

SELECTED REFERENCES - FLOW MEASUREMENTS

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- Driscoll, Fletcher G., 1986, Groundwater and Wells 2nd ed.: Johnson Division, St. Paul MN p. 909 – 1072.
- Eli, Robert, Pedersen, Harald, and Snyder, Ronald, 1980, Calibration of a 90-degree V-notch Weir using Parameters Other Than Upstream Head: U.S. Environmental Protection Agency, Office of Research and Development, Cincinnati OH, EPA-600/4-80-035, 93 p.
- American Society for Testing and Materials, 1994, ASTM D 5242 – 92, Standard Test Method for Open-Channel Flow Measurements of Water with Thin-Plate Weirs: Annual Book of ASTM Standards Vol. 11.01 Water p.170 - 176

Volumetric Discharge Measurements (Bucket & Stopwatch)

General Formula: Flow (Gallons per minute) = 60(seconds/min) / Time (seconds) * gallons

Time (seconds)	125 ml Bottle	500 ml Bottle	1 Gallon Bucket	2 Gallon Bucket	2.5 Gallon Bucket	5 Gallon Bucket
	GPM	GPM	GPM	GPM	GPM	GPM
1	1.98	7.92	60	120.00	150.00	300.00
2	0.99	3.96	30.00	60.00	75.00	150.00
3	0.66	2.64	20.00	40.00	50.00	100.00
4	0.50	1.98	15.00	30.00	37.50	75.00
5	0.40	1.58	12.00	24.00	30.00	60.00
6	0.33	1.32	10.00	20.00	25.00	50.00
7	0.28	1.13	8.57	17.14	21.43	42.86
8	0.25	0.99	7.50	15.00	18.75	37.50
9	0.22	0.88	6.67	13.33	16.67	33.33
10	0.20	0.79	6.00	12.00	15.00	30.00
11	0.18	0.72	5.45	10.91	13.64	27.27
12	0.17	0.68	5.00	10.00	12.50	25.00
13	0.16	0.61	4.62	9.23	11.54	23.08
14	0.14	0.57	4.29	8.57	10.71	21.43
15	0.13	0.53	4.00	8.00	10.00	20.00
16	0.12	0.50	3.75	7.50	9.38	18.75
17	0.12	0.47	3.53	7.06	8.82	17.65
18	0.11	0.44	3.33	6.67	8.33	16.67
19	0.10	0.42	3.16	6.32	7.89	15.79
20	0.10	0.40	3.00	6.00	7.50	15.00
21	0.09	0.38	2.88	5.71	7.14	14.29
22	0.09	0.36	2.73	5.45	6.82	13.64
23	0.09	0.34	2.61	5.22	6.52	13.04
24	0.08	0.33	2.50	5.00	6.25	12.50
25	0.08	0.32	2.40	4.80	6.00	12.00
26	0.08	0.30	2.31	4.62	5.77	11.54
27	0.07	0.29	2.22	4.44	5.56	11.11
28	0.07	0.28	2.14	4.29	5.38	10.71
29	0.07	0.27	2.07	4.14	5.17	10.34
30	0.07	0.26	2.00	4.00	5.00	10.00
31	0.06	0.26	1.94	3.87	4.84	9.68
32	0.06	0.25	1.88	3.75	4.69	9.38
33	0.06	0.24	1.82	3.64	4.55	9.09
34	0.06	0.23	1.76	3.53	4.41	8.82
35	0.06	0.23	1.71	3.43	4.29	8.57
36	0.06	0.22	1.67	3.33	4.17	8.33
37	0.05	0.21	1.62	3.24	4.05	8.11
38	0.05	0.21	1.58	3.16	3.95	7.89
39	0.05	0.20	1.54	3.08	3.85	7.69
40	0.05	0.20	1.50	3.00	3.75	7.50
41	0.05	0.19	1.46	2.93	3.66	7.32
42	0.05	0.19	1.43	2.86	3.57	7.14
43	0.05	0.18	1.40	2.79	3.49	6.98
44	0.05	0.18	1.36	2.73	3.41	6.82
45	0.04	0.18	1.33	2.67	3.33	6.67
46	0.04	0.17	1.30	2.61	3.26	6.52
47	0.04	0.17	1.28	2.55	3.19	6.38
48	0.04	0.17	1.25	2.50	3.13	6.25
49	0.04	0.16	1.22	2.45	3.06	6.12
50	0.04	0.16	1.20	2.40	3.00	6.00
51	0.04	0.16	1.18	2.35	2.94	5.88
52	0.04	0.15	1.15	2.31	2.88	5.77
53	0.04	0.15	1.13	2.26	2.83	5.66
54	0.04	0.15	1.11	2.22	2.78	5.56
55	0.04	0.14	1.09	2.18	2.73	5.45
56	0.04	0.14	1.07	2.14	2.68	5.36
57	0.03	0.14	1.05	2.11	2.63	5.26
58	0.03	0.14	1.03	2.07	2.59	5.17
59	0.03	0.13	1.02	2.03	2.54	5.08
60	0.03	0.13	1.00	2.00	2.50	5.00

