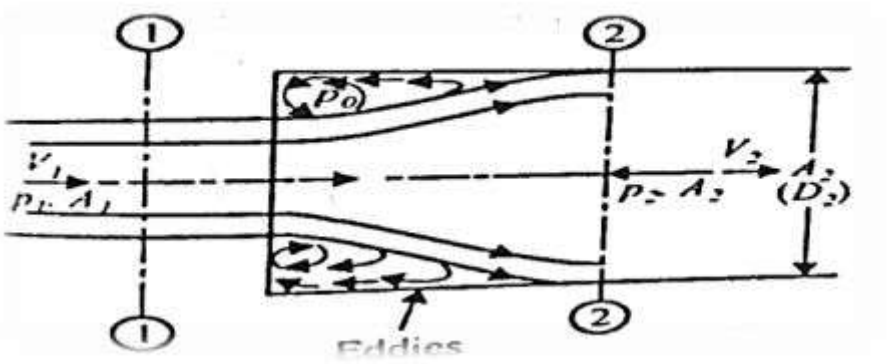
EXPERIMENT:2 --To determine the minor head loss coefficient for different pipe fittings

AIM: To determine different losses in pipe fittings. It comprises of the following items. 1. Test set up of the following 2. Stop watch 3. Accessories

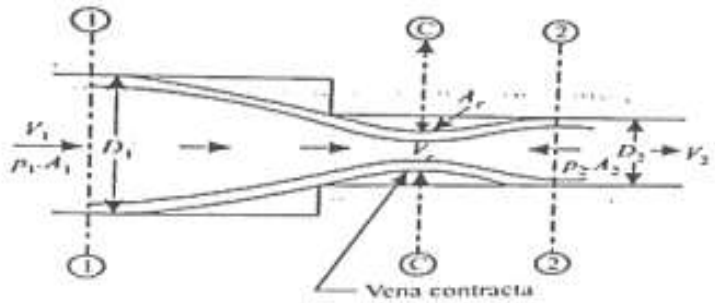
INTRODUCTION AND THEORY:

(a) **Loss of head due to sudden enlargement:**



Consider a liquid flowing through a pipe. Due to sudden enlargement in diameter from d1 to d2, the liquid flowing from smaller pipe is not able to follow the sudden change of boundary and turbulent eddies are generated as shown in the figure resulting in loss of head. This head loss due to sudden enlargement is given by he= (V1 – V2) 2 /2g

(b) **Loss of head due to sudden contraction:-**



Water is flowing from large diameter pipe to smaller diameter pipe as shown in figure. The loss of head due to sudden contraction is actually due to sudden enlargement from vena-contracta

If Cc = 0.62 then hc = 0.375 V2 2 /2g

If Cc is not given then use hc = 0.5 V2 2 /2g

(c) **Loss of head in bend:-**

When there is any bend in a pipe, the velocity of flow changes, due to which separation of the flow from the boundary and also formation of eddies takes place. Thus the energy is lost. Loss of head in pipe due to bend is expressed as hb = k V2 /2g k is the coefficient of bend and its value depends upon 1. Angle of bend 2. Radius of curvature 3. Diameter of the pipe

(d) Loss of head in elbow:- hel =k V2 /2g

EXPERIMENTAL SET UP:

1. Sump Tank: 1210 x 410 x 410 mm3

2. Measuring Tank: 410 x 330 x 410mm3

3. Basic Piping

4. Pipe Fittings a. Sudden Enlargement b. Sudden Contraction c. Pipe Bend d. Pipe Elbow e. Flow Control Valve f. Differential Manometer

PROCEDURE:

1. Start the water.

2. Then fluid is allowed to flow through the pipe fittings like sudden enlargement, contraction, bend and elbow.

3. Take manometer difference of each of the pipe fittings.

4. Take the time required for 100 mm rise of water level in measuring tank

5. Above procedure is repeated for different reading. OBSERVATIONS 1. Sump tank = _____ mm3 2. Measuring tank = (250 x600 x h)mm3 3. Diameter of enlargement = 25 mm 4. Diameter of contraction = 12.5 mm 5. Diameter of bend = 25 mm 6. Diameter of elbow = 25 mm 7. Area of measuring tank = mm

OBSERVATION TABLE

Types of loss	S. No.	Manometer Reading		Difference X cm	Time required for 100 mm rise
		H_1 (cm)	H_2 (cm)		
Sudden Expansion	1				
	2				
Sudden Contraction	1				
	2				
Bend	1				
	2				
Elbow	1				
	2				

CALCULATIONS

1. For Sudden Enlargement d = mm = m i. Head Lost = x (Sh - 1) = mm of water ii. Discharge (Q) = Area of measuring Tank/time Required iii. Velocity (V) = Q A iv. Head lost he = (V1 – V2) 2 /2g

2.For Sudden Contraction i. Head Lost = x(Sh - 1) = mm of water ii. Discharge (Q) = Area of measuring Tank * 0.1/time Required iii. Velocity (v) = Q A iv. Head loss hc =0.375 V2 2 /2g

3. For Bend i. Head Lost = x(Sh - 1) = mm of water ii. Discharge (Q)= Area of measuring Tank * 0.1/time Required iii. Velocity (V) = Q A iv. Head lost hb = kV2 /2g (assume k=1)

4. For Elbow i. Head Lost = x(Sh - 1) = mm of water ii. Discharge (Q)= Area of measuring Tank * 0.1/time Required iii. Velocity (V) = Q A iv. Head lost hel = kV2 /2g (assume k=1)

RESULT TABLE

Sl. No.	Type of loss	Head loss m of water
1	Sudden Expansion	
2	Sudden Contraction	
3	Bend	
4	Elbow	

NOTE:- Go to the below links to see demonstration

https://www.youtube.com/watch?v=UDF448c6fOw&feature=youtu.be

https://www.youtube.com/watch?v=hNtQMu57j44&feature=youtu.be