

Cooperative research on high head work introduced into combined sewerage

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(Purpose)

In east Shinagawa trunk line of Tokyo area, high head work of 16.75m has been planned in the special manhole. Using the conventional multistage free falling system, the manhole with such high head seems to have the problems like the next.

Environmental preservation

Because the head is bigger than traditional manhole and there a large quantity of entrained air in case of the high head manhole, the noise will be generated, and will affect the nearby residents.

Structure

In existing high head manholes, the bottom concrete has been eroded by the falling of the sewage throughout the long term, so it becomes the defect structure as a manhole. Moreover, it is the structure of difficulty for the work of maintenance and repair.

Maintenance

In the manhole of the multistage free falling system, the inspection works in each stage are necessary. However, it is hard to ensue stage work of the high head safe, considering the effects of the compressed air and steam raising from the downstream, etc..

However, the manhole of the multistage free falling system has mainly been adopted with the problems like the above. In order to solve the problem of the multistage free falling system of manhole, improve the operation environment for maintenance, the research and design of perpendicular pipe (the following "the drop shaft") in which whole quantity of the sewage perpendicularly flowed safely were carried out as the cooperative research between Tokyo Metropolitan Gov., Bureau of Sewerage and Japan institute of Wastewater Engineering Technology.

(Result)

By estimating the allowances rate according to the actual circumstances of the region and size of pipe for the plan sewage discharge, the general sewer design has been carried out. When the size of the drop shaft is designed, the identical allowances rate with upstream pipe and downstream pipe is used. Since the object aim to the sewage after the diversion, in this plan, the plan quantity was made to be the objective sewage discharge.

The drop shaft location is decided from the structure of the special manhole. As connection methods with incurrent pipe, the method of establishing the inflow well between drop shaft and incurrent pipe, and the method of directly connecting drop shaft with incurrent pipe as connection were considered, when the drop shaft is installed in the installable range. As the result of comparative examination of these two methods, the drop shaft should be connected with the incurrent pipe by equipping inflow well.

As a performance necessary for the material of drop shaft with the aim of saving space, it is raised to have the smoothness of the inner surface in order to smoothly flow for sewage, chemical resistance for generating hydrogen sulfide from sanitary sewage, abrasion resistance for flow velocity and strength. And, the materials which can uniformly produce with these performances are necessary as an industrial product. Reinforced plastic multiunit pipes which satisfied these conditions should be used as a material of the drop shaft. And, the spiral guide plate was designed on the strength of the members within the allowable stress in term of examination of following 2 items.

Shearing stress in guideway edge (junction between pipe and guideway).

Bending stress of guideway.

The installation of the drop shaft had already finished, and the construction period was shortened drastically. And, it seems to be possible to considerably solve the problems occurred from environmental preservation, structure, maintenance. In the future, the research will be advanced to establish the design technique of the high head facilities.

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Key Words

High head manhole, spiral guideway style head construction, drop shaft