Translated by Mary

FLOW REPORTS FOR CAPIPHON DRAIN BELT

By

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The Test Report of the Flow of Capiphon Drain Belt

1. The purpose for experiment

Background

The coefficient of water permeability in soil is very small and if it reaches the saturated point, it will cause the ground to soften. Furthermore, sinking or collapsing of the earth may occur, and this, in particular will affect the embankments of dams. In the past, dams were constructed using sand and earth filled materials. Dam construction was challenging, expensive, and time consuming and silt-clogging was an ongoing problem. To endeavour to solve these problems, the Capiphon Drain Belt from Taiwan has been imported. The Capiphon Drain Belt consists of tiny capillary tubes with the ability to absorb water into these capillary tubes. Then the siphonal forces generate negative pressure which allows an increased amount of water to be continuously absorbed and drained.

The Capiphon Drain Belt is designed with a combination of four natural phenomenal forces: capillary forces, siphon, gravity and surface tension. The **Capiphon Drain Belt** is a complete water collecting and draining system, based on innovative scientific design for solving underground water clogging problems. If underground water can be drained out into the surface, then it will cause no threat to buildings. Therefore, with aim of testing the effectiveness of the Capiphon Drain Belt in collecting and draining water tests were carried out.

2. Method of testing

Scientific studies were conducted by The Chinese Research Institute of Water Resources and Hydroelectric Power, to test the performance of the Capiphon Drain Belt. The following report explains the methodology and results of the experiments.

<u>Aim:</u>

To ascertain the effect of the permeability coefficient of soil on the flow of water from the Capiphon Drain Belt.

<u>Materials:</u>

Aquarium Tanks: length x width x height = 50cm x 50 cm x 50 cm
Soils: Five different types of soil, each with different permeability coefficients. Their permeability coefficients **were** also different because of their sizes, from **10^{-3} ~ 10^{-} ${}^{7}/_{s}$**

<u>Procedure:</u>

1. Each tank was filled with two layers a mixed composition of soil, to a 20cm depth (Shown as in p. 5). The analysis of particles composition samples according to their size, permeability coefficient, and density are shown in Diagram 3 (p. 10). The sample particles composition were chosen and mixed according to their weight, density and volume.

2. Capiphon Drain Belts were inserted into the tanks in two different positions:

a) Embedded vertically, inserted from the bottom, at depth of 42.5 cm into the soil (shown as in p.6 diagram A-A)

b) Embedded horizontally, inserted from the bottom at slope of 75 °, at depth of 32.5 cm into the soil (shown as in p.6 diagram B-B)

3. Following insertion, the entrances were sealed to prevent water leaking.

4. The tanks were slowly filled with water to two different levels: (shown as in p. 7)
a) low water level: water filled to soil level
b) high water level: water filled to 20 cm above the soil level

4. The flow of water was collected and measured from tanks filled to the low water level flow and higher water level

5. Testing occurred over two months and the **temperature** held between 17° C ~ 25° C

TEST RESULTS

Table 1, shows that as the permeability coefficient of soil increases, the quantity of the particles also increases. The recorded flow of **Capiphon Drain Belt** as shown in table 2 is calculated using the following formula: $q = v / s \cdot t$

q = **$(m^3/s) / m^2$** flow per area per unit (second) within certain water level
v = m^3 the average volume of the collected water
s = m^2 area of the soil and the **Capiphon Drain Belt** contact with each other
t = s (sec) time

Table 2 **CAPIPHON DRAIN BELT TEST RESULTS**

Permeability sample		1	2	3	4	5
		* 10^{-} m/s	* 10^{-} m/s	* 10^{-} m/s	* 10^{-} m/s	* 10^{-} m/s
Horizontally embedded	Low water level	13.20	3.03	0	42.70	219
	High water level	23.70	9.39	5.36	68.70	376
Vertically embedded	Low water level	8.42	7.46	2.66	9.81	185
	High water level	13.40	14.76	5.10	13.80	288

Analysis of Test Results

From the results in Table 2, four diagrams of the quantity of water flow from different samples were drawn (diagram 4, 5, 6, and 7). It was found that there was no correlation between water quantity flow and the permeability coefficient. When the permeability coefficient of soil increased there was no increase in the water quantity flow. The water flow reached the lowest point in the sample 3, showing that the effectiveness of the Capiphon Drain Belt was reduced when used in that particle composition of soil.
Furthermore, when rate of water flow was increased, this resulted in dirty water flowing from Sample 3, after which no more water flowed. Under the same conditions of increased rate of water flow, all other samples showed an increase of water flow and collection from **Capiphon Drain Belt.**

