PARSHALL FLUMES

Data Sheet

arkon
flow systems
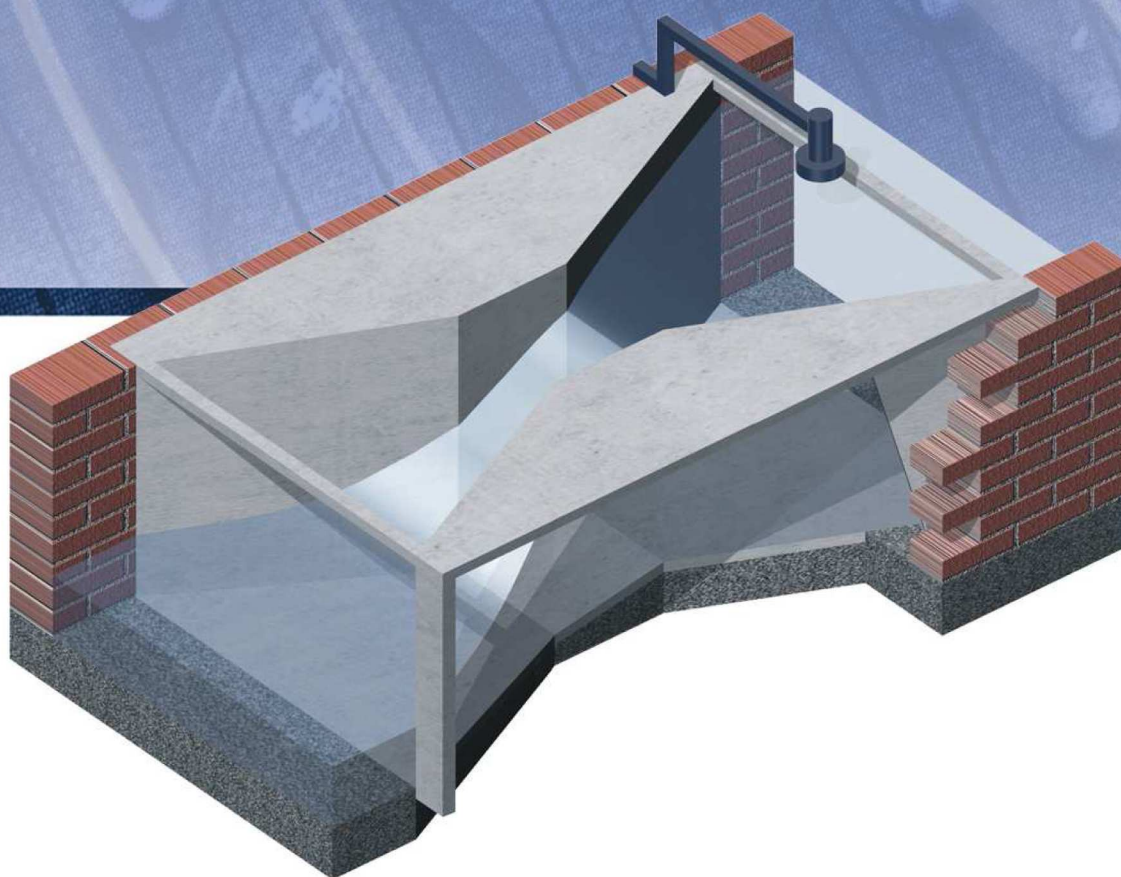
Parshall flume is a flow rate device with a wide range of application. It can be used for flow measurement in creeks, irrigation and/or drainage channels, sewer outfalls, Waste Water Treatment Plants, etc.

Main advantages can be summarised as follows:

a) A relatively low energy loss(3-4 times lower than in sharp-crested weirs).

b) A small sensitivity to a velocity distribution in an approach channel.

c) Flow rate measurement even under drowned conditions.

d) Velocities inside Parshall flumes are high enough to prevent them from the deposition of sediments or accumulation of debris.

e) Minimum maintenance requirements.

f) A wide range of flow rates.

g) A long lifetime.