90° Degree V-notch Weirs

General formula: $Q=aH^b$

where: Q = Discharge ft³/sec
 H = Head of water above apex
 a = 3.052
 b = 2.466

H (Inches)	H (feet)	Q gal/min	H (Inches)	H (feet)	Q gal/min
0.5	0.04167	0.54	6	0.50000	247.91
0.6	0.05000	0.85	6.1	0.50833	258.23
0.7	0.05833	1.24	6.2	0.51667	268.79
0.8	0.06667	1.72	6.3	0.52500	279.61
0.9	0.07500	2.30	6.4	0.53333	290.68
1	0.08333	2.99	6.5	0.54167	302.01
1.1	0.09167	3.78	6.6	0.55000	313.60
1.2	0.10000	4.68	6.7	0.55833	325.44
1.3	0.10833	5.71	6.8	0.56667	337.55
1.4	0.11667	6.85	6.9	0.57500	349.93
1.5	0.12500	8.12	7	0.58333	362.67
1.6	0.13333	9.52	7.1	0.59167	375.47
1.7	0.14167	11.06	7.2	0.60000	388.65
1.8	0.15000	12.73	7.3	0.60833	402.10
1.9	0.15833	14.55	7.4	0.61667	415.82
2	0.16667	16.51	7.5	0.62500	429.81
2.1	0.17500	18.62	7.6	0.63333	444.08
2.2	0.18333	20.88	7.7	0.64167	458.63
2.3	0.19167	23.30	7.8	0.65000	473.46
2.4	0.20000	25.88	7.9	0.65833	488.57
2.5	0.20833	28.62	8	0.66667	503.96
2.6	0.21667	31.53	8.1	0.67500	519.64
2.7	0.22500	34.60	8.2	0.68333	535.60
2.8	0.23333	37.85	8.3	0.69167	551.85
2.9	0.24167	41.27	8.4	0.70000	568.39
3	0.25000	44.87	8.5	0.70833	585.23
3.1	0.25833	48.65	8.6	0.71667	602.35
3.2	0.26667	52.61	8.7	0.72500	619.77
3.3	0.27500	56.76	8.8	0.73333	637.49
3.4	0.28333	61.09	8.9	0.74167	655.50
3.5	0.29167	65.62	9	0.75000	673.81
3.6	0.30000	70.34	9.1	0.75833	692.42
3.7	0.30833	75.26	9.2	0.76667	711.34
3.8	0.31667	80.38	9.3	0.77500	730.56
3.9	0.32500	85.69	9.4	0.78333	750.08
4	0.33333	91.21	9.5	0.79167	769.92
4.1	0.34167	96.94	9.6	0.80000	790.05
4.2	0.35000	102.87	9.7	0.80833	810.50
4.3	0.35833	109.02	9.8	0.81667	831.27
4.4	0.36667	115.38	9.9	0.82500	852.34
4.5	0.37500	121.95	10	0.83333	873.73
4.6	0.38333	128.75	10.1	0.84167	895.43
4.7	0.39167	135.76	10.2	0.85000	917.45
4.8	0.40000	142.99	10.3	0.85833	939.79
4.9	0.40833	150.45	10.4	0.86667	962.46
5	0.41667	158.14	10.5	0.87500	985.44
5.1	0.42500	166.05	10.6	0.88333	1008.74
5.2	0.43333	174.20	10.7	0.89167	1032.37
5.3	0.44167	182.57	10.8	0.90000	1056.33
5.4	0.45000	191.19	10.9	0.90833	1080.61
5.5	0.45833	200.04	11	0.91667	1105.23
5.6	0.46667	209.13			
5.7	0.47500	218.46			
5.8	0.48333	228.03			
5.9	0.49167	237.85			