CONCLUSION

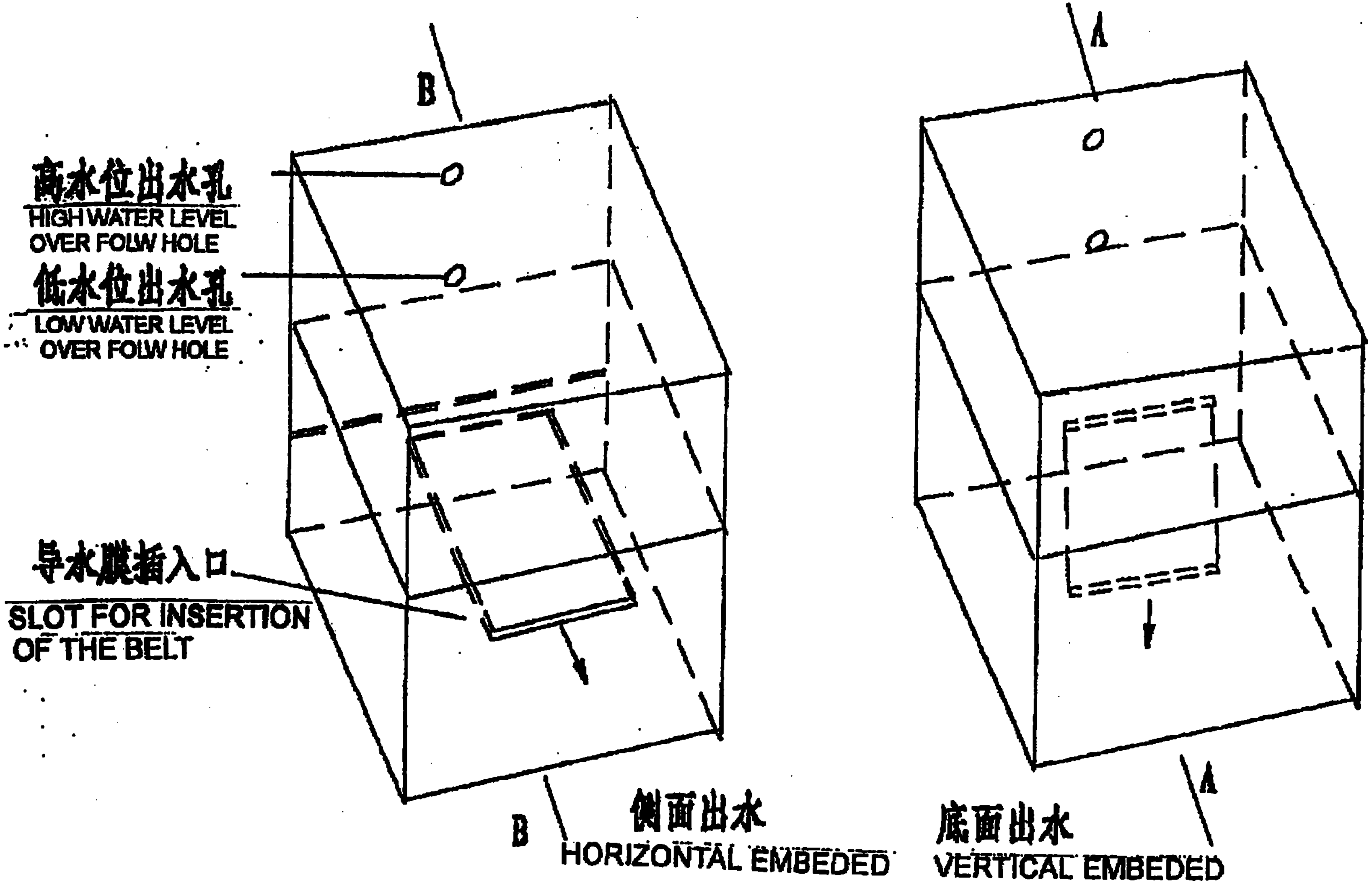
This experiment shows that the flow of water from the **Capiphon Drain Belt** is affected by the permeability coefficient of the soil and the mixture of the particles composition in the soil. The rate of water flow was the lowest in sample three. Therefore, an increase in the rate of water flow was found to occur with an increase in the permeability coefficient of soil along with changes to particle compositions in the soil. When the water level was increased, the quantity of water flow also increased.