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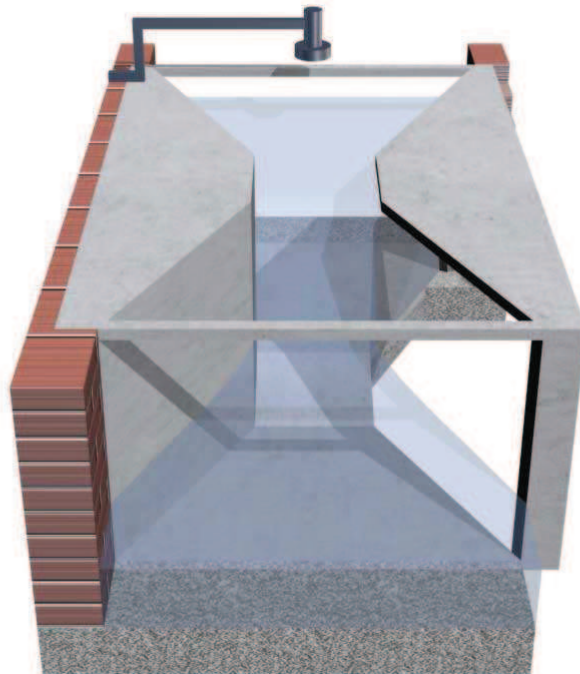
1.- The Parshall flume function

The flow rate measurement is based on the assumption that the critical flow is produced by constricting the width in the throat and then raising the bottom. The flow changes from subcritical to supercritical and then the measurement of a single depth is sufficient to determine the discharge. The water level is measured andrecorded either in the center line of the approach channel using an ultrasonic level sensor or inside a stilling manhole (which can be a part of Parshall flume) by means of a float with a mechanical transfer to a flow rate, or using a sensor with an electronic unit. The electronic unit transforms the measured flow depth to a flowrate.

2.- Technical data

Parshall flume is made of polypropylene and it is not commonly equipped with a float manhole. Precise dimensions and flume weights are shown in Table 1. These dimensions are compulsory for a site design, however some flume parts and a float manhole can be changed. Equation (1) is used for the flow rate calculation when the flow depth is recorded inside a stilling manhole or at the channel section B.

When using ultrasound sensor, a more suitable section profile B´ is located before the throat, see Figure 1, and a different rating curve is provided by the supplier.

Parshall flumes have been verified by the Czech Metrology Institute in June 1, 1995 under a certification No TCM 142/95-2075. A maximum uncertainty of +/- 1.5% of actual flow rate is achieved. Due to a larger uncertainty in the field measuring conditions, we guarantee +/- 3% of actual flow rate.

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	P1	P2	P3	P4	P5	P6	P7	P8	P9	
W	2.54	5.08	7.62	15.24	22.86	30.48	45.70	61.00	91.4	windth of throat (cm)
Q_{min}	0,26	0,52	0,78	1,52	2,25	2,91	4,4	5,8	8,7	maximum of flow (l/s)
Q_{max}	6,22	15,1	54,6	168	368	598	898	1211	1841	minimum of flow (l/s)
B	23.7	27.1	30.5	40.6	57.6	89.5	94.6	99.7	109.7	diameters of flume (cm)
C	9.3	13.49	17.80	39.4	38.1	61.0	76.2	91.44	121.9	
D	16.7	21.35	25.88	39.69	57.4	84.46	102.6	120.7	157.2	
E	23	26.4	46.7	62.0	80	92.5	92.5	92.5	92.5	
L	63.5	77.5	91.5	152.4	162	286.7	294.3	301.9	316.9	
O	5	5	5	10	10	10	15	20	20	**Discharge equation :** $Q = a \cdot h_a^b$ .... (m^3/s, m)
S	20	20	20	20	20	20	20	20	20	
U	24.8	28.6	49.2	69.6	87.6	100.1	100.1	100.1	100.1	
V	30.7	35.35	39.9	54.0	80	100	120	140	180	
a	0,612	0.121	0.182	0.363	0.535	0.689	1.054	1.425	2.186	parameters of equation
b	1.552	1.554	1.556	1.56	1.561	1.559	1.564	1.570	1.578	
m	9	10.6	19.1	49.0	81.0	146	183	231	252	weigt (kg)

(parameters are listed in cm, flume weights in kg)

Rating curve for a depth ha inside a stilling manhole:
$Q = a * h_{ba}$ ... [m3/s,m] /1/
ha ... flow depth in the distance B before the throat [m]
Equation for discharge in case that the flow depth is measured
at a distance B´ can be sent to the client.
Checking the drowned conditions:
The actual value of a ratio hd to ha must be lower than the values
specified in Table 2
ha ... flow depth at a distance B before the throat [m],
hd ... water depth behind the flume, see Figure 1 [m],