ASTM D5242

V NOTCH WEIRS

$$Q = (8/15)(2g)^{1/2} C_{OT} \tan(\theta/2) H^{5/2}$$

WHERE H = HEAD MEASURED IN FEET
 MEASURED BEHIND THE WEIR AT
 A DISTANCE EQUAL TO $4H_{max}$ TO $5H_{max}$
 WHERE H_{max} IS THE MAXIMUM HEAD
 ON THE WEIR

g = ACCELERATION DUE TO GRAVITY
 $= 32.4 \text{ FT/SEC}^2$

θ = NOTCH ANGLE

C_{OT} DISCHARGE COEFFICIENT
 $= .579$ FOR 90° WEIRS
 $= .576$ FOR 60° WEIRS

Q = DISCHARGE IN CFS

90° WEIRS *

$$Q = 2.48 H^{5/2}$$

CONDITIONS (LIMITS)

$$H/P \leq 1.2$$

$$H/B \leq 0.4$$

$$P \geq 0.3 \text{ FT}$$

$$B \geq 2 \text{ FT}$$

$$0.15 \text{ FT} \leq H \leq 2 \text{ FT}$$

60° WEIRS

$$Q = 1.43 H^{5/2}$$

CONDITIONS (LIMITS)

$$H/P \leq 0.4$$

$$H/B \leq 0.2$$

$$P \geq 1.5 \text{ FT}$$

$$B \geq 3.0 \text{ FT}$$

$$0.15 \text{ FT} \leq H \leq 1.25 \text{ FT}$$

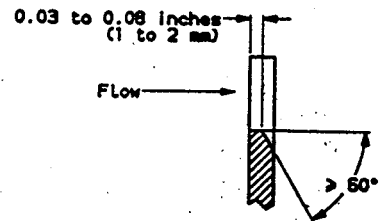
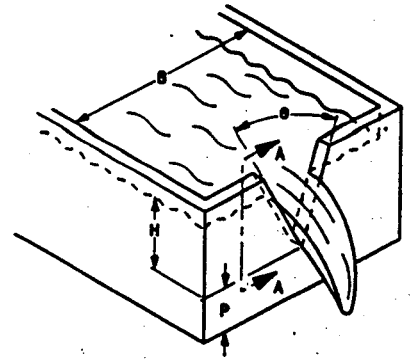
← FOR 90° WEIRS EPA PUBLICATION USES
 THE FOLLOWING EQUATION:

$$Q = a H^b \quad \text{WHERE } a = 3.052$$

$$b = 2.466$$

H IS IN FEET MEASURED AT THE NOTCH

Q = DISCHARGE IN CFS



Notch edge section (A-A).

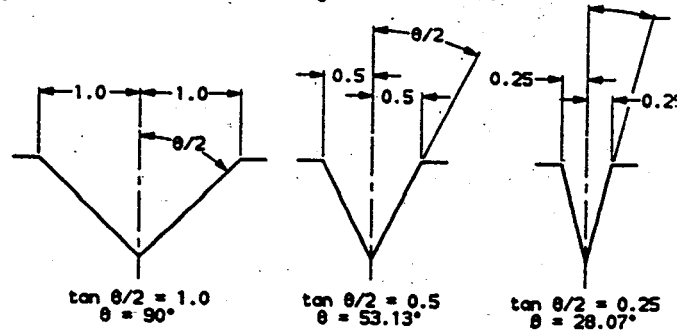


FIG. 4 Triangular Weirs

One and Three Foot Rectangular Weirs

$$Q=3.33(L-0.2H)H^{1.5}$$

where:

Q= Discharge ft³/sec

L= length of weir opening in feet

H= head on weir in feet

L= 1.0 (1 foot weir)

L= 3.0 (3 foot weir)

L= 1.0 (1 foot weir)					L= 3.0 (3 foot weir)			
H (inches)	H (feet)	H ^{1.5}	Q (ft ³ /sec)	Q (gal/min)	H (inches)	H (feet)	Q (ft ³ /sec)	Q (gal/min)
0.5	0.04	0.0085	0.028	12.61	0.5	0.04	0.085	38.03
0.6	0.05	0.0112	0.037	16.54	0.6	0.05	0.111	49.96
0.7	0.06	0.0141	0.046	20.61	0.7	0.06	0.140	62.92
0.8	0.07	0.0172	0.057	25.38	0.8	0.07	0.171	76.83
0.9	0.08	0.0205	0.067	30.24	0.9	0.08	0.204	91.83
1	0.08	0.0241	0.079	35.35	1	0.08	0.239	107.26
1.1	0.09	0.0278	0.091	40.72	1.1	0.09	0.276	123.67
1.2	0.10	0.0316	0.103	46.32	1.2	0.10	0.314	140.84
1.3	0.11	0.0357	0.116	52.13	1.3	0.11	0.354	158.71
1.4	0.12	0.0398	0.130	58.17	1.4	0.12	0.395	177.27
1.5	0.13	0.0442	0.143	64.40	1.5	0.13	0.438	196.49
1.6	0.13	0.0487	0.158	70.82	1.6	0.13	0.482	216.35
1.7	0.14	0.0533	0.173	77.43	1.7	0.14	0.528	236.81
1.8	0.15	0.0581	0.188	84.22	1.8	0.15	0.575	257.86
1.9	0.16	0.0630	0.203	91.18	1.9	0.16	0.623	279.49
2	0.17	0.0680	0.219	98.30	2	0.17	0.672	301.67
2.1	0.18	0.0732	0.235	105.68	2.1	0.18	0.723	324.40
2.2	0.18	0.0785	0.252	113.01	2.2	0.18	0.775	347.65
2.3	0.19	0.0839	0.269	120.60	2.3	0.19	0.828	371.41
2.4	0.20	0.0894	0.286	128.33	2.4	0.20	0.882	395.67
2.5	0.21	0.0951	0.303	136.19	2.5	0.21	0.937	420.42
2.6	0.22	0.1009	0.321	144.19	2.6	0.22	0.993	445.64
2.7	0.23	0.1067	0.339	152.33	2.7	0.23	1.050	471.33
2.8	0.23	0.1127	0.358	160.59	2.8	0.23	1.108	497.48
2.9	0.24	0.1188	0.376	168.97	2.9	0.24	1.168	524.07
3	0.25	0.1250	0.395	177.47	3	0.25	1.228	551.10
3.1	0.26	0.1313	0.415	186.09	3.1	0.26	1.289	578.55
3.2	0.27	0.1377	0.434	194.83	3.2	0.27	1.351	606.43
3.3	0.28	0.1442	0.454	203.67	3.3	0.28	1.414	634.72
3.4	0.28	0.1508	0.474	212.62	3.4	0.28	1.478	663.41
3.5	0.29	0.1575	0.494	221.68	3.5	0.29	1.543	692.50
3.6	0.30	0.1643	0.514	230.84	3.6	0.30	1.609	721.98
3.7	0.31	0.1712	0.535	240.10	3.7	0.31	1.675	751.85
3.8	0.32	0.1782	0.556	249.45	3.8	0.32	1.743	782.09
3.9	0.33	0.1853	0.577	258.90	3.9	0.33	1.811	812.70
4	0.33	0.1925	0.598	268.44	4	0.33	1.880	843.68
4.1	0.34	0.1997	0.620	278.07	4.1	0.34	1.950	875.02
4.2	0.35	0.2071	0.641	287.79	4.2	0.35	2.020	906.71
4.3	0.36	0.2145	0.663	297.60	4.3	0.36	2.092	938.75
4.4	0.37	0.2220	0.685	307.49	4.4	0.37	2.164	971.13
4.5	0.38	0.2296	0.707	317.46	4.5	0.38	2.237	1003.85
4.6	0.38	0.2373	0.730	327.51	4.6	0.38	2.310	1036.91
4.7	0.39	0.2451	0.752	337.63	4.7	0.39	2.385	1070.29
4.8	0.40	0.2530	0.775	347.84	4.8	0.40	2.460	1104.00
4.9	0.41	0.2609	0.798	358.11	4.9	0.41	2.536	1138.03
5	0.42	0.2690	0.821	368.46	5	0.42	2.612	1172.38
5.1	0.43	0.2771	0.844	378.88	5.1	0.43	2.689	1207.03
5.2	0.43	0.2853	0.868	389.37	5.2	0.43	2.767	1242.00
5.3	0.44	0.2935	0.891	399.92	5.3	0.44	2.846	1277.26
5.4	0.45	0.3019	0.915	410.54	5.4	0.45	2.925	1312.83
5.5	0.46	0.3103	0.939	421.23	5.5	0.46	3.005	1348.69
5.6	0.47	0.3188	0.963	431.97	5.6	0.47	3.086	1384.85
5.7	0.48	0.3274	0.987	442.78	5.7	0.48	3.167	1421.29
5.8	0.48	0.3360	1.011	453.64	5.8	0.48	3.249	1458.02
5.9	0.49	0.3448	1.035	464.57	5.9	0.49	3.331	1495.03
6	0.50	0.3536	1.060	475.55	6	0.50	3.414	1532.32
6.1	0.51	0.3624	1.084	486.58	6.1	0.51	3.498	1569.89
6.2	0.52	0.3714	1.109	497.67	6.2	0.52	3.582	1607.72
6.3	0.52	0.3804	1.134	508.81	6.3	0.52	3.667	1645.83
6.4	0.53	0.3895	1.159	520.01	6.4	0.53	3.753	1684.20
6.5	0.54	0.3987	1.184	531.25	6.5	0.54	3.839	1722.83
6.6	0.55	0.4079	1.209	542.54	6.6	0.55	3.925	1761.73
6.7	0.56	0.4172	1.234	553.88	6.7	0.56	4.013	1800.88
6.8	0.57	0.4266	1.259	565.26	6.8	0.57	4.100	1840.29
6.9	0.57	0.4360	1.285	576.69	6.9	0.57	4.189	1879.94
7	0.58	0.4455	1.311	588.16	7	0.58	4.278	1919.65

