DEPARTMENT OF CIVIL ENGINEERING
17CVCC84- HYDRAULICS ENGINEERING LAB (UG)
STANDARD OPERATING PROCEDURE

Name of the Lab./facility	HYDRAULICS ENGINEERING LAB
Purpose	Various fluids are transported through pipes. When the fluid flows through pipes, energy losses occur due to various reasons, among which friction loss is the predominant one.
Scope	Darcy-Weisbach equation relates the head loss due to frictional or turbulent through a pipe to the velocity of the fluid and diameter of the pipe
Responsibility	Faculty Incharge, HOD/CIVIL

STANDARD OPERATING PROCEDURE FOR THE FRICTION LOSSES IN PIPES

PROCEDURE:

1. Note the pipe diameter „D", the density of the manometer fluid (mercury)

„G_m" =13.6 kg/m^3 and the flowing fluid (water) „G_w" =1kg/m^3

2. Make sure only required water regulator valve and required valves at tapings connected to manometer are opened.
3. Start the pump and adjust the control valve to make pipe full laminar flow. Wait for some time so that flow is stabilized.
4. Measure the pressure difference across the orifice meter.
5. Note the piezometric reading „Z_0" in the collecting tank while switch on the stopwatch.
6. Record the time taken „T" and the piezometric reading „Z_1" in the collecting tank after allowing sufficient quantity of water in the collecting tank.
7. Increase the flow rate by regulating the control valve and wait till flow is steady.
8. Repeat the steps 4 to 6 for different flows.

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DEPARTMENT OF CIVIL ENGINEERING
17CVCC84- HYDRAULICS ENGINEERING LAB (UG)
STANDARD OPERATING PROCEDURE

PRECAUTIONS TO BE FOLLOWED

1. When fluid is flowing, the lower meniscus reading should be taken into considerations.
2. There should be some water in the collecting tank.
3. The valve in the downstream end should be closed only when the upstream valve is closed.

RECORD TO BE MAINTAINED

- Laboratory Manual containing the experiments that can be performed with the equipment
- Maintenance Record

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DEPARTMENT OF CIVIL ENGINEERING

17CVCC84- HYDRAULICS ENGINEERING LAB (UG)

STANDARD OPERATING PROCEDURE

Name of the Lab./facility	HYDRAULICS ENGINEERING LAB
Purpose	To determine the coefficients of discharge of the rectangular notch
Scope	In open channel hydraulics, weirs are commonly used to either regulate or to measure the volumetric flow rate. They are of particular use in large scale situations such as irrigation schemes, canals and rivers. For small scale applications, weirs are often referred to as notches and invariably are sharp edged and manufactured from thin plate material.
Responsibility	Faculty Incharge, HOD/CIVIL

STANDARD OPERATING PROCEDURE FOR STUDY OF
CALIBRATION OF DIFFERENT TYPES OF NOTHCES

1. Insert the given notch into the hydraulic bench and fit tightly by using bolts in order to prevent leakage.
2. Open the water supply and allow water till over flows over the notch. Stop water supply, let excess water drain through notch and note the initial reading of the water level „h_o' the hook and point gauge. Let water drain from collecting tank and shut the valve of collecting tank after emptying the collecting tank.
3. After initial preparation, open regulating valve to increase the flow and maintain water level over notch. Wait until flow is steady.
4. Move hook and point gauge vertically and measure the current water level „h1" to find the water head „H" above the crest of the notch.
5. Note the piezometric reading „z_o" in the collecting tank while switch on the stopwatch.
6. Record the time taken „T" and the piezometric reading „z_1" in the collecting tank after allowing sufficient water quantity of water in the collecting tank.

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7. Repeat step 3 to step 6 by using different flow rate of water, which can be done by adjusting the water supply. Measure and record the H, the time and piezometric reading in the collecting tank until 5 sets of data have been taken. If collecting tank is full, just empty it before the step no 3.
8. To determine the coefficient of discharge for the other notch, repeat from step 1.

PRECAUTIONS

1. Ensure and read initial water level reading just above the crest.
2. Make the water level surface still, before taking the readings.
3. Reading noted should be free from parallax error.
4. The time of discharge is noted carefully.
5. Only the internal dimensions of collecting tank should be taken for considerations and calculations.