表 1

ANALYSIS OF SOIL TESTED
土的性能试验成果

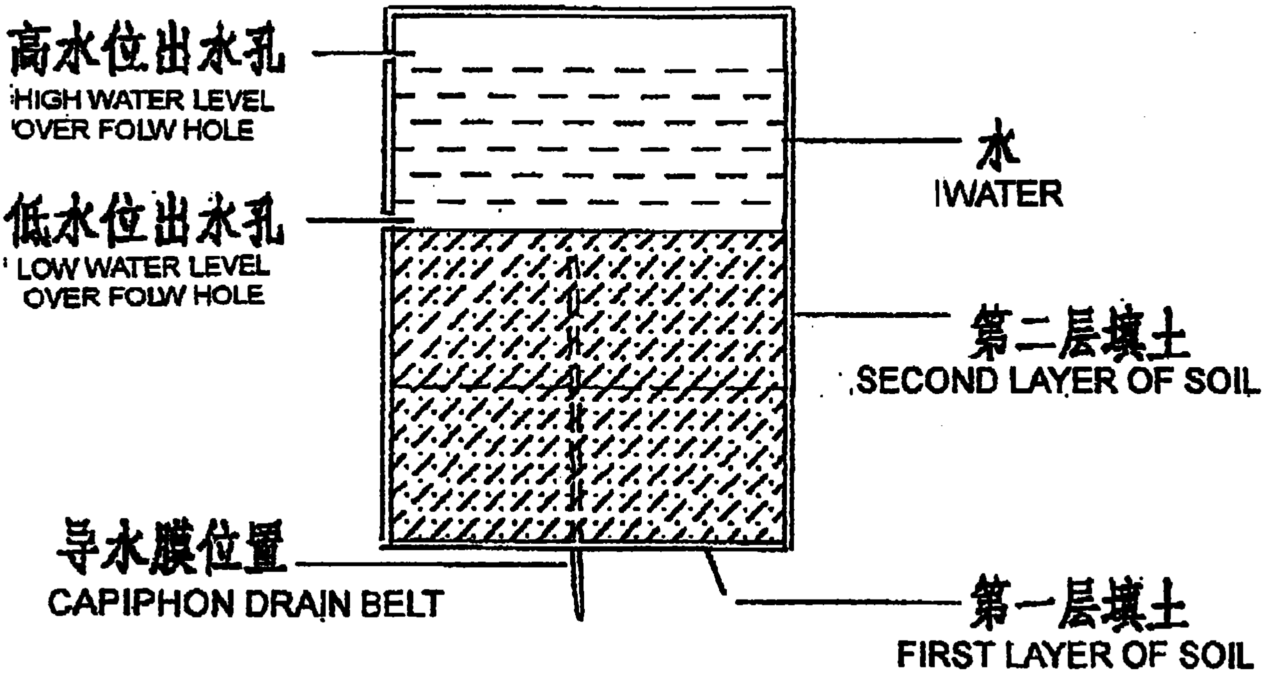
SAMPLE NO. 试样编号	PARTICAL COMPOSITION 颗粒组成 (%) 20~5 mm	5~2 mm	2~0.5 mm	0.5~0.25 mm	0.25~0.75 mm	0.075~0.05 mm	0.05~0.005 mm	<0.05 mm	DRY DENSITY 干密度 g/cm³	PERMEABILITY 渗透系数 cm/sec	NOTE 备注
1	4	2	3	4	8	8	51	20	1.76	3.90×10^{-7}	制样时砂、土混合物应拌合均匀
2	5	4	6	6	8	7	46	18	1.76	4.56×10^{-6}	
3	5	7	9	8	7	7	41	16	1.76	2.42×10^{-5}	
4	7	15	17	13	7	5	26	10	1.76	3.69×10^{-4}	
5	10	22	25	18	6	3	12	4	1.69	6.55×10^{-3}	