Two and Four Foot Rectangular Weirs

$$Q=3.33(L-0.2H)H^{1.5}$$

where:

Q= Discharge ft³/sec

L= length of weir opening in feet

H= head on weir in feet

L= 2.0 (2 foot weir)

L= 4.0 (4 foot weir)

L= 2.0 (2 foot weir)					L= 4.0 (4 foot weir)			
H (inches)	H (feet)	H ^{1.5}	Q (ft ³ /sec)	Q (gal/min)	H (inches)	H (feet)	Q (ft ³ /sec)	Q (gal/min)
0.5	0.04	0.0086	0.056	25.32	0.5	0.04	0.113	50.74
0.6	0.05	0.0112	0.074	33.26	0.6	0.05	0.149	66.67
0.7	0.06	0.0141	0.093	41.87	0.7	0.06	0.187	83.98
0.8	0.07	0.0172	0.114	51.11	0.8	0.07	0.229	102.66
0.9	0.08	0.0206	0.136	60.93	0.9	0.08	0.273	122.33
1	0.08	0.0241	0.159	71.31	1	0.08	0.319	143.21
1.1	0.09	0.0278	0.183	82.19	1.1	0.09	0.368	165.15
1.2	0.10	0.0316	0.209	93.58	1.2	0.10	0.419	188.10
1.3	0.11	0.0357	0.236	106.42	1.3	0.11	0.472	212.00
1.4	0.12	0.0398	0.262	117.72	1.4	0.12	0.528	236.83
1.5	0.13	0.0442	0.291	130.45	1.5	0.13	0.585	262.54
1.6	0.13	0.0487	0.320	143.58	1.6	0.13	0.644	289.11
1.7	0.14	0.0533	0.350	157.12	1.7	0.14	0.705	316.50
1.8	0.15	0.0581	0.381	171.04	1.8	0.15	0.768	344.69
1.9	0.16	0.0630	0.413	185.33	1.9	0.16	0.833	373.65
2	0.17	0.0680	0.446	199.99	2	0.17	0.899	403.36
2.1	0.18	0.0732	0.479	214.99	2.1	0.18	0.967	433.81
2.2	0.18	0.0785	0.513	230.33	2.2	0.18	1.036	464.96
2.3	0.19	0.0839	0.548	246.00	2.3	0.19	1.107	496.82
2.4	0.20	0.0894	0.584	262.00	2.4	0.20	1.179	529.34
2.5	0.21	0.0951	0.620	278.31	2.5	0.21	1.253	562.53
2.6	0.22	0.1009	0.657	294.92	2.6	0.22	1.329	596.37
2.7	0.23	0.1067	0.695	311.83	2.7	0.23	1.406	630.84
2.8	0.23	0.1127	0.733	329.03	2.8	0.23	1.484	665.93
2.9	0.24	0.1188	0.772	346.52	2.9	0.24	1.563	701.62
3	0.25	0.1250	0.812	364.29	3	0.25	1.644	737.91
3.1	0.26	0.1313	0.852	382.32	3.1	0.26	1.726	774.79
3.2	0.27	0.1377	0.893	400.63	3.2	0.27	1.810	812.23
3.3	0.28	0.1442	0.934	419.19	3.3	0.28	1.894	850.24
3.4	0.28	0.1508	0.976	438.02	3.4	0.28	1.980	888.81