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DEPARTMENT OF CIVIL ENGINEERING

17CVCC84- HYDRAULICS ENGINEERING LAB (UG)

STANDARD OPERATING PROCEDURE

Name of the Lab./facility	HYDRAULICS ENGINEERING LAB
Purpose	An orifice is an opening in the wall of the tank, while a mouth is a short pipe fitted in the same opening. Orifice is used for discharge measurement.
Scope	The jet approaching the orifice continues beyond the orifice till the streamline becomes parallel. This section is the jet approaching the orifice, continue to coverage beyond parallel.
Responsibility	Faculty Incharge, HOD/CIVIL

STANDARD OPERATING PROCEDURE FOR DETERMINATION OF COEFFICIENTS OF AN ORIFICE

- Note down the relevant dimensions as area of collecting tank and supply tank.
- Attach an orifice and note down its diameter.
- The apparatus is leveled.
- The water supply was admitted to the supply tank and conditions are allowed to steady, to give a constant head.
- The lowest point of the orifice is used as the datum for the measurement of h and y.
- The discharge flowing through the jet was recorded together with the water level in the supply tank.
- A series of reading of dimensions x and y was taken along the trajectory of the jet.
- The procedure is repeated by means of flow control valve.

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DEPARTMENT OF MECHANICAL ENGINEERING

17MECC93- HYDRAULICS AND PNEUMATIC SYSTEM LAB (UG)

STANDARD OPERATING PROCEDURE

Name of the Lab./facility	HYDRAULICS ENGINEERING LAB
Purpose	The test rig consists of a sump tank to store water. A centrifugal pump is fitted in the rig. Suitable piping with valves for control is provided.
Scope	A measuring tank with gauge glass and scale is provided to measure the flow. Pressure and vacuum gauges are provided to find out the discharge head and suction head.
Responsibility	Faculty Incharge, HOD/CIVIL

STANDARD OPERATING PROCEDURE FOR

PERFORMANCE TEST ON A CENTRIFUGAL PUMP

- Ensure that the delivery valve is in closed position.
- Ensure that the isolation valves of the pressure/vacuum gauges are closed.
- Prime the pump and start it. Allow it to attain the rated speed.
- Open the valve fitted to the pressure gauge fitted at the outlet of the pump.
- Note the following readings at no load:
  - Vacuum gauge reading at inlet to the pump.
  - Pressure gauge readings at outlet of each stage.
  - Time to collect 100 mm height of water in the measuring tank.
  - Time for 5 revolutions of the disc of energy meter.
- At different gate valve opening note the readings.
- Tabulate the readings.
- Do the calculations and draw the graphs.

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DEPARTMENT OF MECHANICAL ENGINEERING

17MECC93- HYDRAULICS AND PNEUMATIC SYSTEM LAB (UG)

STANDARD OPERATING PROCEDURE

Name of the Lab./facility	HYDRAULICS ENGINEERING LAB
Purpose	Orifice meter is a device used to measure the flow through a pipe line. The pressure difference between the upstream and downstream side of the orifice meter is measured by using a differential U – tube manometer.
Scope	The theoretical discharge and actual discharge are calculated, from which the coefficient of discharge of the orifice meter can be calculated.
Responsibility	Faculty Incharge, HOD/CIVIL

STANDARD OPERATING PROCEDURE FOR DETERMINATION OF COEFFICIENT OF AN ORIFICEMETER

PROCEDURE:

1. **Check up the experimental setup.**
2. **Measure the length (l) and breadth (b) of the tank.**
3. **Note the diameter of the pipe line (d1) and orifice diameter (d0).**
4. **Ensure water flow in the pipe line.**
5. **Open the flow control valve to maximum. Ensure that the mercury levels in the manometer are steady.**
6. **Allow water to flow for some time.**
7. **Note the deflections in the manometer (h1, h2).**
8. **Close the tank outlet valve.**
9. **Note the time („t‟ sec) to collect „h‟ m height of water in the tank.**
10. **Open the tank outlet valve.**
11. **Close the flow control valve slightly and repeat steps 7 to 10.**
12. **Tabulate the observations.**

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DEPARTMENT OF CIVIL ENGINEERING
17CVCC84- HYDRAULICS ENGINEERING LAB (UG)
STANDARD OPERATING PROCEDURE

Name of the Lab./facility	HYDRAULICS ENGINEERING LABORATORY
Purpose	A rotary gear pump consists essentially of two intermeshing spur gears which are identical and which are surrounded by a closely fitting casing. One of the pinions is driven directly by the prime mover while the other is allowed to rotate freely
Scope	The fluid enters the spaces between the teeth and the casing and moves with the teeth along the outer periphery until it reaches the outlet where it is expelled from the pump.
Responsibility	Faculty Incharge, HOD/CIVIL

