

Fluid Mechanics Lab

Mechanical Engineering Lab Equipment

FLOW OVER NOTCH

Recirculating-Type

The unit consists of flow channel of proper length & width. The notch or weir is fitted, water supply is given at one end of channel. Water flow over notch or weir. Arrangement are made to measure the still level to determine the head.

Features:

- ✓ Interchangeable Brass/Aluminum notches.
- ✓ Measurement of head by scale.

Range Of Experiments:

- ✓ To determine coefficient of discharge through.
- ✓ 60° 'V' notch.
- ✓ Rectangular notch.

Specifications:

- ✓ Water storage tank.
- ✓ Notches 60 included angle 'V' notch.
- ✓ Rectangular notch.
- ✓ Notch interchanges arrangement.
- ✓ Measuring tank & collecting tank & stop watch.

Service Required:

- ✓ Water supply.
- ✓ Suitable floor space of 2 m. x 2 m.



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MOUTHPIECE & ORIFICE INSTRUMENT

The unit consists of supply tank along with orifice and mouth piece fixed to the tank. A pointer is provided at the discharge of orifice to demonstrate & to determine X, Y co-ordinate of jet.

Features:

- ✓ An arrangement to obtain a steady or quiescent flow.
- ✓ An arrangement to vary the head by changing the position of over flow pipe.
- ✓ Piezometer tube to measure head.
- ✓ An arrangement to measure co-ordinate of jet.

Range Of Experiments:

- ✓ Determination of coefficient of discharged (CD) & coefficient of velocity (CV) & coefficient of contraction (CC) for orifice.

Specifications:

- ✓ Main supply tank with orifice & mouthpiece fitting arrangement.
- ✓ Diameter of Orifice-8.5 mm, Diameter of mouthpiece-8.5 mm, Nozzle-25 mm & 50 mm length.
- ✓ Tracer pointer with scale.
- ✓ Measuring tank.
- ✓ Stop watch.

Service Required:

- ✓ Suitable Water supply.
- ✓ Suitable floor space of 1.5 m. x 1.5 m.
- ✓



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BERNOULLIS THEOREM APPARATUS

The unit consists of a rectangular transparent flow section through which water is to be flown the velocity of water is changes as cross sectional area of channel changes. The changes of head can be measured with manometric tube connected at various sockets, along with the length of channel. Thus the Bernoulli's theorem can be verified by calculating the energy & head of water at different section.

Features:

Steady flow arrangement.
Transparent flow section.
Independent measurement of pressure head.
Variable flow rate arrangement.
Self sufficient unit.

Range Of Experiment:

Bernoulli's theorem can be verified.

Specifications:

Flow channel 750 mm long, transparent acrylic.
Supply with flow control valve.
Manometric tubes fixed over the flow channel.
Measuring tank = 400 x 300 mm
Sump tank = 900 x 400 x 400 mm
1/2 Hp pump.
Supply tank is fitted on heavy pipe frame.
Stop watch.

Service Required:

Suitable Water supply.
Suitable floor space 2 m. x 2 m.



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VENTURI METER FLOW REGULATOR

The unit consist of two pipe emerging out from common manifold along with a Venturi Meter & orifice meter, tapping are provided to measure pressure differences which are connected to differential manometer. A flow regulating valve is provided at the down speed stream of pipe. A measuring tank is provided to collect the flow. The actual flow rate can be measure are both meters calibrated.

Features:

- ✓ Two pipes emerging out from a common manifold with a orifice meter.
- ✓ Each line is provided with flow control valve for setting of differential flow rates.
- ✓ Pressure of different pipe lines are connected..
- ✓ Flow control valve at the end of each line assures for full running of pipe.

Range Of Experiments:

- ✓ Calibration of Venturi Meter.
- ✓ Calibration of orifice meter.

Specifications:

- ✓ Measuring tank & stop watch.
- ✓ Basic piping-1"
- ✓ Orifice meter & Venturi Meter inlet & throat diameter 32 & 15 mm resp.
- ✓ Differential manometer.
- ✓ Flow control valve.

Services Required:

- ✓ Suitable Water supply.
- ✓ Suitable floor space of 1.5 m.x 2 m.



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PIPE FITTING APPARATUS

The unit provide study of loose pipe in various pipe fitting. A differential manometer supply to measure the loss of head in these fitting. A flow control valve is provided. An experiment can be carried out at various flow rates.

