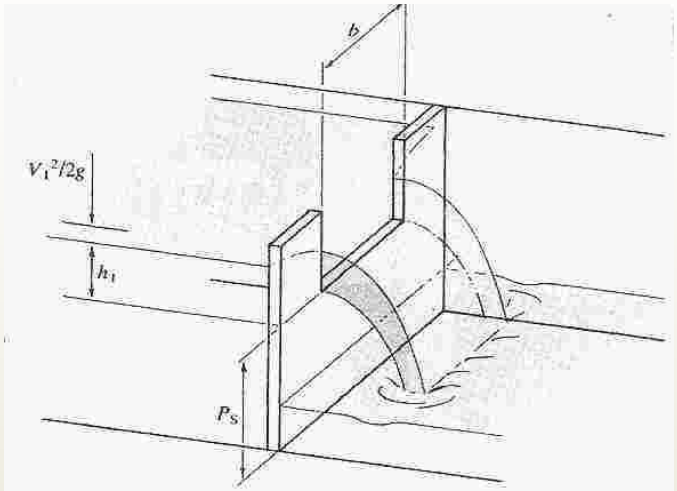
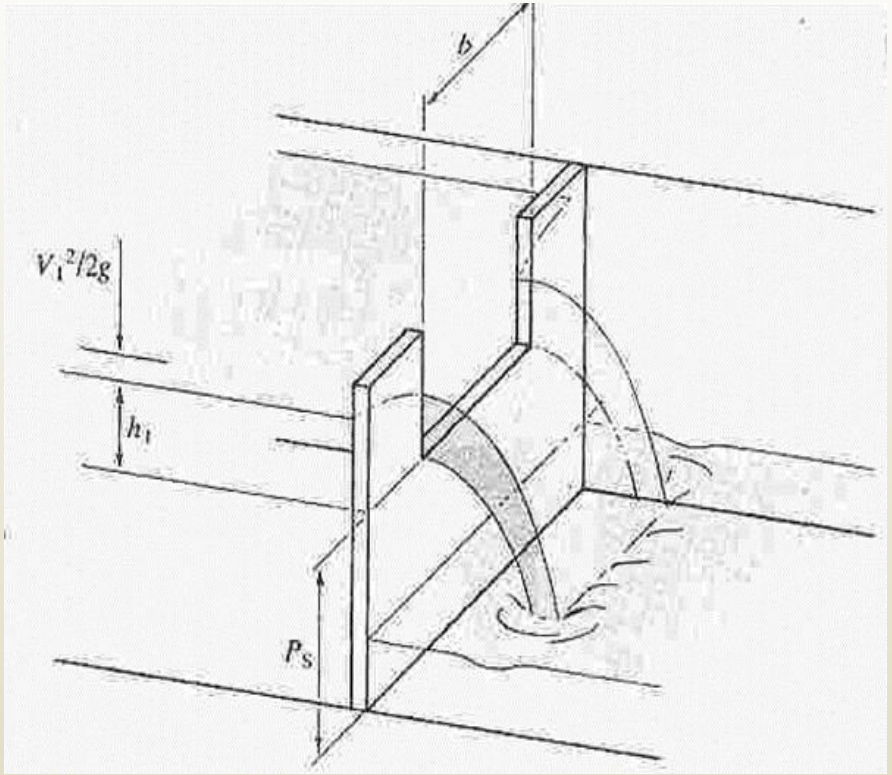
Open channel flow measurement