STANDARD OPERATING PROCEDURE FOR

THE PERFORMANCE TEST ON GEAR PUMP

1. The gear oil pump is stated.
2. The delivery gauge reading is adjusted for the required value.
3. The corresponding suction gauge reading is noted.
4. The time taken for 'N' revolutions in the energy meter is noted with the help of a stopwatch.
5. The time taken for 'h' rise in oil level is also noted down after closing the gate valve.
6. With the help of the meter scale the distance between the suction and delivery gauge is noted.
7. For calculating the area of the collecting tank its dimensions are noted down.
8. The experiment is repeated for different delivery gauge readings.
9. Finally the readings are tabulated.

PRECAUTIONS TO BE FOLLOWED

- Do not conduct an experiment without the complete knowledge of its operating procedure.
- Wear tight fitting clothes and thick leather shoes.
- Do not wear watches (or) bracelets while working in the equipments.
- Do not remove safety guards or parts of any equipment

RECORD TO BE MAINTAINED

- Laboratory Manual containing the experiments that can be performed with the equipment
- Maintenance Record

HOD/CIVIL

DEPARTMENT OF CIVIL ENGINEERING

17CVCC84- HYDRAULICS ENGINEERING LAB (UG)

STANDARD OPERATING PROCEDURE

Name of the Lab./facility	HYDRAULICS ENGINEERING LABORATORY
Purpose	Reciprocating is a positive displacement pump in which the liquid is sucked and then it is actually pushed or displaced due to the thrust.
Scope	These pumps usually have one or more chambers which are alternatively filled with the liquid to be pumped
Responsibility	Faculty Incharge, HOD/CIVIL

STANDARD OPERATING PROCEDURE FOR

PERFORMANCE TEST ON RECIPROCATING PUMP

1. The internal plan dimensions of the collecting tank and the difference in level between the suction and pressure gauges (x) are measured.
2. The speed of the pump and the energy meter N_e are noted.
3. With the delivery valve fully closed, driving unit is started.
4. Water is sucked in through the suction pipe and is lifted up by centrifugal action.
5. By varying the pressure gauge fitted to the delivery pipe the delivery head and in turn the

   discharge are varied.

6. For each pressure gauge reading the following observations are made

   Vacuum gauge reading
   Pressure gauge reading
   Time taken for number flicking of the energy meter disc.
   Time (t) for a rise H in the collecting tank keeping the outlet valve completely closed.

7. The observations are tabulated and the efficiency of the pump is computed.

PRECAUTIONS TO BE FOLLOWED

- Do not conduct an experiment without the complete knowledge of its operating procedure.
- Wear tight fitting clothes and thick leather shoes, In case of any injury, use the FIRST AID KIT.
- Report any fault (or) damage in the equipment to inform the lab in charge.
- Use stop watches, thermometers and accessories carefully.

RECORD TO BE MAINTAINED

- Laboratory Manual containing the experiments that can be performed with the equipment
- Maintenance Record

HOD/CIVIL

DEPARTMENT OF CIVIL ENGINEERING
17CVCC84- HYDRAULICS ENGINEERING LAB (UG)
STANDARD OPERATING PROCEDURE

Name of the Lab./facility	HYDRAULICS ENGINEERING LABORATORY
Purpose	A Kaplan turbine is a type of propeller turbine which was developed by the Austrian engineer V. Kaplan (1876-1934). It is an axial flow turbine, which is suitable for relatively low heads, and hence requires a large quantity of water to develop large amount of power.
Scope	It is also a reaction type of turbine and hence it operates in an entirely closed conduit from the headrace to the tailrace.
Responsibility	Faculty Incharge, HOD/CIVIL

STANDARD OPERATING PROCEDURE FOR PERFORMANCE TEST ON KAPLAN TURBINE

1. The butterfly valve is kept in fully closed position
2. The guide vane opening is kept at maximum position
3. The pump is switched 'ON' and allowed to pick up full speed
4. The butterfly valve is opened slowly to the full open condition
5. For a particular electrical loading condition, the propeller speed setting is adjusted between maximum and minimum and a constant speed of 1500 rpm is maintained
6. The time taken for two revolutions of the energy meter is noted
7. The pressure gauge reading and hook gauge reading are noted
8. The above procedure is repeated for different loadings and different butterfly valve opening.

PRECAUTIONS TO BE FOLLOWED

- Do not conduct an experiment without the complete knowledge of its operating procedure.
- Wear tight fitting clothes and thick leather shoes.
- In case of any injury, use the FIRST AID KIT.

