

Research on Mt. Yoshinosan steep gradient sewer

Period

2000.4~ 2002.1

95P~ 100P

(Purpose)

In improving sewerage works of Mt. Yoshinosan district of Nara Prefecture, it was judged that steep gradient sewerage pipe had to be adopted from the condition of the topography.

In this study, the hydraulic model study is carried out for "joint spot", "steep curve section" and "gradient changing site in middle of the route" in which the hydraulic problems seem to be big for steep gradient sewerage pipe, and the items of countermeasure are decided.

And, the manual (draft) is made for the efficiency improvement of design, construction and maintenance of steep gradient pipeline for Mt. Yoshinosan district.

(Result)

1. Arrangement of steep gradient sewer plan

The consolidation of relation materials was done as necessity for the examination, the site survey was done for synoptic survey of topography, and alternative plan was shown on the route in which construction and maintenance of sewer seem to be difficulty, while the design condition of the plan route was arranged.

2. Grasp of steep gradient sewer problem

On the plan route, assumed hydraulic problem was arranged, while the flow velocity was estimated by the variable flow calculation. Afterwards, the items of examination and countermeasure required for solution were arranged.

3. Examination of the energy dissipation system

It is the oblique flow of high discharge in steep gradient pipe. The energy dissipation treatment for hydraulically safety is required so that it may not generate blockade of the cross section and vibration of pipe in steep gradient sewer. Several methods of energy dissipation treatment are considered. In the joint spot and steep curve section, being most suitable for the site as a stilling basin system, the hydraulic jumping energy dissipater having the research results was adopted for steep gradient in the site of route middle.

4. Setting of hydraulic test condition

There are a number of sites requiring countermeasure. The hydraulic conditions as experiment objects were set by arranging all hydraulic conditions of the Mt. Yoshino district, such as downward flow quantity, flow velocity, momentum (the downward flow quantity \times flow velocity \times density), in order to cover the whole area of Mt. Yoshino district.

5. Hydraulic model study

The hydraulic model study was carried out in order to obtain optimum shape of energy dissipater in proportion to the hydraulic test condition.

It was confirmed that the basic dimension of optimum shape was roughly obtained by inflow momentum of excess of drainage discharge ($2q$).

All inflow momentum and stilling basin volume (the manhole diameter).

Energy dissipater shape and support structure.

6. The arrangement of the design materials

Design materials for attempting efficiency improvement of design, construction and maintenance for steeply laying sewerage sanitary pipe in the Mt. Yoshino district were made.

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Key Words

Steep gradient sewage pipe and drain The energy dissipater Hydraulic model study.