ALL SAMPLE SHOULD BE MIXED THOROUGH



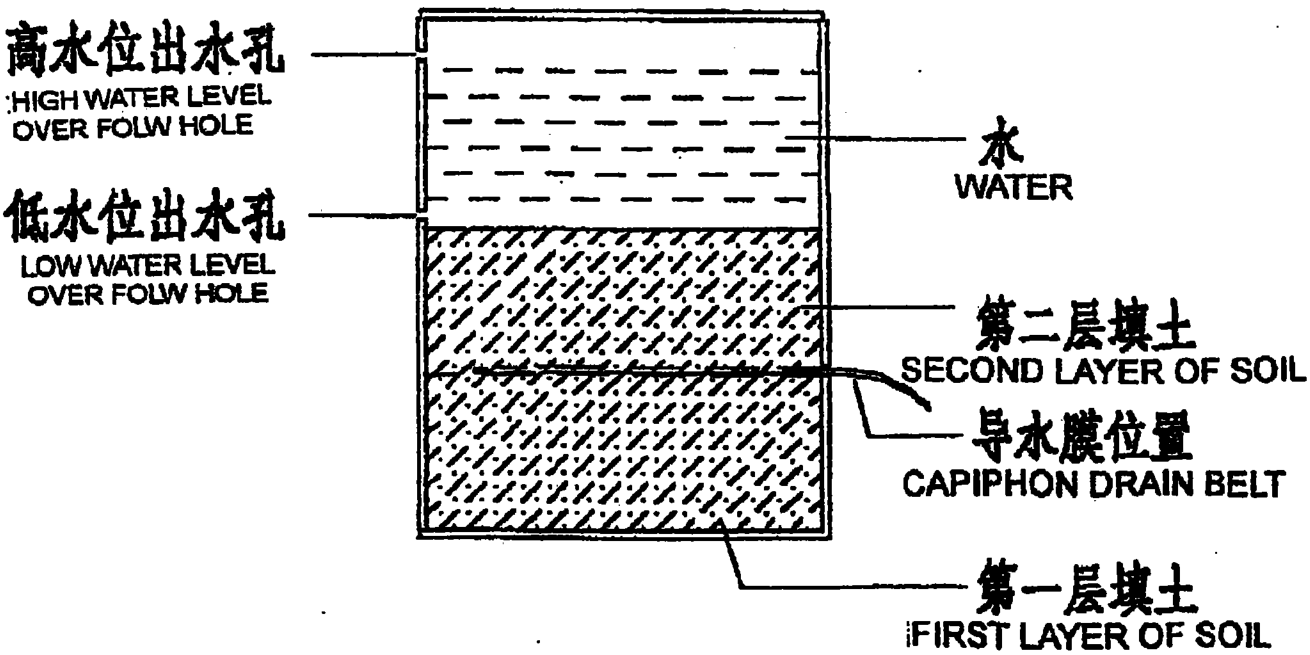
图一　试验箱示意图

DIAGRAM OF "AQUARIUM" TANK



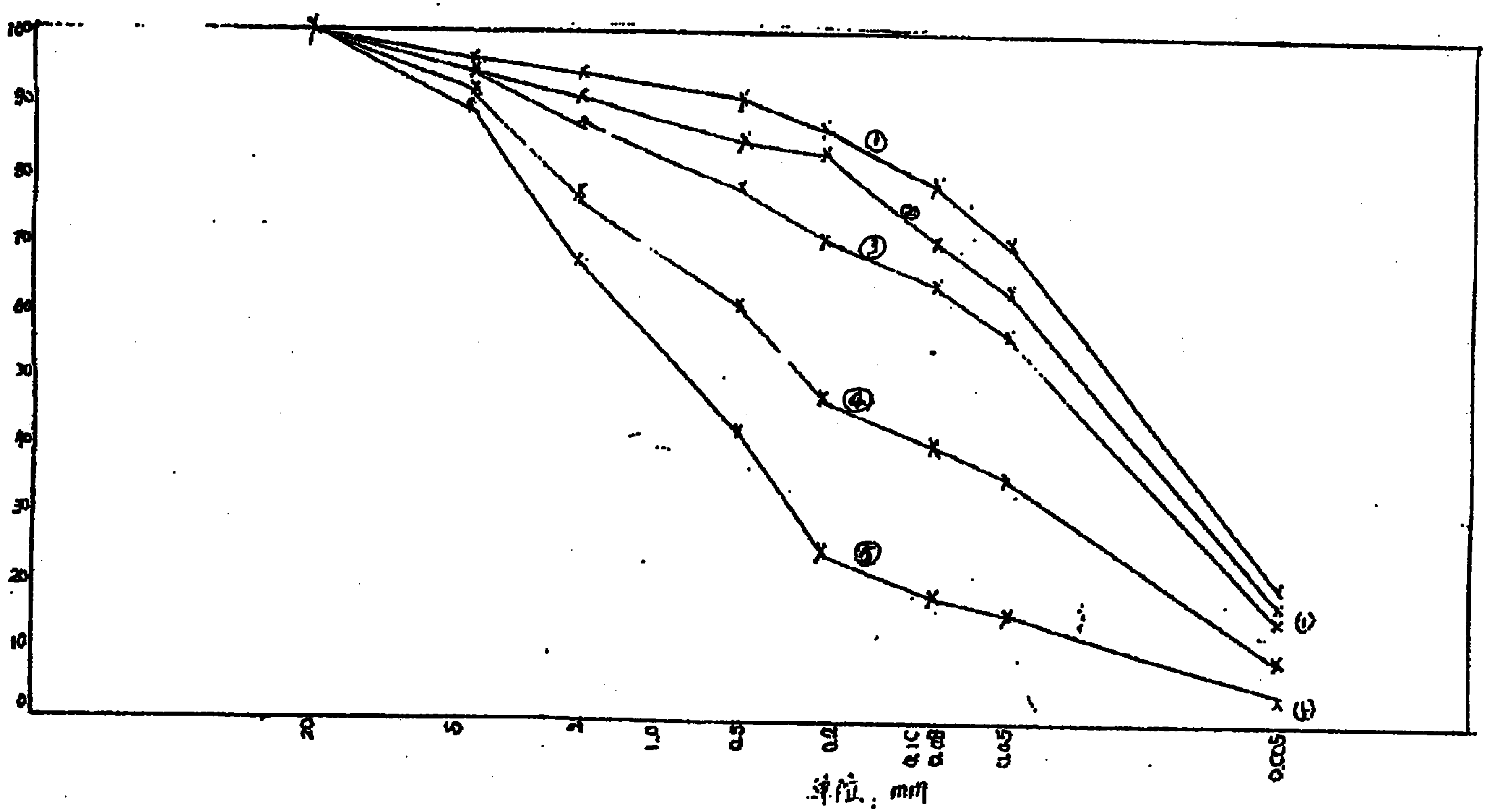
A-A剖面图

