



HIGHWAYS DEPARTMENT

PRACTICE NOTES

Flooding Warning System in Subways/Underpasses

Bridges & Structures Division

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1. Introduction

Flooding has been one of major maintenance problems in subways and underpasses. Despite enormous amount of effort paid to maintain subways and underpasses, flooding still occurs quite frequently especially during rainy seasons. The causes of flooding are normally due to unexpected heavy rainfall, trapped rubbish, incoming power failure, tripping of electrical protective device or pump system failure. Flooding could cause serious threat to public safety and there is a need to incorporate a flooding warning system in subways/underpasses that could give the maintenance authority a warning on any flooding incident.

The objective of this Practice Notes is to provide guidelines on the requirements of design and installation of flooding warning system for all new subways/underpasses.

This Practice Notes supersedes BSTR/PN/002C with immediate effect.

2. General Requirements of Flooding Warning System

The flooding warning system shall comprise a Remote Monitoring Unit. The Remote Monitoring Unit should be able to detect flooding incident and send a telephone message to the maintenance authority through mobile networks. It should also send response messages to the authority when being prompted over telephone.

The designer shall seek advice from Electrical & Mechanical Services Department (EMSD) and maintenance authority for the detailed requirements, specifications, etc. to suit the specific operational need for individual sites.

3 General System Requirements of Remote Monitoring Unit (RMU)

- (a) The RMU shall include sensor devices, transmitters and receivers.
- (b) The RMU shall be capable to carry out the following functions, possibly through sensors, control unit and telephone transmitter: -
 - (i) to detect any incoming power failure in pillar box;
 - (ii) to detect pump power failure in pump house;
 - (iii) to detect high water level in pump pit inside pump room;
 - (iv) to detect high water level in main barrel of subway/underpass;
 - (v) to resume to normal condition for all fault signals; and

- (vi) to report automatically to the Highways Department's message receiver on the detected faults. At present, the message receiver is located at the Information Service Centre of EMSD Headquarter.
- (c) The RMU including the sensor devices, transmitter, receivers and the type of mobile networks shall be reliable and durable to stand for the site environment with 99% overall reliability.
- (d) The design of the RMU shall allow for future expansion such as addition of warning signals detected by the sensor device and addition of locations. Details shall be agreed with the respective maintenance offices during the design stage.
- (e) The RMU shall contain system watch-dog circuit (i.e. self-diagnosis function) and built-in backup battery to sustain 6-hour continuous operation once power supply is failed.

3.1 Sensor Devices Requirements

- (a) The sensors shall be designed to differentiate false alarms resulting from transient incidence such as accidental water splash. Each sensor devices shall be provided with time delay function. The interval for the time delay function shall be adjusted in the range of 4 to 6 minutes.
- (b) The sensors devices for the main barrel of subway or underpass shall cater for the transient high water level by the accidental wetting of routine barrel cleaning works.
- (c) The exact positions of the sensor devices shall be agreed with the respective maintenance offices of HyD and EMSD.

3.2 Transmitter Requirements

- (a) The transmitter shall be of the weatherproof type normally housed in an above ground pillar-box.
- (b) The transmitter shall be designed to suit any type of mobile networks with Short Message Service (SMS) in Hong Kong.
- (c) The transmitter shall be designed with the watchdog or self-monitoring function in case of malfunction.
- (d) The transmitter shall have status display unit or indicator showing the status of the sensors and the communication status with the message receiver to facilitate on-site maintenance works or diagnosis works. The status display unit shall be agreed with the respective maintenance offices of HyD and EMSD.
- (e) A fault report attendance switch shall be provided in the transmitter for record of maintenance attendance. The signal of fault attendance shall be relayed to the RMU.

3.3 Receiver Requirements

- (a) The receiver shall be capable of monitoring the status of the drainage system and the condition of the RMU automatically.
- (b) The receiver shall be capable of checking the performance of the performance of the RMU circuitry and the receiving and transmitting of all alarm signals.
- (c) The receiver shall include all the hardware and software to perform the intended functions of the RMU and shall be positioned in the venue designed by the respective maintenance offices.

4. Implementation

The flooding warning system shall be incorporated for all new subways/underpasses vulnerable to flooding. For cases where the chance of flooding is remote and there is no need for such warning system, agreement from the maintenance authority shall be sought in advance.