Features:

- ✓ Testing of pipe circuit consisting of sudden contraction, sudden enlargement bends etc.
- ✓ Measurement of head loss at each section for various flow

Range Of Experiments:

- ✓ To determine loss of head due to sudden contraction.
- ✓ To determine loss of head due to sudden enlargement.
- ✓ To determine loss of head in an elbow.
- ✓ To determine loss of head in a bend.

Specifications:

- ✓ Basic piping.
- ✓ Pipe fitting.
- ✓ Pipe elbow.
- ✓ Pipe bends.
- ✓ Sudden expansion-1/2" to 1"
- ✓ Sudden contraction-1" to 1/2"
- ✓ Differential manometer.
- ✓ Flow control valve.
- ✓ Stop watch.

Service Required:

- ✓ Suitable Water supply.
- ✓ Suitable floor space of 2 m. x 2 m.
- ✓ 230 V. A. C. single phase supply with earthing connection.



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RECIRCULATING TYPE PIPE FRICTION

The unit consist of two pipes of different diameter. A collect tank is provided to measure the actual discharge.

Features:

- ✓ Testing of two pipes of different diameters.
- ✓ Measurement of head loss in the pipes at various flow rates.
- ✓ Calculation of pipe friction at various flow rates.

Range Of Experiments:

- ✓ To determine coefficient of friction for pipes.
- ✓ To plot relation between pressure loss and flow rates for a particular pipe diameter.

Specifications:

- ✓ Three pipes of 29 mm, 22 mm & 17 mm diameter G.I Pipe
- ✓ Length of pipe 1 m
- ✓ Flow control valve
- ✓ Differential manometer
- ✓ Measuring tank and stop watch

Service Required:

- ✓ Water supply.
- ✓ Suitable floor space.



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RECIRCULATING TYPE JET APPARATUS

The unit consists of a box with one leak proof transparent side. At the base of the box nozzle can be fitted to supply pipe. The flow can be controlled with a valve. A differential lever with a fine balancing arrangement is provided to measure the force exerts. Plates of different angle can be easily connected to the lever.

Features:

Interchangeable plates.

Nozzle.

Measurement of force developed by impact of jet.

Very clear visualisation of impact of jet.

Range Of Experiments:

To study the impact of jet on various types of plates & to measure impact forces.

Specifications:

Circular box one leak proof of transparent side.

Differential lever mechanism & dead weight to measure the force.

Measuring tank.

Nozzle diameter-8.5 mm.

Plates of shape.

600 inclined.

Curved plate.

1800 inclined.

Service Required:

Suitable water supply arrangement.

Suitable floor space of 1.5 m. x 1 m.



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METACENTRIC HEIGHT APPARATUS

The unit consists of a small tank. Water is poured in it, so that a small ship model can float over it. The ship model is provided with a horizontal guide bar over which a small weight can be slid. Displacement of weight is measured with a scale. A pointer is attached at the centre of ship. When the weight is slide the ship tilts. The angle of tilt is measured by displacement of pointer & from then the metacentric height of ship can be studied.

Specifications:

- ✓ Water tank 700 mm. x 700 mm. x 300 mm. heights with fibre lining inside.
- ✓ Ship model 300 mm. x 150 mm. with a horizontal guide bar for sliding weight & pointer hung from a hook.
- ✓ Scales for measuring displacement of sliding weight & pointer.

Services Required:

Bench area of about 1 m. x 1 m. at working height.

FREE FORCED VORTEX

The apparatus consists of a perspex cylinder with drain at center of bottom. The cylinder is fixed over a rotating platform which can be rotated with the help of a D.C motor at different speeds. A tangential water supply rip is provided with flow control valve. The whole unit is mounted over the Pump tank. Water is supplied by a centrifugal pump.

Specifications:

- ✓ Cylindrical vessel 300 mm D.I.A with central bottom outlet, mounted over rotating platform. D. C. motor with controller to rotate the vessel.
- ✓ Measuring tank - 400 x 300 x 400 mm mounted over the sump tank.
- ✓ Centrifugal pump to circulate the water.
- ✓ X-Y Co-ordinate measurement probe.



