DEPARTMENT OF CIVIL ENGINEERING
RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY
RAJSHAHI-6204, BANGLADESH

Engineering Hydraulics Sessional
Course No: CE 3122

Presented by:
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Lecturer, CE, R

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COURSE TITLE: ENGINEERING HYDRAULICS SESSIONAL

COURSE NO: CE 3122

Credit: 0.75

Contact Hours: 1.5 hrs/week

Experiment No	Experiment Name
1.	Flow through a venture flume
2.	Flow through a Parshall flume
3.	Observation of Hydraulic Jump
4.	Flow Beneath a Sluice Gate

What is Hydraulic engineering?

- **Hydraulic engineering** as a sub-discipline of civil engineering is concerned with the flow and conveyance of fluids, principally water and sewage. One feature of these systems is the extensive use of gravity as the motive force to cause the movement of the fluids.

- This area of civil engineering is intimately related to the design of bridges, dams, channels, canals, and levees, and to both sanitary and environmental engineering.

- Hydraulic engineering is the application of the principles of fluid mechanics to problems dealing with the collection, storage, control, transport, regulation, measurement, and use of water.

- Before beginning a hydraulic engineering project, one must figure out how much water is involved. The hydraulic engineer is concerned with the transport of sediment by the river, the interaction of the water with its alluvial boundary, and the occurrence of scour and deposition.

- The hydraulic engineer actually develops conceptual designs for the various features which interact with water such as spillways and outlet works for dams, culverts for highways, canals and related structures for irrigation projects, and cooling-water facilities for thermal power plants.

Fundamental principles:

- A few examples of the fundamental principles of hydraulic engineering include fluid mechanics, fluid flow, behavior of real fluids, hydrology, pipelines, open channel hydraulics, mechanics of sediment transport, physical modeling, hydraulic machines, and drainage hydraulics.

Why do we study hydraulics?

- All organised societies need adequate water supplies, drainage to dispose of waste or excess water, as well as the protection from uncontrolled water. Thus an obvious necessity for a study of hydraulics exists.

- However, this self-evident need does tend to persuade many students that hydraulics is separate from, and often more difficult than, the other major civil engineering studies such as:-

  - structural mechanics,
  - structural design and
  - soil mechanics.

- As your studies progress in this area of study, you will become aware of the interaction of hydraulic factors with other civil engineering studies. Thus it is important that you realise that hydraulic problems do not occur in isolation and that in professional life it will be essential to integrate hydraulics with other academic subjects.

What is flumes?

- A **flume** is a human-made channel for water in the form of an open declined gra chute whose walls are raised above the surrounding terrain, in contrast to a trench or ditch.
- Flumes are not to be confused with aqueducts, which are built to transport water, rather than transporting materials using flowing water as a flume does.
- Flumes route water from a diversion dam or weir to a desired materiel collection location. **Flumes** are usually made up of wood, metal or concrete.
- Many flumes took the form of wooden troughs elevated on trestles, often following the natural contours of the land. Originating as a part of a mill race, they were later used in the transportation of logs in the logging industry, known as a log flume.
- They were also extensively used in hydraulic mining and working deposits for gold, tin and other heavy minerals.

Types of flumes:

Parshall:

The Parshall flume is the most commonly used flume that's been in use for about a century. It's entirely standardized and comes in a variety of different sizes for near-universal application. Even if flow spills off the end of a Parshall flume, you can still get accurate measurements. As long as the discharge is lower than the inlet, along with several other requirements, the flow can easily be accurately measured.

Montana:

If you're looking for a shorter Parshall-type design, be sure to consider the Montana. It's set up in a similar hourglass shape, but the discharge and throat sections have been removed. It uses the same equations as the Parshall would for the most part, and it's best used in situations where you don't have a lot of room for installation. It's not nearly as popular, but most of the Parshall's research can be applied to the Montana as well, so maintenance and accounting for errors is easier.

Trapezoidal:

For flows that deal with a lot of solids and debris, a trapezoidal flume is one of the best options. That's why it's so commonly used for measuring irrigation channels. It maintains its accuracy when measuring a wide variety of flows, including low flows. The trapezoidal flume also implements a flat-bottom design, so it's easy to install in flat grades.

Palmer-Bowlus:

The Palmer-Bowlus flume is most commonly used among already existing manholes and pipelines. It is very accurate when it comes to average to high flow rates, but low flows will throw off measurements significantly. Keep that disadvantage in mind when installing in lower-flow areas. Additionally, the upstream requirements are significant

Venturi-flume:

Venturi flume has a converging section, a throat section and a diverging section. A control flume that comprises a short constructed section followed by one expanding to normal width. The bed level is kept horizontal. The streamlines run parallel to each other at least over a short distance upstream of the flume.

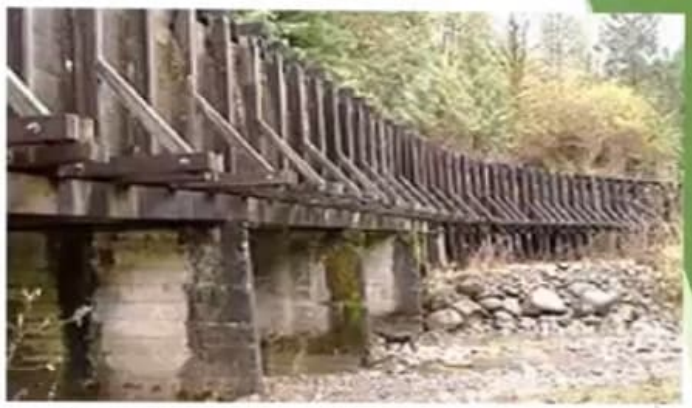
RBC

An RBC flume features a long throat and is most commonly used in ditches and furrows. There are several different sizes, and they're all suitable for accurate measurements with high submergence transitions. They scale universally among the different sizes, but it's important to remember that sediment can collect with a raised throat. When that happens, your measurements will be thrown off because the geometry of the flume has changed.

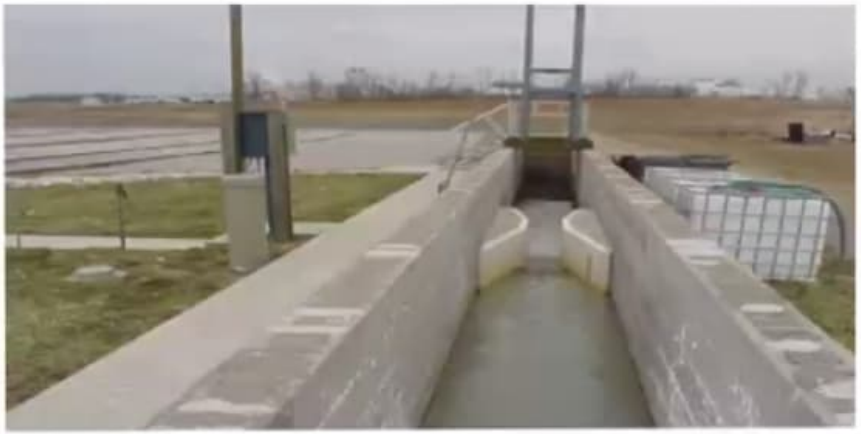
Cutthroat

A Cutthroat flume functions primarily like a Parshall flume with a few key differences. With a Cutthroat flume, you'll have a flat bottom without any extended throat area. The primary functional difference is that the Cutthroat excels at passing solids.

Parshall flume



Diversion flume, carrying water from one reservoir to another.



Venturi flume

Flume outflow