SECTION VIEW OF VERTICALLY EMBEDED



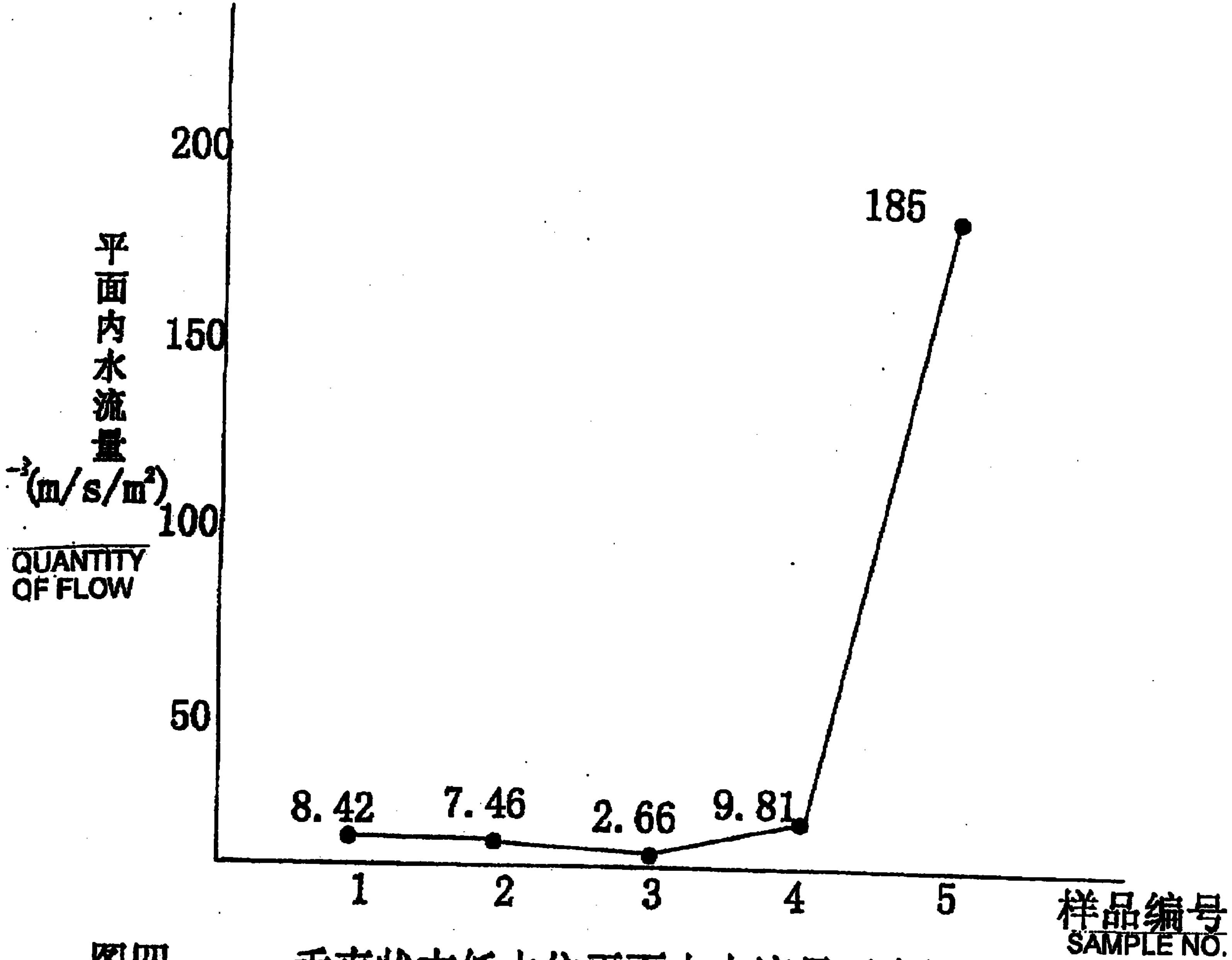
图二 B-B剖面图

SECTION VIEW OF HORIZONTALLY EMBEDED



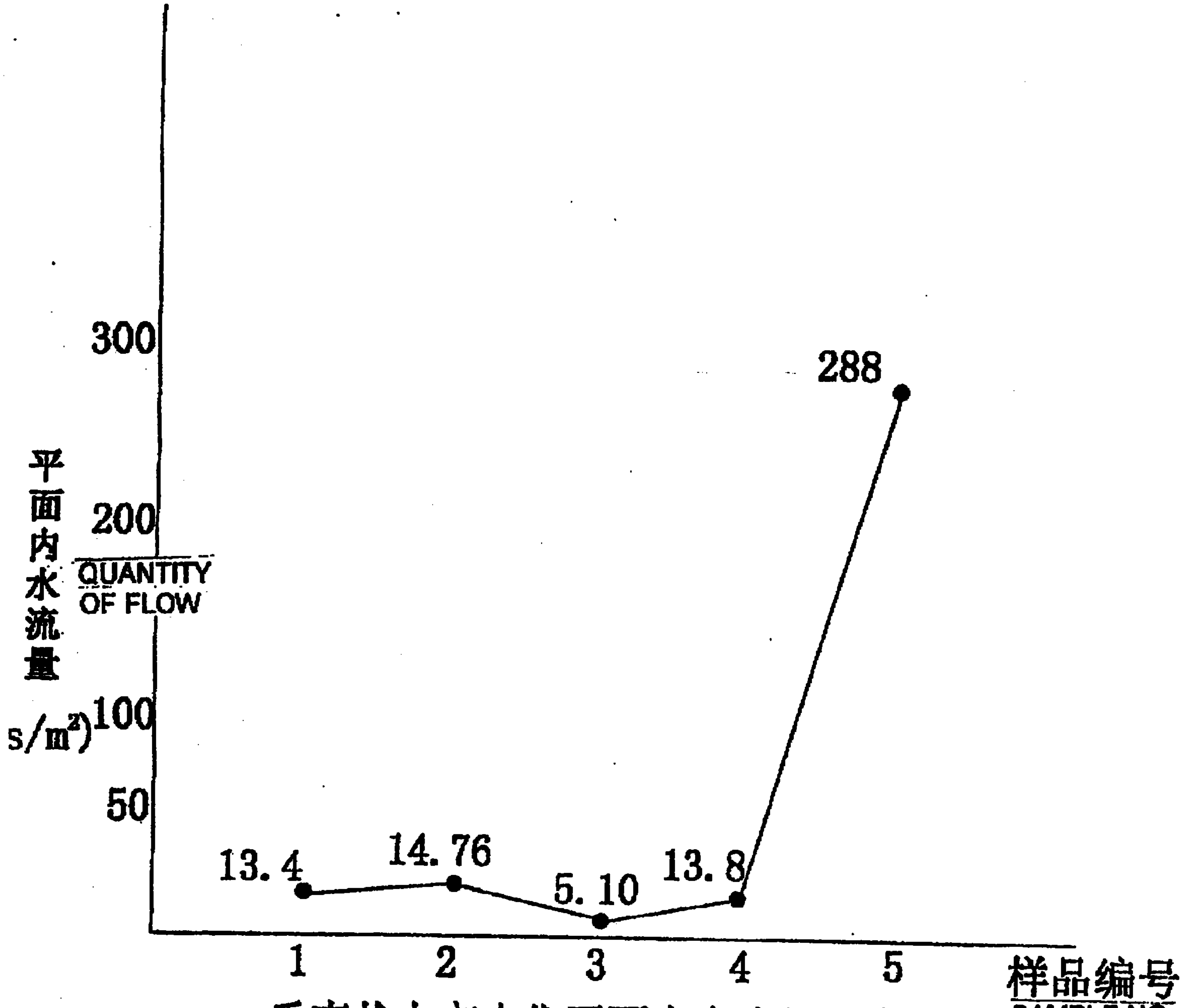