3.5	0.29	0.1575	1.018	457.09	3.5	0.29	2.068	927.91
3.6	0.30	0.1643	1.062	476.41	3.6	0.30	2.158	967.55
3.7	0.31	0.1712	1.105	495.97	3.7	0.31	2.245	1007.72
3.8	0.32	0.1782	1.149	515.77	3.8	0.32	2.336	1048.41
3.9	0.33	0.1853	1.194	535.80	3.9	0.33	2.428	1089.60
4	0.33	0.1925	1.239	556.06	4	0.33	2.521	1131.30
4.1	0.34	0.1997	1.285	576.54	4.1	0.34	2.615	1173.49
4.2	0.35	0.2071	1.331	597.25	4.2	0.35	2.710	1216.16
4.3	0.36	0.2145	1.377	618.17	4.3	0.36	2.806	1259.32
4.4	0.37	0.2220	1.424	639.31	4.4	0.37	2.903	1302.95
4.5	0.38	0.2296	1.472	660.65	4.5	0.38	3.001	1347.06
4.6	0.38	0.2373	1.520	682.21	4.6	0.38	3.101	1391.61
4.7	0.39	0.2451	1.569	703.96	4.7	0.39	3.201	1436.62
4.8	0.40	0.2530	1.617	726.92	4.8	0.40	3.302	1482.09
4.9	0.41	0.2609	1.667	749.07	4.9	0.41	3.405	1527.99
5	0.42	0.2690	1.717	770.42	5	0.42	3.508	1574.33
5.1	0.43	0.2771	1.767	792.96	5.1	0.43	3.612	1621.11
5.2	0.43	0.2853	1.817	815.68	5.2	0.43	3.717	1668.31
5.3	0.44	0.2935	1.869	838.59	5.3	0.44	3.823	1715.94
5.4	0.45	0.3019	1.920	861.69	5.4	0.45	3.930	1763.98
5.5	0.46	0.3103	1.972	884.96	5.5	0.46	4.038	1812.43
5.6	0.47	0.3188	2.024	908.41	5.6	0.47	4.147	1861.29
5.7	0.48	0.3274	2.077	932.04	5.7	0.48	4.257	1910.55
5.8	0.48	0.3360	2.130	955.83	5.8	0.48	4.368	1960.21
5.9	0.49	0.3448	2.183	979.80	5.9	0.49	4.479	2010.27
6	0.50	0.3536	2.237	1003.94	6	0.50	4.592	2060.71
6.1	0.51	0.3624	2.291	1028.24	6.1	0.51	4.705	2111.54
6.2	0.52	0.3714	2.346	1052.70	6.2	0.52	4.819	2162.75
6.3	0.52	0.3804	2.400	1077.32	6.3	0.52	4.934	2214.34
6.4	0.53	0.3895	2.456	1102.10	6.4	0.53	5.050	2266.30
6.5	0.54	0.3987	2.511	1127.04	6.5	0.54	5.166	2318.53
6.6	0.55	0.4079	2.567	1152.13	6.6	0.55	5.284	2371.32
6.7	0.56	0.4172	2.623	1177.38	6.7	0.56	5.402	2424.38
6.8	0.57	0.4266	2.680	1202.77	6.8	0.57	5.521	2477.80
6.9	0.57	0.4360	2.737	1228.32	6.9	0.57	5.641	2531.57
7	0.58	0.4455	2.794	1254.01	7	0.58	5.761	2585.69

