

Study on improvement of maintenance of manhole and manhole cover

Whole term

2005.6~2007.3

Text P.99~P.105

(Purpose)

Sewerage systems in Japan are said to have 11 million manholes. Three types of accidents and inconvenience with respect to manholes are brought to our attention in recent years;

- ① Fatal accidents to pedestrians falling into manholes with no manhole covers, which were flowed away by floods from sewerage systems during heavy rainstorms
- ② Fatal accidents to sewer maintenance workers in manholes filled with toxic gas such as hydrogen sulfide
- ③ Inconvenience of wide area check-up of sewerage systems after large earthquakes by gathered supporters from different regions, due to not uniformed opening devices of manhole covers.

In order to avoid these accidents and inconvenience, this study aims at three points below.

- ① Development of new performance standard of flood-resistant manhole cover structure and a new type of canted wall of manhole providing safer maintenance-work
- ② Development of technical standard with respect to adoption and installment of new type of flood-resistant covers and new type of canted wall
- ③ Development of an opening device guideline in order to lead a uniformed opening device

(Results)

(1) Features of New Performance Standard of Flood-Resistant Manhole Covers

1) Prevention of Excessive Stuck Force

The existing standard manhole covers in Japan have Incline Support Structure ("ISS"). The ISS often cause excessive stuck force, which result in ①difficulty of opening covers, and, ②when floods happen, explosive movement of covers triggered by high-pressured air mass accumulated inside manholes

A new performance standard requires prevention of excessive stuck force, and "Two-tier ISS", shown as Fig.1 is a good example satisfying this performance standard.

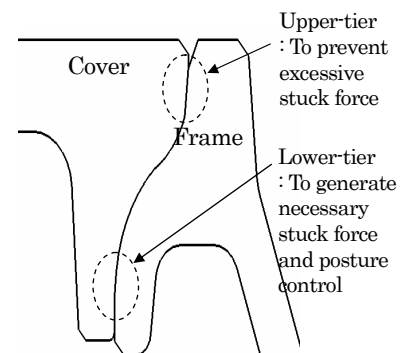


Fig.1 Two-tier Incline Support Structure of Cover and Frame

2) Consideration of Performance upon Limit State

A new performance standard requires consideration of performance upon limit state (expiration of expected life of 15 years for manhole covers for vehicle road use) with respect to load test, anti-slipping performance and rattle-free performance.

(2) Features of Twin-Hole type Canted Wall of Manhole

- 1) The inside diameter of worker entrance should be 700mm based on ergonomic evaluation.
- 2) The withdrawal strength for insert nuts buried in the top of the canted wall should be determined in such a way that bears upward pressure of 0.38 MPa, in order to secure the flood-resistance performance.

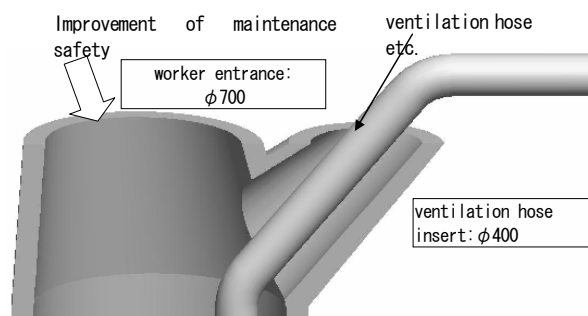


Fig.2 Twin-Hole type Canted Wall of manhole

- 3) Addition of ventilation hose insert with the diameter of 400mm shown as Fig.2, in order to improve maintenance safety.
 - 4) The material should be polymer concrete which has superior durability and anti-corrosiveness
- (3) Proposal of a Uniformed Opening Device
- 1) The opening device should have a versatile holder that can hold different claws interchangeably.
 - 2) Our finding describes desirable range of posture of opening action of manhole covers, including desirable height of handle and inclination of opening device against covers, based on ergonomic evaluation.

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Key words

Manhole covers, Flood-resistant, Canted wall of manhole, Opening device, Ergonomic evaluation