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REYNOLDS APPARATUS

The unit consists of a Acrylic tube connected to a tank. At entrance of tube a bell mouth section is provided and at the other end a valve is provide to control the rate of flow. A capillary tube is introduced centrally to the bell mouth to inject die. By varying the rate of flow the reynolds number changes. This also changes type of flow. Visual observation of die (thread) will indicate the type of flow which can be confirmed from the Reynolds number computed.

Features:

- ✓ Steady flow arrangement
- ✓ Very clear flow visualization
- ✓ Fine control of die thread.
- ✓ Accurate flow measurement & control.

Range Of Experiment:

- ✓ To determine the Reynolds number & hence the type of flow either laminar or turbulent.
- ✓ To determine upper & lower Reynolds number & velocities.

Specifications:

- ✓ Acrylic tube (transparent) 25 mm OD of suitable length.
- ✓ Sump tank of 400 X 400 X 700 mm.
- ✓ Supply tank of 300 x 300 mm size & die tank with die needle.
- ✓ Flow control valve.
- ✓ Measuring Flask & stop watch for flow measurement.
- ✓ Crompton Greaves motor for recirculating type unit.

Service Required:

- ✓ Suitable floor space of 2 m. x 2 m. x 2 m. for the instrument.
- ✓ Water supply.



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HELESHAW APPARATUS

Flow visualisation apparatus is basically designed on Hele-shaw principle of potential flow, which uses water as Fluid medium and dye solution forms the streamlines. The thin test channel is formed between two acrylic plates and is having entry from the top and exit from the bottom. The model is placed between the acrylic plates. Both the Fluid medium and dye solution are poured into the top containers. The acrylic is kept open from the top so as to facilitate the insertion of the model into the Flow Visualisation Space. The channel is placed vertically in a strong sturdy frame mounted on a “C” channel. At the outlet the brass cock is provided with an outlet pipe connection for the proper flow of the water.

Specifications:

- ✓ Test Channel: White side acrylic plates, both smooth on test side, fixed in rigid framed structure. Nominal Dimensions: 600 mm Long x 250 mm wide app. Depth of Channel can be varied by using different thickness models of rubber to some extent.
- ✓ Dye container with small series of holes to facilitate proper flow of the dye.

Experiments:

- ✓ Visual observation of the flow patterns.
- ✓ Square Model.
- ✓ Triangular Model.
- ✓ Circular Model.
- ✓ Aerofoil Model.
- ✓ Oval/Eye Shaped Model.
- ✓ Many more such models can be made and tested.

Services Required:

Sufficient Water.

Suitable floor space area 0.5 m. x 0.5 m.



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PRESSURE MEASUREMENT APPARATUS

This is a board mounted model which demonstrates various types of pressure measurement devices used in common practice. The devices incorporated are:

- ✓ Single well Manometer
- ✓ Differential Manometer
- ✓ Sensitive Manometer
- ✓ Pressure Gauge
- ✓ Vacuum Gauge

These devices are coupled to suction and discharge piping of Hydraulic Bench Pump and a close circulation systems is established, with this set up, the working and operating principle of the pressure measuring devices can be studied.

Service Required:

- ✓ Bench Area of about 2.5 m x 1 m at working height.
- ✓ Glycerine 500 ml for each experimental trial.



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WIND TUNNEL

This is an open circuit Wind Tunnel which provides a region of controlled airflow into which models can be inserted. The propulsion is provided by a fan at downstream of working section. The tunnel consists of bell mouth shaped entry to guide the air smoothly into settling chamber consisting of honeycomb and nylon mesh screens which filters and stabilizes the air flow. This follows working section or test section where various models can be tested. Two windows with acrylic sheet one each on either side will be provided for visual observation. Working section is followed by diffuser section, which reduces the dynamic pressure at the exit. A three-blade fan coupled with D.C variable speed motor is used to produce desired wind velocity. A thyristorised motor control is used for smooth variation of air velocity.

Specifications:

- ✓ Type: Open type Wind Tunnel.
- ✓ Test Section: 300 mm x 300 mm x 1000 mm. long with two Perspex windows.
- ✓ Blower Fan: 3 /10 blades /nylon fan.
- ✓ Motor: 7.5 HP D.C shunt motor, 1500 rpm.
- ✓ Speed Controller: 3 phase, thyristor controller to give smooth Speed control.
- ✓ Air Velocity: In test section-1 to 30 m/sec.
- ✓ Duct: Manufactured out of ms sheet.
- ✓ Length of Tunnel: 4/5 meter.