RECTANGULAR WEIRS

$$Q = 3.33(L - 0.2H)H^{1.5}$$

L = LENGTH OF WEIR OPENING IN FT

H = HEAD ON WEIR IN FEET. HEAD MUST BE MEASURED BACK IN THE POOL AT A DISTANCE AT LEAST $4H_{max}$ TO $5H_{max}$ WHERE H_{max} IS THE MAXIMUM HEAD ON THE WEIR

Q = DISCHARGE IN CFS

CONDITIONS (LIMITS) OF APPLICATION :

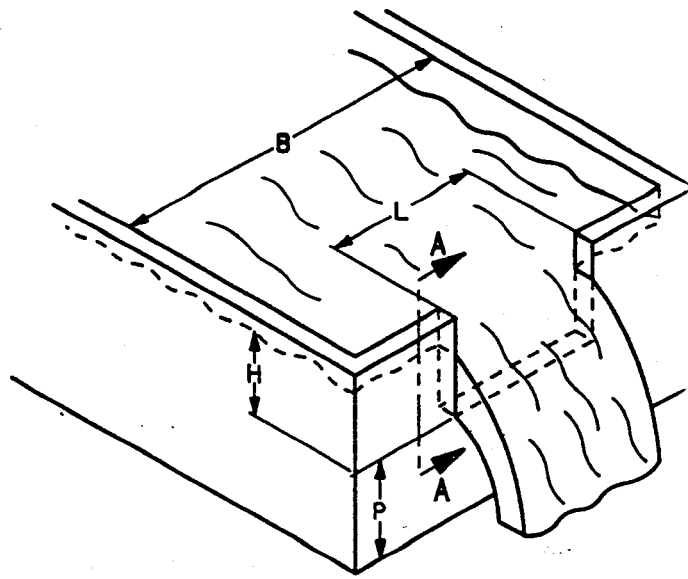
$$H/P \leq 2$$

$$H \geq 0.1 \text{ FT}$$

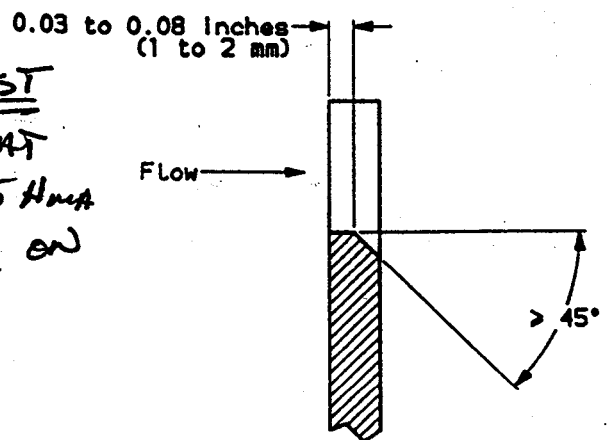
$$L \geq 0.5 \text{ FT}$$

$$P \geq 0.3 \text{ FT}$$

NOTE: THE ABOVE EQUATION MAY BE INVALID FOR $L > 4.0 \text{ FT}$ AND/OR $H > 2.0 \text{ FT}$ ACCORDING TO ASTM D5242



B = CHANNEL WIDTH



Notch edge section (A-A).