RECORD TO BE MAINTAINED

- Laboratory Manual containing the experiments that can be performed with the equipment
- Maintenance Record

HOD/CIVIL

DEPARTMENT OF CIVIL ENGINEERING
17CVCC84- HYDRAULICS ENGINEERING LAB (UG)
STANDARD OPERATING PROCEDURE

Name of the Lab./facility	HYDRAULICS ENGINEERING LABORATORY
Purpose	In an impulse turbine the pressure energy of water is converted into kinetic energy when passed through the nozzle and forms the high velocity jet of water.
Scope	The pelton wheel turbine (named after the American engineer Lester Allen Pelton) is an impulse turbine.
Responsibility	Faculty Incharge, HOD/CIVIL

STANDARD OPERATING PROCEDURE FOR

PERFORMANCE TEST ON PELTON WHEEL TURBINE

- The Pelton wheel turbine is started.
- All the weight in the hanger is removed.
- The pressure gauge reading is noted down and it is to be maintained constant for different loads.
- The venturimeter readings are noted down.
- The spring balance reading and speed of the turbine are also noted down.
- A 5Kg load is put on the hanger, similarly all the corresponding readings are noted down.
- The experiment is repeated for different loads and the readings are tabulated.

PRECAUTIONS TO BE FOLLOWED

- Do not conduct an experiment without the complete knowledge of its operating procedure.
- Wear tight fitting clothes and thick leather shoes.
- In case of any injury, use the FIRST AID KIT.

RECORD TO BE MAINTAINED

- Laboratory Manual containing the experiments that can be performed with the equipment
- Maintenance Record

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DEPARTMENT OF CIVIL ENGINEERING
17CVCC84- HYDRAULICS ENGINEERING LAB (UG)
STANDARD OPERATING PROCEDURE

Name of the Lab./facility	HYDRAULICS ENGINEERING LABORATORY
Purpose	A Francis turbine is an inward flow reaction turbine with mixed flow runner, in which water enters at high pressure. Around the runner, a set of stationary guide vanes direct the water into the moving vanes.
Scope	The input power supplied to the turbine is calculated from the net supply head on the turbine and the discharge through the turbine. The output power from the turbine is calculated from the readings taken on the rope brake drum and the speed of the shaft.
Responsibility	Faculty Incharge, HOD/CIVIL

STANDARD OPERATING PROCEDURE FOR

CHARACTERISTICS CURVES OF FRANCIS TURBINE

- The Francis turbine is started
- All the weights in the hanger are removed
- The pressure gauge reading is noted down and this is to be maintained constant for
- different loads
- Pressure gauge reading is ascended down
- The pressure gauge reading and speed of turbine are noted down
- The experiment is repeated for different loads and the reading are tabulated

PRECAUTIONS TO BE FOLLOWED

- Do not conduct an experiment without the complete knowledge of its operating procedure.
- Wear tight fitting clothes and thick leather shoes.
- In case of any injury, use the FIRST AID KIT.

RECORD TO BE MAINTAINED

- Laboratory Manual containing the experiments that can be performed with the equipment
- Maintenance Record

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DEPARTMENT OF CIVIL ENGINEERING
17CVCC84- HYDRAULICS ENGINEERING LAB (UG)
STANDARD OPERATING PROCEDURE

Name of the Lab./facility	HYDRAULICS ENGINEERING LABORATORY
Purpose	Determine the co-efficient of discharge of the Venture meter than a given pipe size.
Scope	To find Cd for various pipes and its efficiency
Responsibility	Faculty Incharge, HOD/CIVIL

STANDARD OPERATING PROCEDURE FOR

FLOW THROUGH PIPE VENTURIMETER

- The diameter of pipe and internal cross sections of collecting tank are note down.
- First start the motor, slowly press the delivery valve and adjust to the required total head.
- Note down the monometer reading and also value down the time for rise of water level in the tank(say 10 cm).
- The central discharge is measured with the help of the measuring tank.
- Repeat the above procedure for different manometer reading by adjusting the gate valves.

PRECAUTIONS TO BE FOLLOWED

- Do not conduct an experiment without the complete knowledge of its operating procedure.
- Wear tight fitting clothes and thick leather shoes.
- In case of any injury, use the FIRST AID KIT.

RECORD TO BE MAINTAINED

- Laboratory Manual containing the experiments that can be performed with the equipment
- Maintenance Record

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