis of the result of detailed structural analysis in the third stage of the assessment strategy.

- (2) Overall result of the Stage 2 of the Holistic Assessment Strategy (Part (2) of the letter dated 29 March and Part (2) of the letter dated 30 April):

On 29 April 2019, MTRCL completed the PAUT and the opening-up investigation in the second stage of the Holistic Assessment Strategy. The layout plan of the platform slabs of East West Line (EWL) and North South Line (NSL) for the HUH Extension, the locations of couplers tested, and all the past and

latest test results are available at the website of HyD for the SCL project (www.hyd.gov.hk/en/road_and_railway/railway_projects/scl/index.html) for reference by the public. A total of 225 test locations are involved in Tables 1 to 3 on the HyD's website, which correspond to 152 test locations involving couplers with embedded length not less than 37 millimeters; 39 test locations involving couplers with embedded length less than 37mm; and 34 locations where completion of test is unsuccessful, which include seven locations with improper connection to couplers or connection of rebars by lapping that could be determined by mere visual inspection and therefore without any need to carry out measurement by device.

(3) Actual number of samples in Stage 2 of Holistic Assessment Strategy (Parts (3) and (6) of the letters dated 29 March and 30 April respectively):

The first purpose of the opening up in the second stage of the Holistic Assessment Strategy is to carry out physical investigations by opening up the concrete at connections between the platform slabs and diaphragm walls of the HUH Extension with gaps in construction documentation, so as to verify the as-constructed conditions of these areas. This involves at least 24 locations at the platform slabs of the EWL. Eighteen out of 24 locations had been inspected on site. As the remaining six locations were obstructed by existing structures, they could not be verified by opening-up. Upon further review of records, the MTRCL managed to retrieve the concerned site photos and verify the as-constructed conditions of these six locations.

The second purpose of the opening up in the second stage of the Holistic Assessment Strategy is that, in view of the allegations that steel bars have been cut, the MTRCL needs to open up certain connections between the platform slabs and diaphragm walls for detailed inspection, and to conduct non-destructive tests for verification of the conditions of the coupler connections, the locations of which are randomly sampled by statistical methods. Based on the advice from the expert

team from the Department of Statistics and Actuarial Science of the University of Hong Kong, the MTRCL opened up 28 random locations each at connections between the platform slabs and diaphragm walls of the EWL and the NSL, i.e. 56 locations in total with at least 168 rebars/couplers exposed; and made use of PAUT for measurement of the embedded length. There are currently 169 samples with successful test results.

As the number of samples obtained in the second stage of the assessment strategy has already exceeded the original target of 168, the MTRCL can proceed with the assessment in the third stage and the MTRCL does not need to further increase the number of PAUT samples.

In the third stage, the MTRCL will consolidate the test results of the first two stages, including the as-constructed details of the platforms, works quality information, and the technical data provided by the coupler supplier; and conduct a detailed structural assessment of the HUH Extension to determine the overall structural integrity of the works, and whether remedial works is required.

(4) Enhanced PAUT (Parts (3) and (5) of the letter dated 30 April):

The test results of all 121 couplers obtained before 29 January 2019 were re-tested by the enhanced PAUT, and the final test results were given in Tables 1, 2 and 3 on 29 April 2019. The PAUT may give unclear signals or readings under certain situations that make the tests and measurement unsuccessful. These situations include uneven end face or damage of the threaded steel bars, insufficient area for the operation of the device due to site constraints, etc. In addition, the MTRCL does not need to test and take measurement if upon the opening up of concrete, the improper connection to couplers or connection of rebars by lapping can be determined by mere visual inspection. Of the 225 test locations under the second stage, 34 locations fall under the above situations and the tests have not been successfully completed. As the number of PAUT samples has

exceeded the number originally planned, MTRCL will determine the overall structural integrity of the platform slabs and diaphragm walls of the EWL and NSL in the third stage of the Holistic Assessment Strategy.

(K M Cheung)
for the Secretary of Transport and
Housing Bureau

26 June 2019

cc:

HyD (Attn: Mr. C M Chan) (Fax : 2714 5297)

MTRCL (Attn: Ms. F T Chan) (Fax : 2795 9991)