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max. 1:4

S

E h h_a

B`

B

L

U

h_z

h_d

O

V D

Pritok

W

C

max 45°
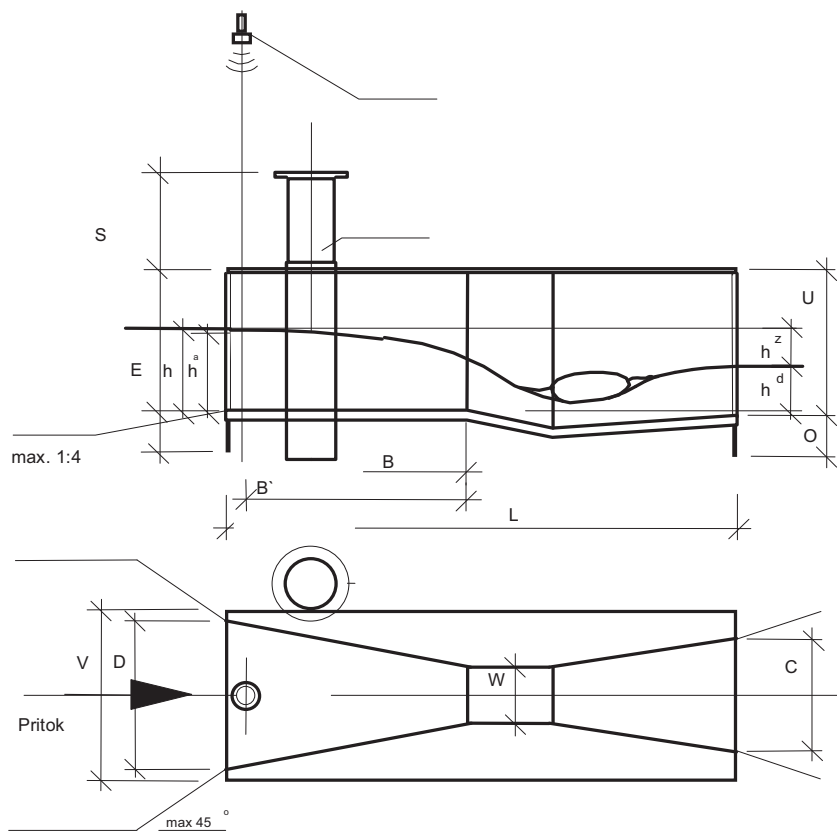
	P1	P2	P3	P4	P5	P6	P7	P8	P9
a	0,06124	0,1212	0,1818	0,3643	0,537	0,689	1,054	1,427	2,191
b	23,7	27,1	30,5	40,6	57,6	89,5	94,6	99,7	109,7
h_d / h_a	30,0	34,0	39,0	53,0	75,0	120,0	130,0	135,0	150,0
Q_{min}	9,29	13,49	17,8	39,4	38,1	61.0	76,2	91,44	121,9
Q_{max}	16,75	21,35	25,88	39,69	57,47	84,46	102,6	120,7	157,2

(flow rates are given in l/s)

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3.- Operational conditions

Parshall flumes are made of polypropylene and are designed to measure for water flow measurements. The flume is resistant to air temperatures (up to 80 oC), however, water inside the flume must not get frozen. Moreover, Parshall flume can stand up well the solutions of inorganic salts, acids and bases that do not exhibit strong oxidation properties, and a majority of organic solvents. It is recommended once a year to clean a stilling manhole and a connecting pipe between the flume and the manhole. In flows carrying sediments, it is recommended to carry out the inspection and maintenance more often. Maximum size of suspended solids is limited to 80% of the throat width (dmax = 0.8 w).

Water temperature from 0oC up to 80° C

Diameter of suspended solids less then 0,8 x w (80% of the windth of throat)

Free - surface water flow

Measurement error under operational conditions is less then ±2.5 %

CONDITIONS OF TRADE

- flume sizes P1 - P5 are delivered immediately,larger sizes within a month
- standard flumes are delivered without a gauge shaft;
- electronic flowmeters with ultrasonic transducer are attached on customer's request
- hydraulic calculation of Parshall flume installations and other types of measuring system are provided (via E mail)
- checking of your hydraulic project of Parshall flume is free

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