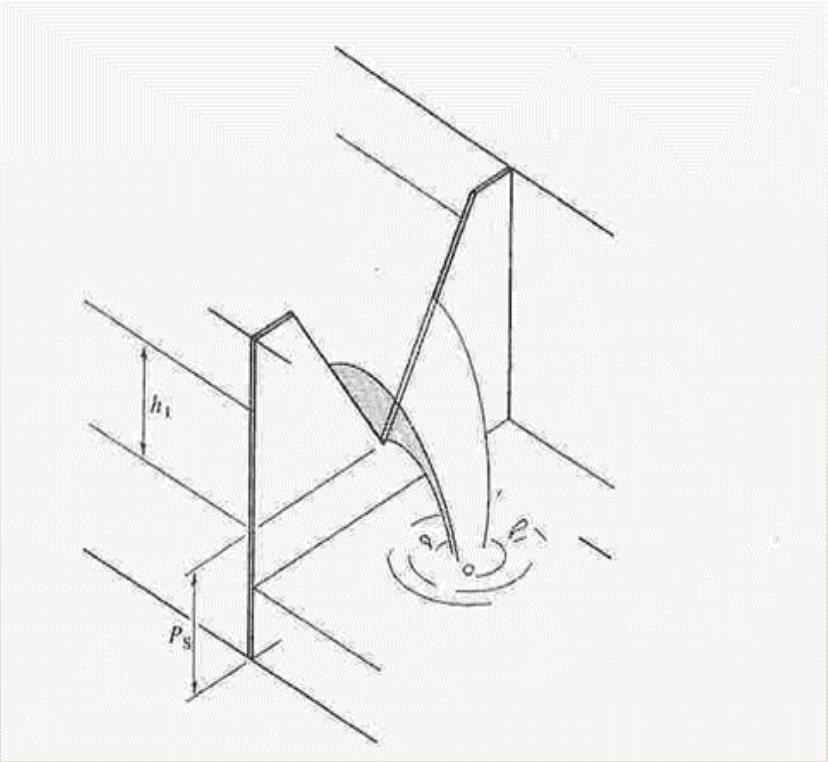
Measuring structures



Permanent weirs - rectangular



Permanent weirs: v-notch

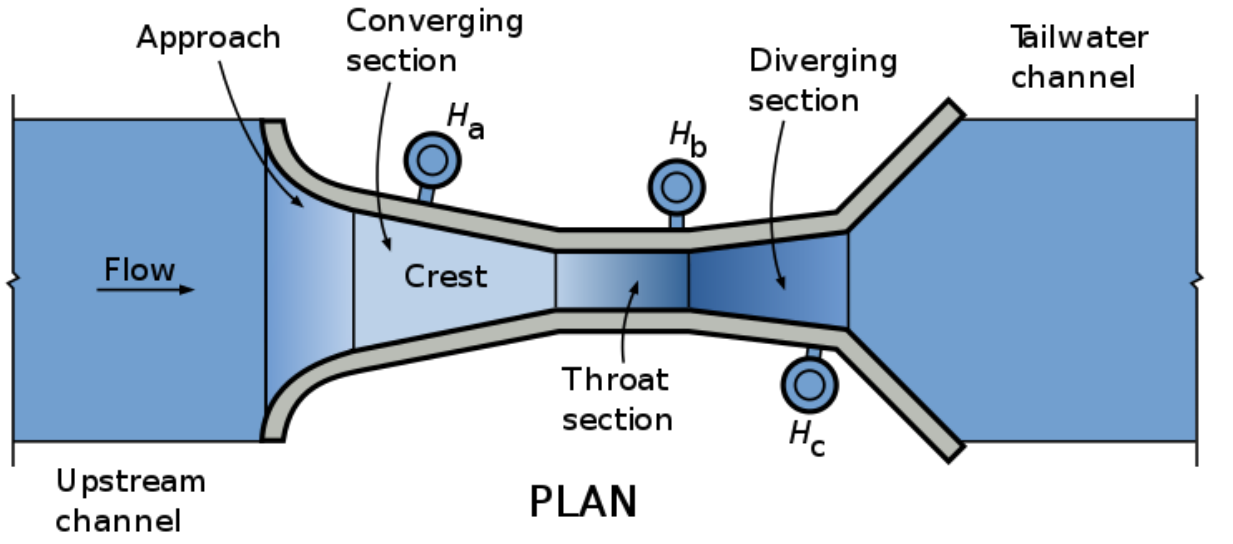


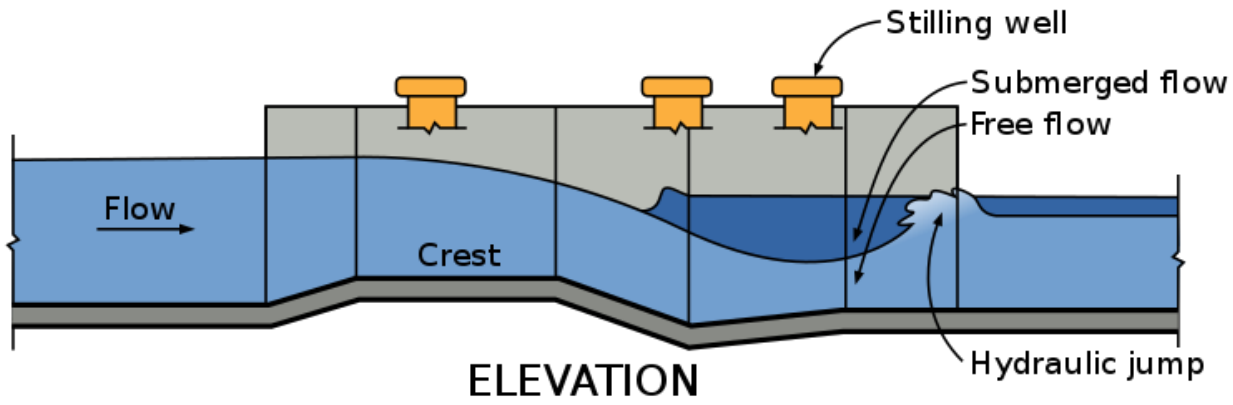
Francis equations

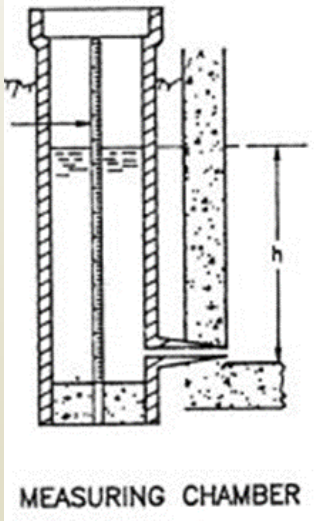
Weir type	Metric equations	Imperial equations
Cipolletti	$Q = 1{,}86Lh^{1,5}$	$Q = 3{,}367Lh^{1,5}$
90° V-notch	$Q = 1{,}38h^{2,5}$	$Q = 2{,}50h^{2,5}$
Rectangular, submerged	$Q = 1{,}84Lh^{1,5}$	$Q = 3{,}33Lh^{1,5}$
Rectangular with end contractions	$Q = 1{,}84(L-0{,}2h)h^{1,5}$	$Q = 3{,}33(L-0{,}2h)h^{1,5}$
Units	Q : [m^3/s] h : [metre] L : [metre]	Q : [cusec] h : [feet] L : [feet]

