

## Investigation research on evaluation of perpendicular sewer technology

Period

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### ( Purpose )

This study purpose is to review the application range and examine the rational design method of each part hydrology shape for perpendicular sewer( the spiral guideway style drop shaft (the following, "the drop shaft" ) ) installed in Chikumagawa River river-basin sewerage ( the upstream and downstream process zone )with cooperation of Chikumagawa River river-basin sewerage construction office of Nagano Prefecture, while carry out the extraction and arrangement of technical problems in design, construction and maintenance.

The research extracts and arranges the technical problems by arranging past research result of the spiral guideway style drop shaft in domestic and overseas and investigating the actual condition about drop shaft and executed case. Based on these research results, application range of the drop shaft and rational setting method of each part shape are examined, and it is coordinated as design data.

Arrangement of past experiment contents and so on

Nagano Prefecture, Tokyo, Kyoto prefecture.

Arrangement of the past literature

Iowa University, Tokyo University.

Arrangement of the execution case

Survey on actual situation of the drop shaft.

Hydraulic consideration of the drop shaft.

### ( Result )

(1) Design of each part shape of the drop shaft.

Drop shaft diameter :  $D_s$

$D_s = 0.292L_r (L_r = (Q_d/0.038)^{0.4})$  Head of manhole:

$H_d = 0.8D_s$

Interval of upper spiral guide plate :  $P_1 = 0.8D_s$  Middle

guideway height :  $H_m = 10D_s$

Interval of lower spiral guide plate :  $P_2 = 0.5D_s$

Effluent pipe diameter :  $D_2 = 0.5D_s$

(2) Application range of the drop shaft.

Design discharge: about  $Q_d = 10\text{m}^3/\text{s}$ .

### ( Future assignment )

(1) It is not possible to appropriately calculate the air entrainment quantity bringing to downstream pipe and plumbing gas volume from the shaft, because aeration and entrainment phenomenon in the large-scale utilities which exceed design discharge  $10\text{m}^3/\text{s}$  have not been sufficiently grasped. And, for that the application range of drop shaft is limited for the middle guideway high under  $10D_s$  and design discharge under  $10\text{m}^3/\text{s}$ . It is necessary to establish the similarity law of aeration and entrainment phenomenon of the drop shaft, if the application range is expanded.

(2) The application is limited in the case that the downstream pipe dynamic water level is high, because the energy loss of full flow in drop shaft of flow pipe can not have been grasped. In the application to the downward flow pipe, it is necessary to evaluate the energy loss of the drop shaft.

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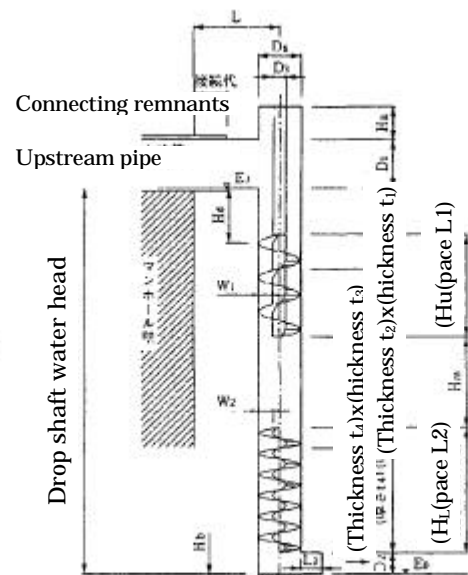


Fig.1 Drop shaft general figure

Key Words

Spiral guideway style drop shaft , design discharge, drop shaft head, inflow division, upper guideway, middle guideway, lower guideway, outflow division