图三 颗粒大小分配曲线

DIAGRAM OF PARTICLES COMPOSITION FOR TESTED SAMPLES



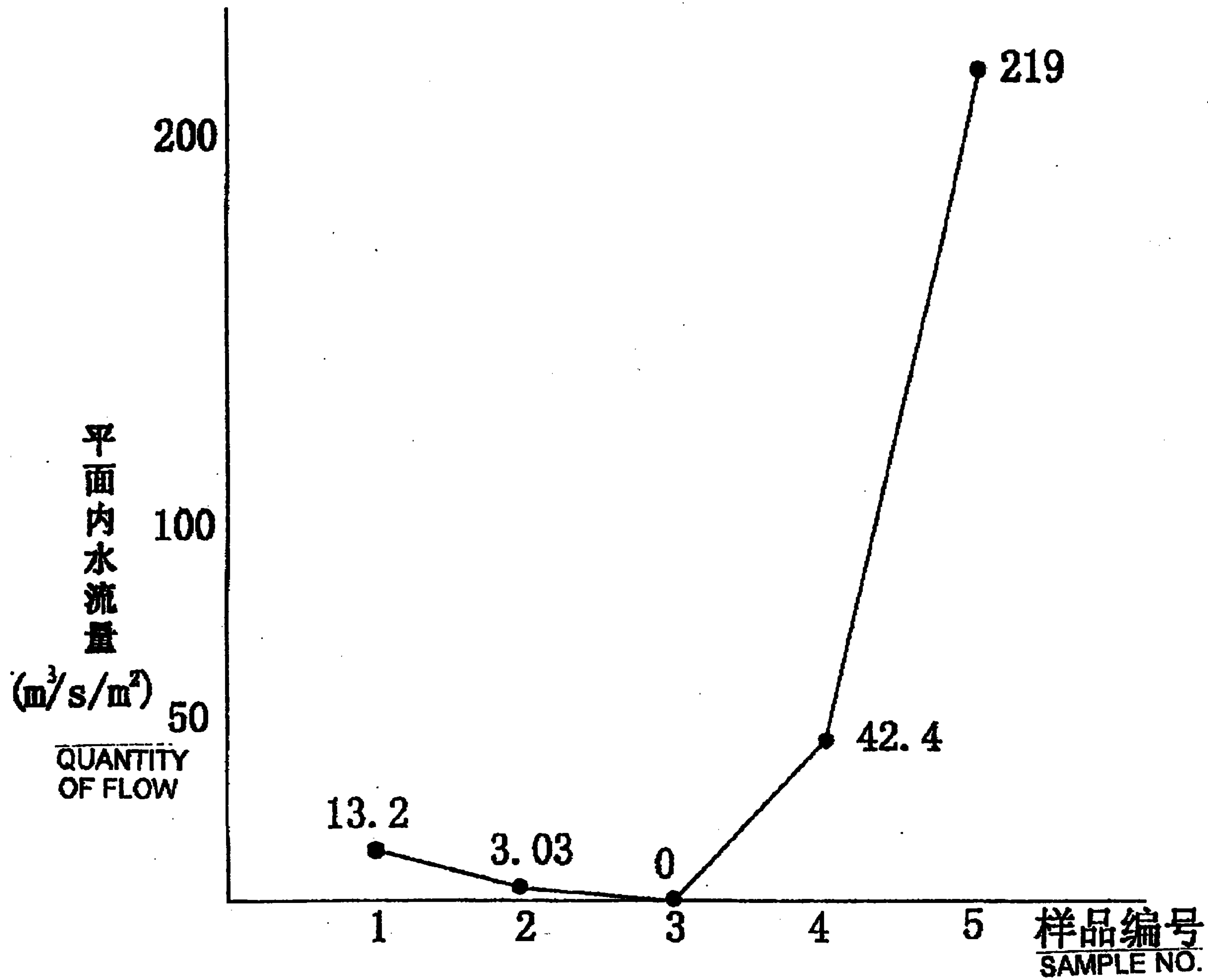
图四 垂直状态低水位平面内水流量示意图

DIAFRAM OF FLOW FOR VERTICALLY EMBEDED