Permanent flumes: Parshall

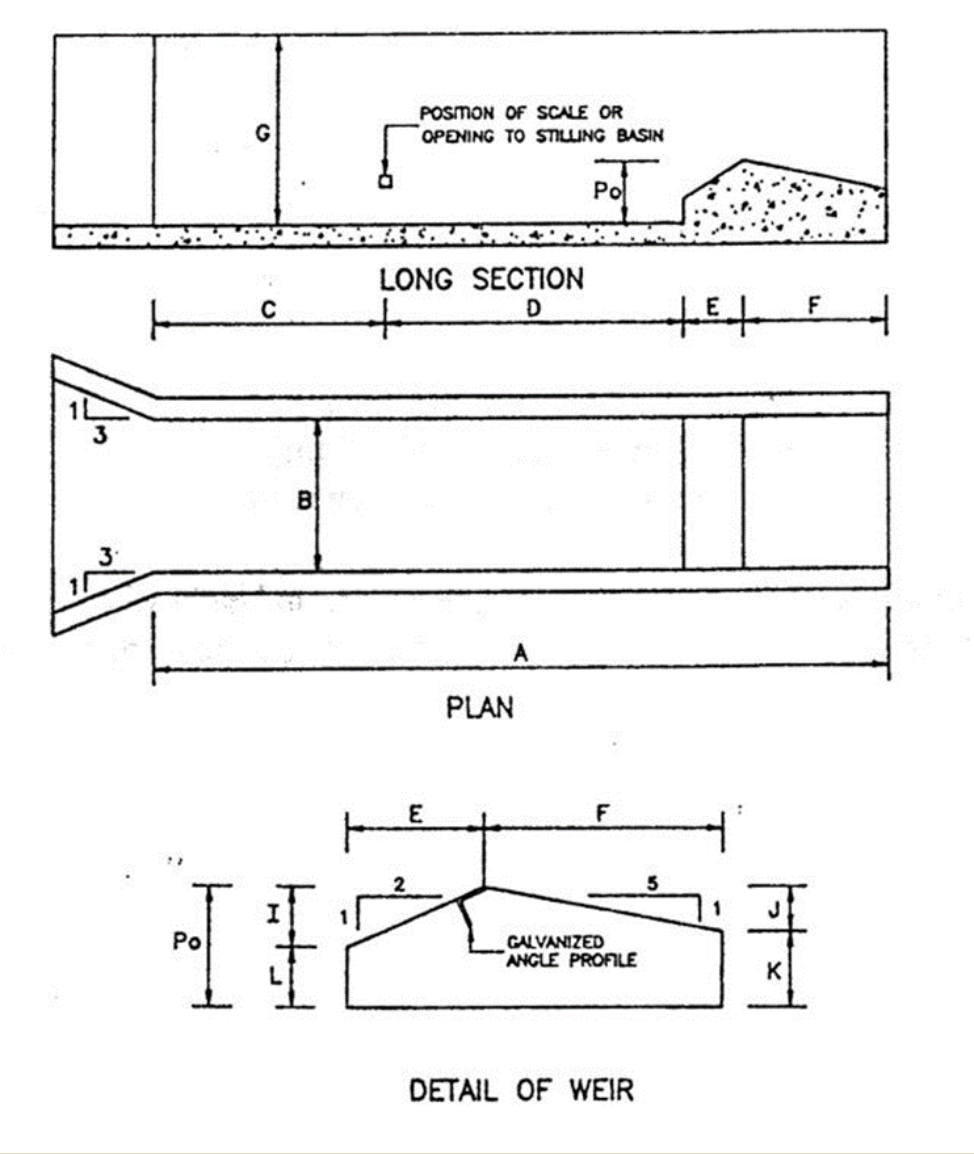
Parshall flume





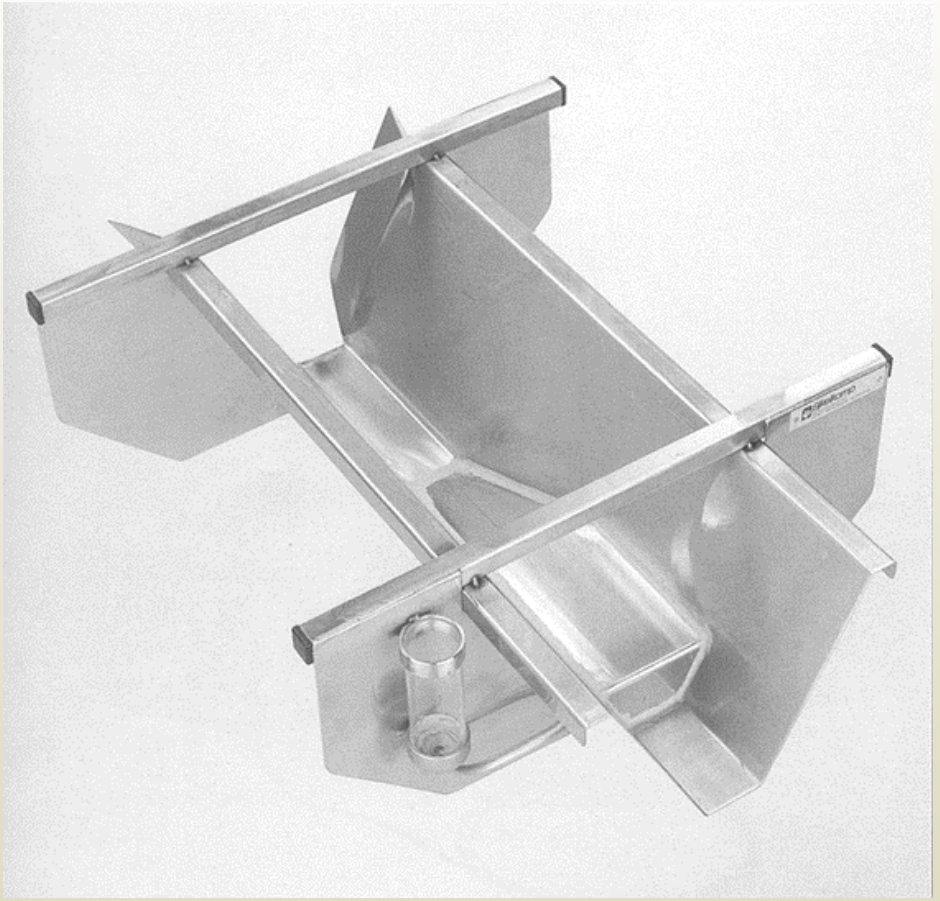


Crump weir

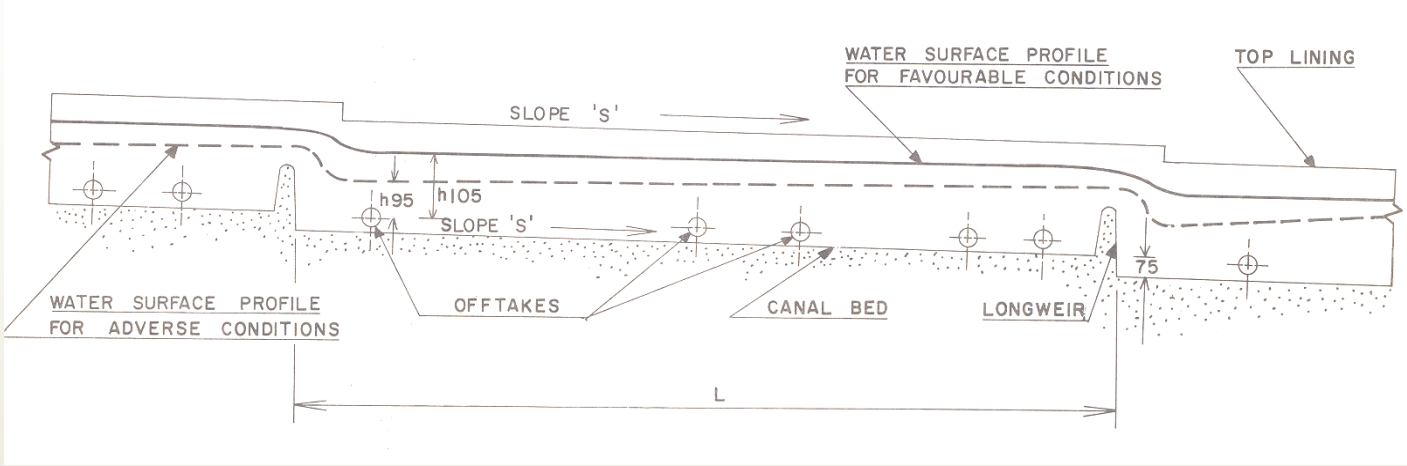

G
POSITION OF SCALE OR
OPENING TO STILLING BASIN
Po
LONG SECTION
C
D
E
F
1
3
B
3
1
A
PLAN
E
F
2
5
1
1
I
L
Po
J
K
GALVANIZED
ANGLE PROFILE
DETAIL OF WEIR

