PROPERTIES OF OPEN CHANNEL

Artificial channels

These are channels made by man. They include irrigation canals, navigation canals, spillways, sewers, culverts and drainage ditches. They are usually constructed in a regular cross-section shape throughout - and are thus prismatic channels (they don't widen or get narrower along the channel.

In the field they are commonly constructed of concrete, steel or earth and have the surface roughness' reasonably well defined (although this may change with age - particularly grass lined channels.) Analysis of flow in such well defined channels will give reasonably accurate results.

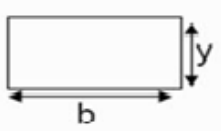
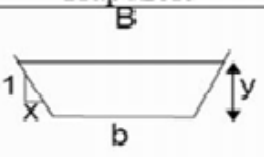
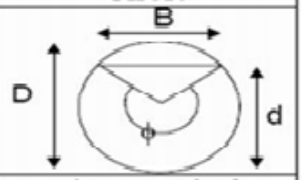
Natural channels

Natural channels can be very different. They are not regular nor prismatic and their materials of construction can vary widely (although they are mainly of earth this can possess many different properties.) The surface roughness will often change with time distance and even elevation.

Consequently it becomes more difficult to accurately analyse and obtain satisfactory results for natural channels than is does for man made ones. The situation may be further complicated if the boundary is not fixed i.e. erosion and deposition of sediments.

Geometric properties necessary for analysis

For analysis various geometric properties of the channel cross-sections are required. For artificial channels these can usually be defined using simple algebraic equations given y the depth of flow.

	Rectangle	Trapezoid	Circle
			
Area, A	by	$(b+xy)y$	$\frac{1}{8}(\phi-\sin\phi)D^2$
Wetted perimeter P	$b+2y$	$b+2y\sqrt{1+x^2}$	$\frac{1}{2}\phi D$
Top width B	b	$b+2xy$	$(\sin\phi/2)D$

Hydraulic radius R	$by/(b+2y)$	$\frac{(b+xy)y}{b+2y\sqrt{1+x^2}}$	$\frac{1}{4}\left(1-\frac{\sin\phi}{\phi}\right)D$
Hydraulic mean depth D_m	y	$\frac{(b+xy)y}{b+2xy}$	$\frac{1}{8}\left(\frac{\phi-\sin\phi}{\sin(1/2\phi)}\right)D$

Depth(y)-the vertical distance from the lowest point of the channel section to the free surface.

Stage (z) - the vertical distance from the free surface to an arbitrary datum

Area (A) - the cross-sectional area of flow, normal to the direction of flow

Wetted perimeter (P) - the length of the wetted surface measured normal to the direction of flow.

Surface width (B) - width of the channel section at the free surface

Hydraulic radius (R) - the ratio of area to wetted perimeter (A/P)

Hydraulic mean depth (Dm) - the ratio of area to surface width (A/B)

VELOCITY DISTRIBUTION IN OPEN CHANNEL

An open channel is a conduit which has free water surface exposed to the atmosphere. Rivers, canals etc come under open channel category. Because of free water surface and frictional resistance along the channel boundary velocity distribution is non-uniform in open channels. To measure velocity of open channel at required depth, Pitot tube or current meter are used. In general, to find average velocity of a particular open channel, velocity at a depth of 0.6 m from free water surface is measured. In the other case, velocity at 0.2 m depth, 0.8 m depth from free water surface is taken and average velocity of these two values is considered as channel average velocity.