Stream Flow Measurements – General Notes

Open Channel Flow: The discharge is calculated using the following equation

$$Q = V_m * A$$

Where:

Q = Discharge in cubic feet per second
V_m = Mean (average) velocity in feet per second
A = cross-sectional area in square feet

The cross-sectional area is determined by measurements of water depth (D) and corresponding channel section length (L); $A = L * D$

In order to convert the flow in cubic feet per second (CFS) to Gallons per Minute (GPM) multiply this number by 448.8

$$Q(\text{GPM}) = Q(\text{CFS}) * 448.8$$

Velocity Distribution: Flow velocities vary both across the stream and also with depth. We can account for the difference across the stream section by taking a number of velocity measurements. Since the flow also varies with depth at any given point in the stream, there are also methods to deal with this problem in order to give us a reasonable estimate of the average (mean) velocity (V_m)

For stream depths of 2.5 feet or less a velocity taken at 6/10 ths of the total depth is assumed to be representative of the mean velocity (V_m)

For stream depths of 2.5 feet or greater 2 velocity measurements are made one at 2/10 ths and one at 8/10 ths of the total depth. The average of these two measurements is assumed to be the mean velocity (V_m)

When using a floating object you are actually measuring the surface velocity and this measurement should be multiplied by 0.85 in order to be representative of the mean velocity (V_m).

Site selection: In order to obtain the best possible accuracy you should select a portion of the stream that has the following characteristics:

1. A straight reach with flow parallel to the streambanks
2. A stable streambed free of large rocks, weeds and obstructions.
3. The channel should have as much straight run as possible look for sections which have straight upstream lengths which are at least twice the width of the stream
4. Avoid areas immediately downstream of bridges, culverts and other obstructions.

Stream Flow Measurement using the Floating Object Method

Stream Station: _____

Date: _____

EXAMPLE

Method: measure a section along the streambank and determine the time it takes for a float to travel this distance. The section length should be long enough so that the float is timed for at least 10 to 20 seconds. Do this in at least 5 (depending upon stream width) different points across the width of the stream. Repeat the measurement at least 3 times at each point and determine the average time at each point. Also measure the water depth at each point in order to determine the cross-sectional area. The Discharge (Q) is determined multiplying the velocity (V) by the cross-sectional area (A). It is important to note that the surface velocity you have determined with the floating object should be adjusted to represent the average sectional velocity. This is done by multiplying the surface velocity by 0.85.

Float Section Length = 20 feet

Location (from left Bank)	Section width (feet)	Water Depth (feet)	Trial 1 Time (seconds)	Trial 2 Time (seconds)	Trial 3 Time (seconds)	Average Time (seconds)	Average velocity (ft/sec)	Adjusted velocity (ft/sec)	Section Discharge (ft ³ /sec)
2	3	0.2	20	25	24	23	0.87	0.74	0.44
4	2	0.5	19	15	17	17	1.18	1.00	1.00
6	2	1	15	14	15	14.7	1.36	1.16	2.32
8	2	0.6	20	22	22	21.3	0.94	0.80	0.96
10	3	0.2	23	25	26	24.7	0.81	0.69	0.41

Total Discharge = $0.44+1.00+2.32+0.96+0.41$
 = 5.13 ft³/sec
 = 2302 gallons per minute

Average Time = $(\text{Trial 1} + \text{Trial 2} + \text{Trial 3}) / 3$
 Average Velocity (ft/sec) = $\text{Float Sectional Length (feet)} / \text{Average Time (seconds)}$
 Adjusted Velocity (ft/sec) = $\text{Average velocity (ft/sec)} * 0.85$
 Section Discharge (ft³/sec) = $\text{Section width (ft)} * \text{Water Depth (ft)} * \text{Adjusted Velocity (ft/sec)}$

Total Discharge (ft³/sec) = sum of section discharges

Note : to convert the discharge from ft³/sec (cubic feet per second) to gallons per minute multiply by 448.8