Portable flumes

- Applications:
  - Flow
    - Small canals



Off-takes/ Orifice outlets

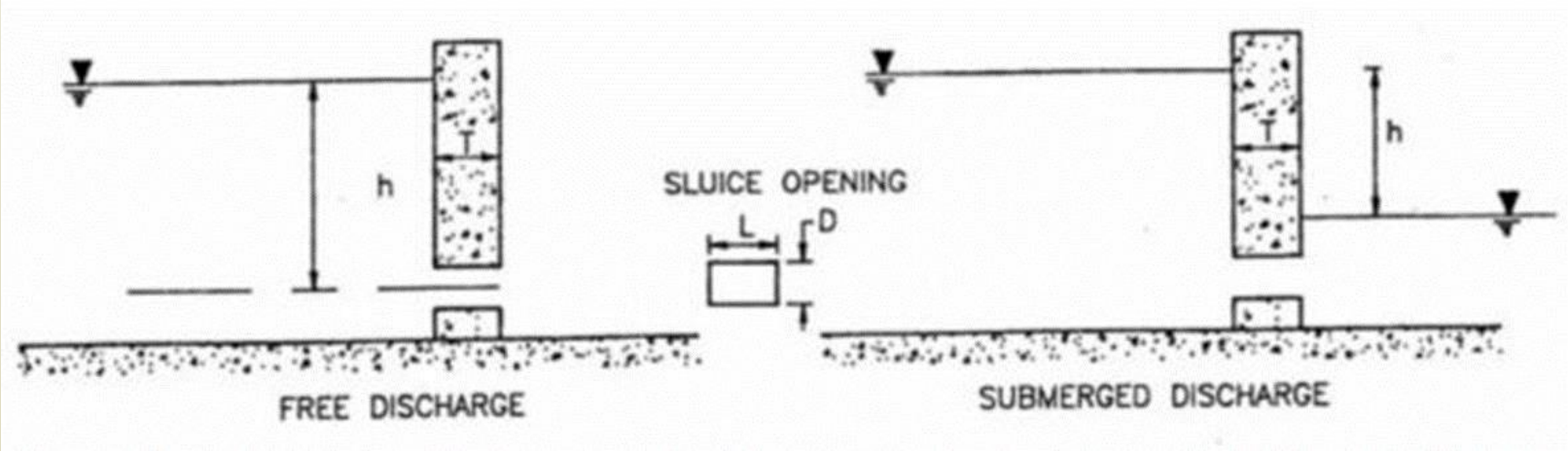


Parshall flume

Pressure regulated sluice gate

Orifice outlets

$$Q = CA\sqrt{2gh}$$

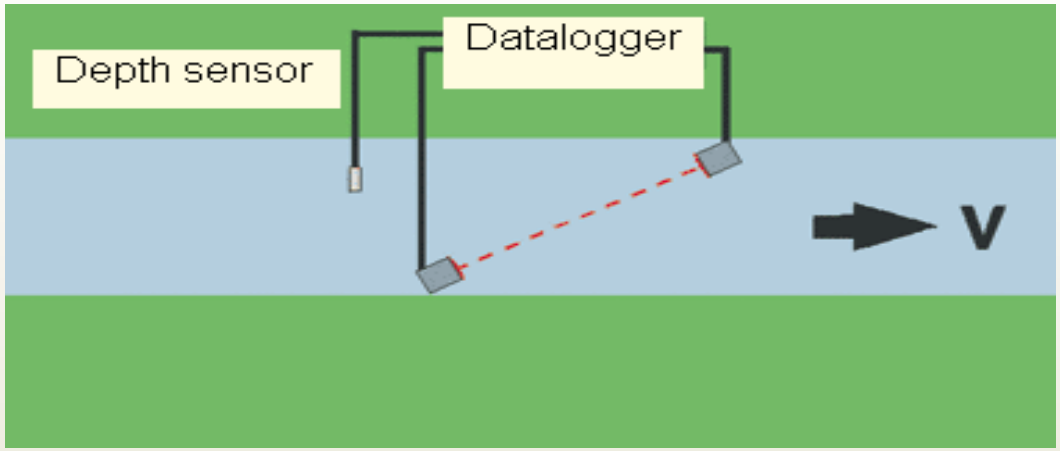


Structures in unlined canals

Meter on an orifice outlet

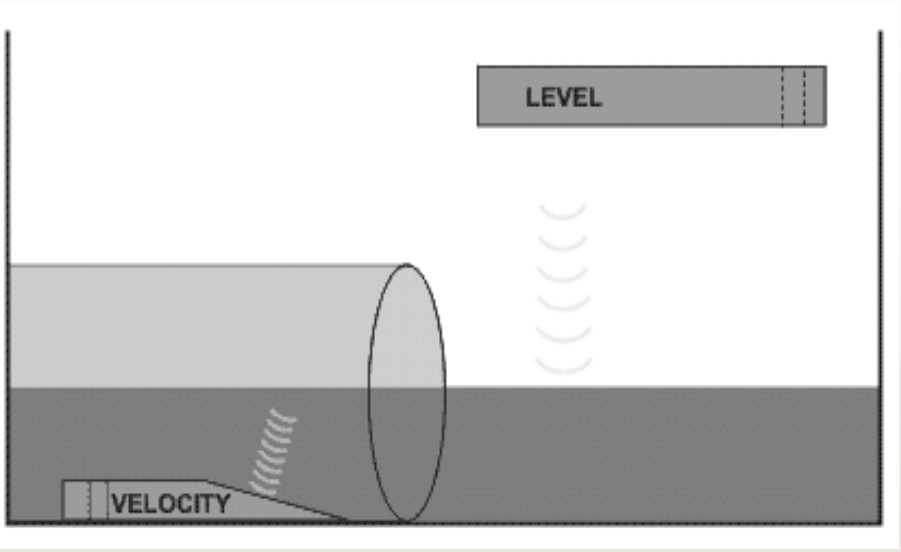
Meter on an orifice outlet

Alternative to structures



Ultrasonic transit time single path arrangement (OTT Hydrometry, 2005)

Alternatives to structures



Acoustic Doppler Velocity Meters (ADVM)

Portable / Temporary measurements