TESTING AT LOW WATER LEVEL



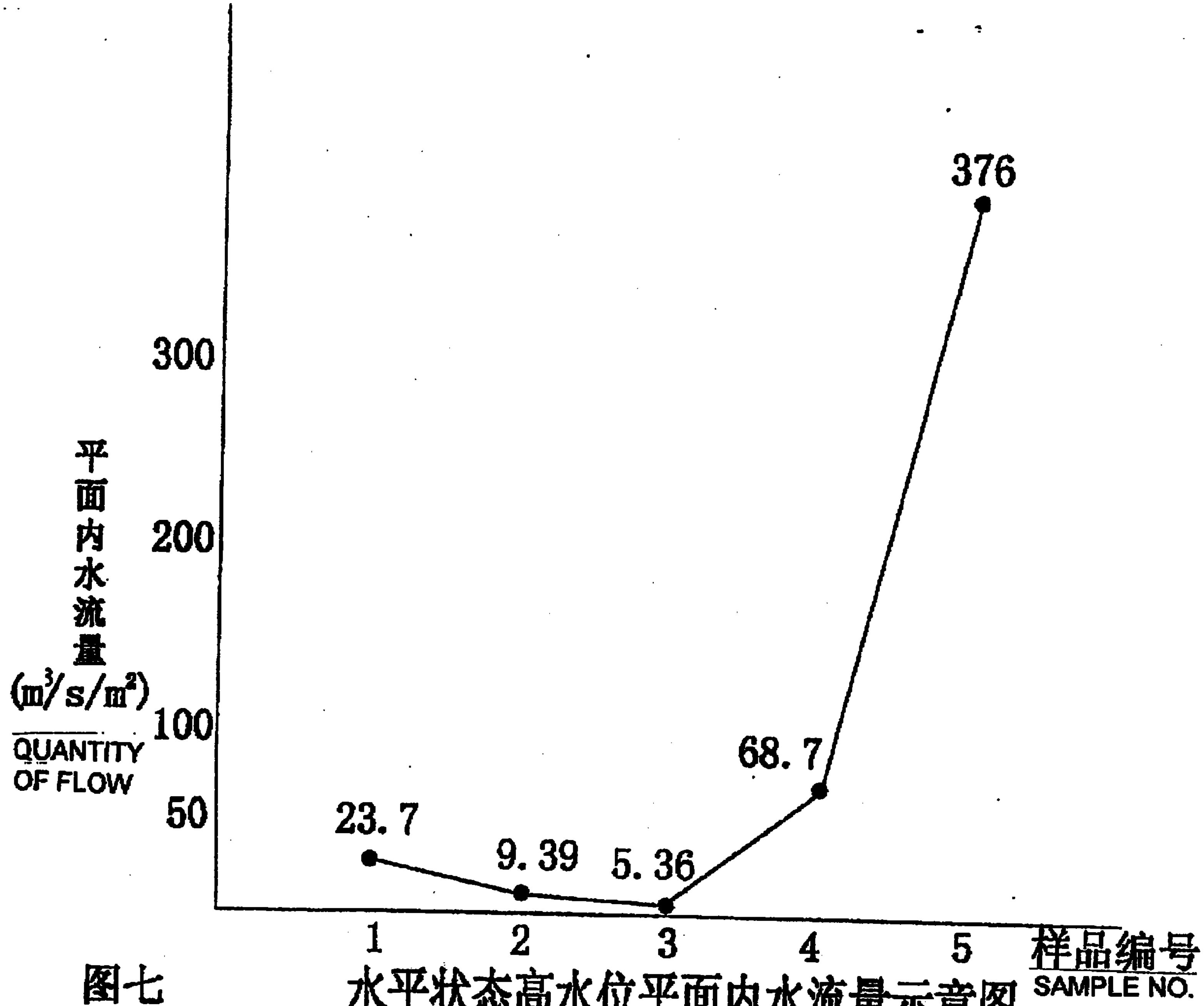
图五 垂直状态高水位平面内水流量示意图

DIAFRAM OF FLOW FOR VERTICALLY EMBEDED TESTING AT HIGH WATER LEVEL



图六 水平状态低水位平面内水流量示意图

DIAFRAM OF FLOW FOR HORIZONTALLY EMBEDED TESTING AT LOW WATER LEVEL



图七 水平状态高水位平面内水流量示意图

DIAFRAM OF FLOW FOR HORIZONTALLY EMBEDED TESTING AT HIGH WATER LEVEL